



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Jasleen K. Bains	Project Number J0901
Project Title Investigating the Bioremediation Effectiveness of Oil-Eating Bacteria under Various Environmental Conditions	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project was to investigate the bioremediation effectiveness of oil-eating bacteria under various environmental conditions. Oil spreads rapidly and covers huge areas quickly. The reason I did this experiment was to determine if oil-eating bacteria is an efficient and quick way to remove oil.</p> <p>Methods/Materials I filled each Petri dish with 25 mL of salt or fresh water and placed them in their designated environment (warm or cold). I had 10 trials each and an average with the fresh water in a cold and warm temperature and the salt water in a cold and warm temperature. I then added three drops of motor oil and 5 mL oil-eating bacteria suspension, recording the rate of bioremediation. I also made an oil slick in three different beach soils (fine sand, coarse gravel, and medium sand) and added the bacteria suspension, recording how long it took for the oil-slick to disappear. In my control groups, the same steps told above were done, except the bacteria was not added. I used Petri dishes, salt/fresh water, oil eating bacteria, motor oil, pipette, beaker, magnifying glass, fine sand, coarse gravel, and medium sand. The warm environment was in a room upstairs and the cold environment was inside my refrigerator. The salt water was taken from Pismo Beach.</p> <p>Results The results of my investigation on the bioremediation effectiveness of oil-eating bacteria under various environmental conditions indicates that fresh water in a warm environment and coarse gravel are the most efficient and quickest variables for oil remedy. The least efficient environment and beach material was the salt water in a cold temperature and the fine sand.</p> <p>Conclusions/Discussion Both of the environments and the beach soils allowed the bacteria to eat the oil successfully. When all of the oil was gone, the bacteria died. This means that the bacteria live and thrive off of oil and oxygen. They are a quick and successful way to remove oil from a river to the ocean. Since I used "real" sea water, I am sure that these bacteria can be used in the ocean. In conclusion, response to cleaning up an oil spill must be fast to minimize its impact on the environment. I feel that we are ruining our future and destroying the earth. Poor animals are becoming endangered because of human activity. I hope my project has made a new turn in the remedy of an oil spill.</p>	
Summary Statement My project was investigating the bioremediation effectiveness of oil-eating bacteria under various environmental conditions.	
Help Received Teacher helped get oil-eating bacteria	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Kaitlin J. Bakhshian	Project Number J0902
Project Title Got Carbon: Does the Density of Carbon Particles in a Filter Increase Filter Effectiveness?	
Abstract Objectives/Goals The purpose of my project is to determine which is better at removing chlorine from water: a tightly-packed (commercial) carbon filter or a loosely-packed (homemade) carbon filter. Methods/Materials My materials are an old pickle jar, water bottles, a peristaltic pump, a micropipetor, two 12-volt batteries, connecting wires, two plastic cups, activated loose carbon, a store bought water filter, clear tubing, and rubber stoppers. I also used Clorox, a glass stirring rod, distilled water, and a chlorine test kit. I first tested the amount of chlorine in the distilled water. None was detected. Next, I measured and added chlorine to a measured amount of water, and checked the amount with the chlorine test kit. I then pumped the chlorinated water through each of the filters. Then I tested the amount of chlorine in the filtered water. I tested seven different concentrations of chlorine in water. Results The filter from the store with tightly-packed carbon removed more chlorine, and the homemade filter with loosely packed carbon removed less chlorine. Both filters were ineffective at removing chlorine from the lower concentration solutions. The homemade filter was ineffective at removing chlorine from the higher concentration solutions. Conclusions/Discussion I confirmed my hypothesis that the commercial filter with tightly-packed carbon worked better to remove chlorine than the loosely-packed carbon filter that I made myself.	
Summary Statement My project is about whether the density of activated carbon in a filter effects its performance in removing chlorine from water.	
Help Received My dad helped me design & assemble the project board, including the pump, the batteries, and the tubing system. He also did the power tool work. My mom helped me write my report & this application. I did my log book alone. I ran the experiments at school with my dad and my science teacher.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Daniel J. Barton	Project Number J0903
Project Title Does Soil Absorb Motor Oil Spills Better than Consumer Products?	
Abstract Objectives/Goals My objective last year was to determine whether soil, sand, cat litter, or sawdust absorbed motor oil spills the best. I found that soil was the most absorbent. So my objective this year is to determine whether soil absorbs motor oil spills better than store bought consumer products that are made for that specific purpose. My hypothesis stated that the consumer products would be the most absorbent because that is their primary function Methods/Materials Lay out 4 pie pans;Pour 1/2c of 10w 40 motor oil into pans;Pour level 1/2c of soil, Multi Purpose Ultra Sorb, Oil Dri Concentrate or Select Sorb Auto-Spill on top of oil;Wait 24 hours;Pour contents of pan into strainer over 2c measuring beaker;Measure amount remaining;Record results;Pour oil into oil recycling container;Repeat steps 1-9 for 10 trials Results Soil - Least absorbent material= 32% (average) amount absorbed Ultra Sorb - Third most absorbent material= 35% (average) amount absorbed Oil Dri - Second most absorbent material= 37% (average) amount absorbed Select Sorb - Most absorbent material= 38% (average) amount absorbed Conclusions/Discussion My hypothesis was correct. The least absorbent material was the soil with an absorbency of 32% average. The most absorbent was the Select Sorb consumer product with an average absorbency of 38%. Another observation I made is that the consumer products are probably only used for smaller spills. In my first trial I used 1c of oil and only 1/2c of material, there was so much oil that the materials became overwhelmed that they could not absorb it, therefore I had to decrease the oil quantities to 1/2c. I learned that the Select Sorb absorbed more motor oil than the soil and other consumer products I tested. I would definitely recommend buying this product if you work at an auto repair or oil-recycling center. In conclusion people should use the Select Sorb to absorb motor oil spills instead of soil. Although last year soil was my top absorber, it didn't fare as well this year.If you're concerned about spending money though, you can still use soil. If you look at my results soil absorbed only 6% on average lower than the Select Sorb. There is really not that much difference. So, if you want to absorb motor oil spills most effectively, buy the Select Sorb product. If you want to absorb motor oil spills economically, use the soil, it works fine too. Be sure to dispose of everything properly too!	
Summary Statement Determining whether soil absorbs motor oil spills more effectively than store bought consumer products.	
Help Received Mother helped apply project to board and took photographs.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Nora M. Britton	Project Number J0904
Project Title Heat: From Substrate to Water	
Objectives/Goals To find whether gravel, sand, or clay transfer heat to water the quickest and highest degree Celcius, depending on the temperature they intially have.	
Abstract	
Methods/Materials Tape a plastic tube to the center of the can, then fill with 3 litres of terra cotta clay, pumice gravel, or sand. Then heat substrate to 60 degrees Celsius. Pour water into tube, and record temperature increase at 2 minute intervals for 30 minutes. Repeat 3 times for each substrate.	
Results Gravel heated water the quickest, followed by clay, and then sand. Clay heated water to the highest average degree of 45.9, then gravel with an average of 44.5, and then sand with the lowest of 42.	
Conclusions/Discussion These results support my objective for I found that clay heats water to the highest degree, but gravel the quickest. This is useful information for determining the preferential substrate for an application, especially the application to Geothermal Heating and Energy.	
Summary Statement My project was about finding if sand, gravel, or clay heat water the quickest and to the highest degree, and the result's application to geothermal heating and energy.	
Help Received Besides interviews with Erik Zinn, a geologist, suggestions on project and procedure from parents, and Grammatical Editing from a parent, I received no help.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Aubryn R. Butterfield	Project Number J0905
Project Title Wind Farming the Fertile Pavement of the San Joaquin Valley	
Abstract Objectives/Goals Can wind generated from from highway traffic be captured to produce a useable source of energy. Methods/Materials First year: I used a Turbo Meter wind speed indicator to determine if there was more wind produced from the traffic along Highway 99 compared to my control site. Second year: Based on the results of the previous year, I built a prototype Savonius wind turbine from a kit. For the field trial I modified the turbine, attached a volt meter and returned to the same locations as the previous year attempting to capture the wind generated by the traffic. Results First year: Wind speeds at Highway 99 resulted in an average net gain of 1.72 kph above the control site. Second year: The cut-in wind speed for my Savonius wind turbine is 6.4 knots. The average of the wind speed readings taken along Highway 99 was 1.29 knots. At the control site it was .74 knots showing a net gain of .55 knots generated by traffic. Conclusions/Discussion First year: More wind was produced along Highway 99 than at the control site. Second year: Although a net gain of .74 knots was generated by traffic along the highway, the cut-in wind speed was too high to make that gain capturable by my Savonius in its current design. I was able to test my turbine on a very windy day and highway traffic produced 1.62 more volts than the control site. Design modifications are needed to compensate for the cut-in wind speed.	
Summary Statement Can the wind that is produced by highway/freeway traffic be captured and utilized to generate energy.	
Help Received Financial support and a second set of hands provided by parents.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Paul C. Deardorff	Project Number J0906
Project Title Effects of Adding Denatured Alcohol to Unleaded Gasoline on Emissions from a Small Internal Combustion Engine	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Small internal combustion gasoline engines contribute significant amounts of exhaust pollutants into the environment. These include such things as polycyclic aromatic hydrocarbons (HC), nitrous oxide (NO), carbon monoxide (CO) and carbon dioxide (CO₂). Many of these pollutants are known to contribute to health problems and global warming. Fuel additives, such as ethanol, have been tested in automobiles and result in a decreased level of these harmful emissions. This study tested the effect of adding denatured ethanol (DE) to unleaded gasoline on the production of pollutants in the exhaust of a small internal combustion engine. DE is inexpensive and readily available at any hardware store and the engine was similar to what might be commonly used in lawn equipment</p> <p>Methods/Materials Various fuel mixtures (0%, 15%, 25%, and 35%) of DE and gasoline were tested by a certified technician using a gas emission analyzer. The test was run for High and Low RPM conditions.</p> <p>Results It was found that levels for all pollutants measured (HC, NO, CO, and CO₂) decreased as the concentration of DE in the fuel increased, for both RPM levels.</p> <p>Conclusions/Discussion The study concludes that adding a small amount of DE to unleaded fuel results in decreased emissions. The discussion points out that adding a small amount of DE to each tank of gasoline has the potential to significantly decrease emissions from small internal combustion engines such as those used in lawn equipment. Directions for future research include testing under laboratory conditions, determining the most cost-effective amount of DE to add to the fuel, and the effects of adding DE on engine performance and longevity.</p>	
Summary Statement The project determined whether adding denatured alcohol to unleaded gasoline lowered harmful emissions from a small engine.	
Help Received My father drove me to the SMOG testing station and took pictures of me throughout the project. My parents and science teacher helped edit my research report. My mother helped with some of the poster board construction.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Jennifer E. Fox	Project Number J0907
Project Title Using Plants to Remove Pesticides from Storm Water Run-Off, Year 3	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project is to create a natural filter that farmers can use to clean pesticides from their storm water runoff. I will use my findings from this year and my last two science projects to determine if a combination of plants, air and natural filter material can be an effective filter. All the parts of this filter are available to the average farmer at very little cost.</p> <p>Methods/Materials This year, I will use the plant that filtered the best in my previous experiments, Hardstem Bulrush and place it in a water contaminated with Malathion at 12 1/2 % of the recommend label strength per gallon of water. I will use an aquarium air pump to add air to the filter. I will then pour the water treated by the plants and air, through four different kinds of filter material to see if it will finally remove all of the contamination. The filter material I will use is Walnut Shells, Almond Shells, Sand and Activated Carbon. Activated Carbon is known to have the ability to remove pesticides from water, it will be the control I will compare my other samples to. I will crush the 2 types of nutshells, Almond and Walnut, screen them so that the size of their pieces is similar to that of Activated Carbon or .5-3.0mm in size. I will also screen sand through the same filter. I will fill four 18 in long, 1 1/4 dia PVC pipe with one type of filter material.</p> <p>Results There were many high and low results in my project. It was no surprise that the control had the worst results but my other results were surprising. Sand and Almond did better than the sample that was not ran through filters but only by 2 to 3 minutes. The Walnut was the most like activated carbon. Like the AC, the sample from the filter using Walnuts cleaned the water and the tadpole didn't die. The reason this happened is because walnut shell particles have many pores that work to break off the Malathion molecules from water like AC does.</p> <p>Conclusions/Discussion After completing my project I found my hypothesis was correct. My hypothesis stated that using a combination of plants, air, and natural filters, I will successfully clean pesticide contamination from storm water run off. My experiment proved that after filtering contaminated water through a pond of with Hardstem Bulrush plants, added air for 10 days and then a final filtration through a natural walnut filter, the tadpole didn't die and the sample was clean.</p>	
Summary Statement using natural filters to remove pesticides from storm water un-off.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Shaleena Jeeawoody	Project Number J0908
Project Title Water Purification: The Green Way	
Objectives/Goals Many contaminants can enter the water system through various ways, greatly endangering human health. Excess iron can cause chronic fatigue, cancer, and heart disease, while excess copper can damage the liver and kidneys, and can cause severe stomach distress. The purpose of my project is to find out whether natural products, such as Dungeness crab shells and Nopal cactus gel, can filter out the metals, iron and copper, dissolved in water.	
Abstract Methods/Materials I used four plastic columns and filled the first one with sand, the second one with charcoal, the third column with crushed boiled Dungeness crab shells, and the last one with raw Nopal cactus gel. I prepared three solutions of iron (II) sulfate and copper (II) sulfate each of different concentrations: 5 ppm, 50 ppm, and 500 ppm. I ran 100 mL of distilled water through each tube as my control, followed by 100 mL of each solution. I measured the concentration of metals in the filtrates using Lamotte iron and copper test strips. As the water could not penetrate the thick gel, I put the cactus gel in jars with 100 mL of each solution, gave them a good shake, and let them stand. In one set of jars, I used raw, untreated cactus gel and in the other set I used boiled cactus gel. Over several days, I measured the concentration of metals in the jars using the Lamotte test strips.	
Results Sand proved to be 0% effective as it did not filter out any of the metals. For all concentrations of iron and copper tested, the crab shells removed all the metals instantaneously, showing 100% effectiveness, just like the charcoal. The boiled cactus gel shows 100% effectiveness in iron removal after 2 days instead of 30 days when raw, and 100% effectiveness in copper removal after 3 days instead of 30 days when raw.	
Conclusions/Discussion Since the Dungeness crab shells and Nopal cactus gel trapped the dissolved metals, iron and copper, present in the water, the filtered water contained no metal, thus making it safe to consume. Therefore, crab shells and cactus gel can be used as filters to purify water, hence, an environmentally friendly way to cleanse our water by recycling the crab shells that would otherwise end up in landfills and by using cactus that grows in abundance in South West United States and Mexico.	
Summary Statement The purpose of my project is to find out whether natural products, such as Dungeness crab shells and Nopal cactus gel, can filter out the metals, iron and copper, dissolved in water.	
Help Received My mother helped me gather the materials I needed and guided me during my experiments. My father and my sister helped me with my display board.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Mikayla R. Jundt	Project Number J0909
Project Title Water Purification with Solar Energy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project was to purify water using only solar energy. I chose to use a solar still based on the El Paso Solar Project model.</p> <p>Methods/Materials The El Paso Solar Still was improved by using aluminum backed rigid, insulation for the box. My small solar still (0.372m²) was used to purify saline water from an irrigation ponding basin. The water was tested before it was put into the still and tested after the water was purified. The cost of the improved solar still was used to determine the unit cost to produce a liter of purified water. The unit cost was compared to the cost of store bought water.</p> <p>Results My still produced water more pure than the state standard for drinking water. When I did the tests at the City of Fresno Waste Water Treatment Lab, the reduction in electro-conductivity proved that 99.5% of all solids were removed from the water. The same results were demonstrated by testing for the removal of suspended and dissolved solids. My still produced purified water for 14 cents per liter. If all costs (bottling, shipping, etc.) were considered, my cost would be 43 cents per liter, which is less than the average store cost of \$1.07 per liter.</p> <p>Conclusions/Discussion Through my experiment I was able to conclude that evaporating saline water using solar energy and a solar still can produce purified water. The improved solar still with aluminum backed, rigid insulation more cost effectively purified saline water than other solar still models researched.</p>	
Summary Statement My project purifies saline water using only solar energy.	
Help Received Mr. David Trauger, Senior Lab Tech with the City of Fresno helped me test the water samples. Mr. Steve Hogg, Manager of the Waste Water Treatment Facility with the City of Fresno was my expert. Mr. Steve Carner, Manager with Pepsi-Cola Bottling Grp., Fresno helped me determine bottling and shipping costs.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Stacey Jung; Dalia Khammash	Project Number J0910
Project Title Wind Energy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In my project, I used motors and fan blades turned by wind to generate energy. For my first variable, I tested different motors and saw how adding gears would affect the amount of energy generated. For my second variable, I used two and four blades attached to a motor and determined which is the most efficient to use while generating energy. While testing these two variables, I determined the optimal resistance (load) to use. To put my findings to work, I attached a motor, blades, and LED lights to a large 69" x 69" box kite and watched the lights turn on by the spinning blades and motor.</p> <p>Methods/Materials In my project, I used a DC Motor without gears, a DC Motor with gears, a drill with 750 RPM, resistors or sum of resistors with 1 ohm, 4 ohms, 7 ohms, 15 ohms, 30 ohms, and infinite resistance, wires, a wire stripper, a Volt Meter, "Electricity Learning Lab Kit," a fan with two blades, a fan with four blades, and an electric powered fan (to test the blades).</p> <p>Results Due to my experiments, I have concluded that Hypothesis A was correct, but Hypothesis B, however, was proven incorrect. Just as I had predicted, when I added gears to the motor, it generated more power than without gears because there was more RPM. When I tested the geared motor with both two and four blades, I determined that my hypothesis was incorrect. Previously, I assumed that four blades would be the least efficient because of the addition of weight. However, I learned that it turned out to be more effective because there is more surface area, which means there are more blades to catch the wind and help the blades spin and generate energy.</p>	
Summary Statement In my project, I tested a motor with and without gears, tested the efficiency of different numbers of blades, determined optimal resistance, and later attached a motor, LED lights and gears to a box kite to generate energy through the wind.	
Help Received Professor Mustafa Khammash at UCSB mentored my project and helped answer some of my questions on mechanical concepts.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Nicholas A. Kinsman	Project Number J0911
Project Title Catching Rays: Reflections on Portable Desalination Devices	
Abstract Objectives/Goals Objective: Increase Portable Desalination Device (PDD) effectiveness using a flexible reflector (FR) to focus sunlight. The manipulated variable is whether a FR is part of the PDD. Responding variables are the salinity and volume of produced water, and the temperature inside PDDs. Controlled variables are the PDDs, conductivity meter, thermometers and seawater. Prediction: A FR will focus the sun to increase PDD effectiveness because reflecting sunlight from mirrors raises the temperature inside a container, increasing the water evaporation rate. Evaporation leaves salt behind in the original container. Cooled water vapor then condenses into liquid that can be collected and tested for salinity.	
Methods/Materials Materials: 6 each: Large water bottles, Small water bottles, Small plastic cups, Flex straws, Quarters, Rubber bands, and Liters of seawater. Plastic wrap, Aluminum foil, Wire, 7 Thermometers (C), Conductivity/Total Dissolved Solids Meter, Metric measuring cup, Knife, Wire cutters, Scissors, Data Sheets, Pencil, Computer, Sun. Methods: Construct 6 PDDs, 3 with and 3 without foil reflectors. Measure seawater conductivity. Pour 750 ml of seawater into each PDD. Record water temperature in PDDs. Place PDDs outside in sunlight, in random order, and record the time. Record PDD water temperatures, ambient air temperature and wind conditions at least hourly. At sunset, record the water volume and conductivity produced by each PDD. Repeat the trial. Enter data into Excel, obtain means and standard errors, and make graphs.	
Results Weather during trials was cold and windy. PDDs reduced the seawater conductivity from 41,259 uS/cm (SE=108) to as low as 22 uS/cm (SE=12). The data did not clearly demonstrate that adding a reflector to the PDD resulted in higher water production, water with lower salinity, or higher water temperatures within the PDDs compared with the experimental controls without a reflector.	
Conclusions/Discussion I want to be an inventor using solar energy to reduce dependence on other energy sources. I developed a PDD that can be built from household items and used in an emergency to produce drinking water from seawater. PDDs did not make as much water as I expected, but they produced very high quality water with lower salinity than even tap or bottled water. Conducting additional warm weather trials should increase temperatures within PDDs and therefore the water volume produced.	
Summary Statement This research has demonstrated that a Portable Desalination Device, which provides pure drinkable water, can be constructed from recycled materials.	
Help Received Aunt Becky bought materials, cut the bottles, and took pictures while I did the experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Abhishek P. Kodukulla	Project Number J0912
Project Title Recycled Copy Paper vs. Recycled Newsprint: Which Is Stronger?	
Abstract	
Objectives/Goals To test the effect of starch as an additive on the strength of recycled copy paper and that of recycled newsprint	
Methods/Materials Two kinds of paper were used in the experiment: copy paper and newsprint. Two sheets each of the copy paper and newsprint were shredded and blended with water to form a pulp. The pulp was stirred vigorously and quickly poured into a mould. For the pulp containing starch, 1 tablespoon of cornstarch was added to the paper and water mixture during blending. The pulp without any additive served as the control. The independent variable was starch and the dependent variable was the strength of the paper. After drying, the paper samples were cut into thin strips and holes were punched through the taped parts. The paper was hung vertically by tying a piece of string through one of the holes. Another piece of string was tied to the bottom end. Weights were slowly added to the bag until the strips tore. The weight needed to tear each strip of paper was recorded. The procedure was repeated ten times for each sample.	
Results Recycled copy paper with starch as the additive was the strongest of all paper samples (1451 grams \pm 9.9). This was followed by recycled copy paper without any additive (1305 grams \pm 4.2). Recycled newsprint with starch as the additive came in third with a tear strength of 964.76 grams (\pm 4.2). The weakest among all recycled paper samples was newsprint recycled without any additive (828.66 grams \pm 4.8). Within each category (control, starch), the strength of recycled copy paper was slightly higher than that of recycled newsprint.	
Conclusions/Discussion Copy paper recycled using starch as the additive was the strongest of all recycled papers. My hypothesis was correct. Addition of high molecular weight chemicals such as starch can help increase the strength of recycled paper. The experiment had a few limitations. Because the recycling process was repeated multiple times, the texture of the finished paper varied. Perhaps refining the procedure would minimize this variability. The strength of the recycled paper also depends on the strength of the original paper. The use of additives (like starch) during recycling can produce papers of varying strengths that can be used for different applications.	
Summary Statement The purpose was to test the effect of starch as an additive on the strength of recycled copy paper and that of recycled newsprint.	
Help Received Science teacher, Mrs. Vodraska and my parents for their encouragement and support.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Alexis M. Meruelo	Project Number J0913
Project Title Do Earthworms Help Refurnish the Soil of Saltwater Spills?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Hypothesis: In my science project I am going to experiment if worms help the dead soil replenish. I have researched on this topic and scientists have found out that earthworms break apart the thatch (layer of dead roots, stems) and pull organic matter into the soil. I strongly believe that the worms do have a huge affect on soil and will help the soil replenish. I also believe this project will be successful and constructive on the benefits of earthworms.</p> <p>Methods/Materials Materials: 100 red worms, water, sunlight, 400g of soil (backyard), pens, paper, a notebook, a binder, 1 can, salt, gauze tape, 2g of rabbit food, 1 packet of cilantro seeds, eggshells (for the worm food) 1 spray bottle, 1 graduated cylinder, 1 small cup, 1 spoon, sharpies (for labeling)</p> <p>Procedure: The major steps I did to investigate the problem were, 1. Researched, wrote and read about it 2. Bought all of the materials. The factor or variable I changed in order to test my hypothesis was the different amount of worms in each of the containers. My number of trials was that I had to put (instead of 4 containers) 8 containers and do the project set-up twice. Also, to make the soil highly concentrated with salt I put salt and some rabbit food inside of them containers and had to wait for two weeks. During those two weeks I also put the specific number of worms in the containers. Part B:I took measurements on the moisture of the soil, how many worms there were, and how many seeds germinated.</p> <p>Results Results: My final results were very successful. During the first two weeks of part B, I was very upset in thinking that my project was not going to turn out the way I planned, and that was for container 4 to grow cilantro seeds. At the end of the third week right before the due date of my project container 4 (which had the most worms) grew some cilantro seeds and it was a great turn out. The worms in container 4 had successfully helped to replenish the soil and the cilantro seeds grew.</p> <p>Conclusions/Discussion Conclusion: My project supports my hypothesis and I#m excited that earthworms have a cause and affect on saltwater spills helping refurnish the soil. From this project I have learned earthworms tunnels in the soul help oxygen and water to enter the soil easily and their casting (waste) enrich it. I hope that my project can be valuable in future environmental issues and encourage a healthy environment. Thank you!</p>	
Summary Statement Earthworms can help replenish the soil of saltwater spills and can have a big impact on the environment.	
Help Received Mother helped design poster and think of ideas; teacher (Mrs. Westheart) helped come up with my project.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Tyler J. Newcomb	Project Number J0914
Project Title Evaporation Collaboration	
Abstract Objectives/Goals To see if a layer of canola oil on top of water can stop or at least slow down the process of evaporation so cities that have water evaporation issues can help preserve their water. Methods/Materials 6 wide mouth jars water canola oil ruler pencil paper measuring cup Results Jars D,E,and F with the oil on top had more water in them by about 2 inches at the end of 14 days than jars A,B, and C without any oil. Conclusions/Discussion In conclusion, my hypothesis proved correct. Jars D,E, and F had more water than jars A,B, and C at the end of 14 days, proving that the oil helped stop the evaporation process.	
Summary Statement My project tests whether oil sitting on top of water affects the evaporation process.	
Help Received Mother bought supplies and helped glue items on board.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Howard Nguyen	Project Number J0915
Project Title Reduction of NO(3) and PO(4)	
Abstract Objectives/Goals The objective of this project is to eliminate and/or reduce the problem of agricultural runoff through the use of different biofilter mixtures or ratios. Methods/Materials A total of five tennis cans were suspended between two poles, each can was filled with a different biofilter media ratio. A solution of either nitrate or phosphate was then poured through each filter ratio and allowed to drain for 20 minutes. The concentration of the fertilizer was determined by using a nitrate and phosphate test kit. Results The 0:100 could reduce nitrate from 20 ppm down to an average of 2.64 ppm. The 25:75 ratio was the best at reducing the phosphate levels; it had an average of 2.76 ppm. Basically, it was the 0:100 that reduced nitrate the best, and the 25:75 that reduce phosphate the best. Conclusions/Discussion As the compost percentage decreased and the wood chip percentage increased, the filter's performance also increased. Compost is known to contain nitrogen and actually contribute to the nitrate concentration, and therefore the 0:100 ratio performed the best. However, when filtering phosphate, the 25:75 had the ratio and composition that was just right for removing phosphate.	
Summary Statement My project is about reducing agricultural run-off through the use of biofilters.	
Help Received Parents helped me purchase materials; Pershing Middle School for lending materials; Ken Dang at Alvarado Treatment Plant for inspiration; Holly Nguyen for taking pictures and editing	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Ellie I. Paul	Project Number J0916
Project Title Which Natural Material Filters Polluted Water Best?	
Abstract Objectives/Goals To successfully reach my goal, I had to confirm which of selected natural materials filtered contaminated water the best. Methods/Materials I took the approach to pollute water with gasoline, transmission fluid and motor oil. I poured a measured amount through five halved two-liter bottles that were individually filled with sand, backyard dirt, potting soil, gravel, and leaves. I tested the polluted water both before and after filtering for pH, chlorine, alkalinity, cyanuric acid level, and turbidity. Results The outcome of all this was not truly what I expected! The potting soil resulted with the prime results, suggesting that potting soil may be a preferable and eco-friendly ground cover for places where urban runoff may infiltrate into the earth. Conclusions/Discussion Conclusively, my hypothesis that the sand would have the best results was almost wholly wrong! It came out with some of the most catastrophic numbers, and the water that had been poured through it was cloudy, sandy, and had sand floating around in it.	
Summary Statement Petroleum product pollutants are filtered through sand, backyard dirt, potting soil, gravel, and leaves.	
Help Received Dad took pictures, helped measure pollutants, pour polluted water, and advised.	



CALIFORNIA STATE SCIENCE FAIR 2007 PROJECT SUMMARY

Name(s) Darby Schumacher; Ryan Schumacher	Project Number J0917
Project Title A Filter Today Keeps Pollutants Away	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective was to determine whether sand, carbon, or foam best removes the dangerous pollutants and excess nutrients in the storm drain outfall runoff that flows into the Monterey Bay and then design a model of a workable filter. We hypothesized that sand would be the best of the three filter types and the one that Monterey should consider using on its storm drain outfalls.</p> <p>Methods/Materials We collected one water sample from two different Monterey storm drain outfalls during the first significant rainfall of the year. Using test kits, we performed two tests on each sample for pH, nitrates, and phosphates before and after pouring each through three filters: carbon, sand, and foam. We also obtained professional results from the Monterey Bay Sanctuary Monitoring Network First Flush event and professional analysis of our filtered samples from Monterey Bay Analytical Services. After analyzing the test results, we were able to determine which filter would be most effective and we built a model of our proposed filter.</p> <p>Results Based on our testing and research, we determined the most harmful nutrients to the ocean and its creatures are nitrate, orthophosphate, and zinc, and the most detrimental bacteria is enterococci. In the unfiltered samples from both locations, the levels of nitrate (0.52 to 0.57 mg/L) and orthophosphate (not detected) were below harmful levels, while the zinc level (101 to 172 mcg/L) and enterococci (41,058 to 155,312 MPN/100mL) were significantly above state standards. After filtering each sample, the amount of nitrate and phosphate barely changed, while the zinc and enterococci levels were significantly reduced by all three filters. Though all three filters reduced the amount of pollutants, the carbon filter had the most positive effect on the water flowing through it.</p> <p>Conclusions/Discussion After a thorough analysis of our results, we concluded that our hypothesis was incorrect. The carbon filter, not the sand filter, best reduced the amount of pollutants, though the sand filter was a close second. We learned that home tests are not nearly as reliable as we expected. We should have focused more on the enterococci and zinc results, instead of so much on nitrates and phosphates. After reading our project, we hope people will better understand what contributes to storm drain pollutants and consider our method as a way of reducing the negative impact of pollutants.</p>	
Summary Statement To design a simple filter that would remove the most pollutants from storm drain outfall runoff and build a model of the filter.	
Help Received Mom helped gather samples, drove us, bought materials, and helped find reliable Internet sources. Eric Kingsley, Monterey Bay Aquarium specialist, supplied the clean sand. Bridget Hoover provided First Flush data, supplies, and maps. Monterey Bay Analytical Services donated the professional lab tests.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Martin G. Severhill	Project Number J0918
Project Title Is It Possible to Generate Electricity Using Passive Solar Energy?	
Abstract Objectives/Goals my objective for this project was to test my hypothesis. My hypothesis was that it would be possible to generate electricity using passive solar energy. Methods/Materials To accomplish this on a small scale and in keeping within environmental concerns, I used recycled materials. To conduct my project, I needed a 55 gallon barrel which I spray painted black, fan blades, wire, and three magnets and a digital multimeter. the fan blades wire, and the barrel were recycled. Results My results showed that the power generator that I made produced electricity and proved my hypothesis to be correct. Though it only produced a few millivolts, that is better than nothing. Conclusions/Discussion This project took place during the summer. If it had been conducted during the winter, it would not have generated any electricity. This project taught me a lot about electricity, electrical generators and how to use a multimeter. It was difficult but in the long run it was worth it.	
Summary Statement generating electricity using passive solar energy and recycled objects	
Help Received father helped cut materials with saw	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Timothy J. Tang	Project Number J0919
Project Title Water Purification in Emergency Situations	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project examines various methods to purify water to make it drinkable, and analyzes which method is the most efficient.</p> <p>Methods/Materials In this experiment, water is collected from San Francisco's Lake Merced. The lake water is then filtered through paper towels to remove the large debris. The filtered water is then diluted and plated on a sheet of Petrifilm to determine the amount of bacteria in the original sample (the control). Then, the remaining water is processed through various methods to determine which method(s) will make the water "drinkable." The various treatments include chemical treatment (bleach and chlorine dioxide), filtration (active carbon/charcoal and micro membrane), boiling, steam distillation, and ultraviolet light irradiation. The method(s) that lead to drinkable water will then be analyzed to determine which method is the most "efficient."</p> <p>Results In conclusion, the methods that are effective in killing the microorganisms are bleach, chlorine-dioxide, boiling, steam distillation, and UV light irradiation. The active charcoal and micro-membrane are not effective in killing bacteria. The Webster's Dictionary defined "efficient" as "performing or functioning effectively with the least waste of time, effort or resources." Relative to time, ultra-violet light irradiation is the fastest in purifying the water. Relative to the amount of effort, the bleach and chlorine dioxide are the easiest to use. Relative to resources, the bleach and chlorine-dioxide required very little resources. Relative to cost, ultraviolet light irradiation is the cheapest.</p> <p>Conclusions/Discussion In summary, bleach, chlorine dioxide, boiling, steam distillation and UV light irradiation are all effective methods to purify water. Bleach and chlorine-dioxide are the best methods in purifying water relative to effort and resources. The UV light method is best in purifying water relative to time and cost. 2,400,000 gallons of contaminated water can be purified with one \$80.00 UV light unit! This is amazing! Of course, there is no "one" method that can be classified as the most efficient. The "best" method can only be evaluated relative to the situation at the time. However, with our better understanding of water science and newer technology, we may be better able to provide everyone with a constant source of inexpensive, safe, drinkable water.</p>	
Summary Statement This project examines various methods to purify water to make it drinkable in emergency situations, and analyzes which method is the most efficient relative to time, effort, resources, and cost.	
Help Received My father helped me purchase materials over the internet, helped me get the UV light, and drove me to Lake Merced. My aunt helped me get the Pipetman, and gave me suggestions for the dilutions.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Yuliya Tumaykina	Project Number J0920
Project Title Ecologically Safe Methods of Getting Rid of Whiteflies	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this experiment is to find a way to get rid of whiteflies with out harming the ecology around.</p> <p>Methods/Materials The question is, How does changing of the natural factors applying to the whiteflies affect the viability of whiteflies? It is hypothesized that at least one of the substances will prevent whitefly eggs from developing because many of the substances used kill germs. The procedure of the experiment is as follows. Some leaves infected with whitefly eggs were gotten and put in six plastic containers. Each container contained 3 infected leaves and 1-2 fresh leaves. Also, each of the containers were sprayed inside with a different substance- eucalyptus oil, pine tree oil, lavender extract, onion juice, regular arrowhead drinking water, and some lady bugs. The containers were covered with a thin net so that the whiteflies, the leaves and the ladybugs would not suffocate. Data was collected every other day to see if anything had hatched or if the eggs had gotten larger.</p> <p>Results The results support the hypothesis. The leaves that were sprayed with onion juice showed no whitefly egg development. Also, the ladybugs ate all of the whitefly eggs.</p>	
Summary Statement The project summary is to find a way to get rid of whiteflies with out harming the ecology around.	
Help Received My parents helped me buy the items needed for this experiment. Professor Mark Hoddle encouraged me not to give up when a sudden cold killed all of the whiteflies I was working with. He told me to try and search for whiteflies and whitefly eggs in plant nurseries.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Scarlett C. Winningham	Project Number J0921
Project Title Oil Spills	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my project was to see how much oil soil samples absorbed, and if the absorption rate differed over a course of five days. I also wanted to investigate if the properties of the soils changed before the oil was spilt, and after.</p> <p>Methods/Materials The oil spills were conducted upon 250 ml. of seven different types of soil. Some types of soil that I used were pebbles, fine sand, and clay. I conducted five test per one of the seven soil types, so I tested thirty-five different samples. I recorded the properties of the soil samples before the oil was spilt on them. I then proceeded to pour 60 ml. of 10W-40 oil over each soil sample and recorded how much oil each sample absorbed. I did this every day for five days. (The oil was poured over the same samples on time each day.) I then recorded the properties of the soils after the five-day oil spill, and compared the properties of the soils before the oil spill occurred.</p> <p>Results The finer grained soils absorbed the most oil in the beginning of the oil spill, but their pores were soon filled with oil. The larger grained soils absorbed less oil in the beginning, but still absorbed some oil. Then, by the end of the oil spill, the fine grained soils barely absorbed any oil, and the larger grained soils, absorbed slightly more than the finer grained. This happened because the fine grained soils absorbed a lot in the beginning, but their absorption rate dropped immensely, because their pores were already filled with oil, making them absorb the least in the end. The larger grained soils absorbed roughly the same over all five days, which made them absorb the most in the end. Also, I found that the oil spills made the soils smell horrible, create a sticky, compacted texture, and a wet, greasy appearance.</p> <p>Conclusions/Discussion In my hypothesis, I didn't expect the absorption rates to differ over the five days. The fine grained soils absorbed the most in the beginning, and the least in the end. And the larger grained soils absorbed the least in the beginning and then the most. I also concluded that no matter what type of soil, (large grained or fine grained) all of the soils took on a completely different texture, scent, and appearance after the oil spill occurred, demonstrating the effect of an oil spill. Hopefully, by doing my experiment I have shown that oil spills harm our land, and make it hard for animals and for us to enjoy it.</p>	
Summary Statement I wanted to determine how the properties of soils changed after an oil spill has occurred compared to before, to see how much oil different grain sized soils will absorb, and if the absorption rate changes over a course of five days.	
Help Received Parents and teacher proofread papers. Parents bought materials, and helped clean up any mess.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Clayton Wright	Project Number J0922
Project Title Less Is More	
Abstract Objectives/Goals My objective was to find out if motor oil slows the evaporation of water in order to conserve water in field agricultural operations. Methods/Materials Fill 6 cups of water 6cm (120mL of water) in height. Add 1 cm of oil (20mL) to three of the cups of water. Each set of cups will consist of one cup of water and one cup of water with oil. There will be 3 sets total (cup of water and a cup of oil/water). Monitor the evaporation daily for one week. Analyze and graph the results. Results The motor oil did slow the evaporation of water. Day one: no change in water height or oil/water height. Day two: cups of water only down to 5.5 cm, whereas oil/water down to 5.3 cm. Day three: cups of water only down to 5.25 cm, whereas oil/water down to 4.75 cm. Conclusions/Discussion In my conclusion since the motor oil slows the evaporation it should help people buy less water. Water conservation in agriculture operations is very important. It is essential to find effective ways to conserve water. Even though this experiment used motor oil, using biodegradable oils maybe a safe, efficient and effective water conservation tool.	
Summary Statement My objective was to find out if motor oil slows the evaporation of water in order to conserve water in field agricultural operations.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Abbas R. Zaidi	Project Number J0923
Project Title Solving the Crisis on Hand: Ozone Depletion	
Abstract Objectives/Goals The goal of my project is to stop the depletion of the ozone layer. In this project, I am proposing my strategy to stop ozone depletion. Methods/Materials I created a method for my experiment to show how I intended to carry out my strategy to solve this major world crisis. First, I filled a bottle with 350 mL of warm water. Next, I lit a matchstick, blew it out, and immediately dropped it into the bottle before closing the lid shut. Finally, I squeezed the bottle a couple of times to create a miniature cloud that is a small-scale replica of polar stratospheric clouds (PSC) up high in the atmosphere. These clouds are one of the major causes of ozone depletion. In the second phase, I demonstrated the strategy I intended to use to fix ozone depletion. I dropped one gram of crushed dry ice into the bottle. After waiting until the dry ice completely sublimated, I measured the difference in water quantity since the beginning of the project. I gave an estimation of a change in the size of the cloud based on the difference in the amount of water in the bottle. I repeated the same process with the four other bottles, except I used different quantities of dry ice. Results In my results, the larger the quantity of dry ice I used, the smaller the size of the cloud was at the end of the experiment. These results show that my strategy was feasible. Dry ice could be used to disperse PSCs in the atmosphere, which form conditions through which chlorine and other ozone-depleting substances are formed. If these clouds were dispersed, these substances wouldn't form. This would in turn greatly decrease the amount of ozone depleted each year. Conclusions/Discussion My strategy to stem ozone depletion was proven feasible. The results of my project are evidence that my project could be used to stem the increase of ozone depletion each year. This experiment shows us a practical technique through which we could build a safer and healthier future.	
Summary Statement As applied on a small-scale replica, my strategy is to stem ozone depletion by dissipating polar stratospheric clouds in the atmosphere.	
Help Received Mrs. Shagufta Akhtar gave recommendations for improving my project. Mother helped decorate board.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Lydia K. Zdeb	Project Number J0924
Project Title A Comparison of Two Potential Lead Bioremediating Plants	
Abstract Objectives/Goals The problem I tested in my experiment was whether morning glory or Indian Mustard Greens were the most effective bioremediator of lead. Methods/Materials To test this problem, I planted both morning glory and Indian Mustard Greens seeds in two test beds of soils containing lead at concentrations of 990ppm and 330ppm. Each week I took measurements of height and counted the number of sprouts in each section. After 3 weeks, there was finally enough plant mass to do an XRF test, and from weeks four to six I harvested a portion of the plants and conducted weekly XRF tests to check the lead content. At the end of week six, all of the plants were uprooted, the roots were cut off, all of the excess dirt washed off, and they were dried and tested. Results The results showed that, of plants raised in the soil with 990ppm of lead, Indian Mustard Greens (with 7.28ppm) had almost double the amount of lead as in the morning glory (4.23ppm). In the soil with 330ppm morning glory had 4.93ppm of lead to the Indian Mustard Greens 3.19ppm of lead. Conclusions/Discussion Overall I concluded Indian Mustard Greens were the more effective bioremediator of lead. It is notable that while the Indian Mustard Greens showed more ill effects of the lead (including distressed leaves), they grew more robustly and generated more plant mass than the morning glory.	
Summary Statement My project is a comparison of Indian Mustard Greens and Morning Glory to see which one is most effective at bioremediation.	
Help Received My father (Thomas Zdeb) operated the XRF, analyzed the samples (he is a certified XRF analyst) and helped to ensure that all safety regulations were properly followed in this experiment; PCR Mobile Laboratories allowed me to use the XRF	