CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Zoe J.F. Altenberg

Project Number
J1101

Project Title
Wastewater Purification using Evaporation and Capillary Action: Part 1

Abstract

Objectives/Goals
The purpose of this project is to investigate the potential of using capillary action and gravity and strips of fabric to increase the rate of water evaporation. Ultimately, this will lead to a passive water evaporation system that uses capillary action to separate the water from the waste.

Methods/Materials
Twenty 200mL beakers, Five 400mL beakers, Four square meters of polyester and cotton, One 250mL graduated cylinder, Food dye, Shelf structure.
Section 1
1. Cut 1 cm, 3 cm and 9 cm strips of cotton and polyester.
2. Fill 250mL beakers with 200mL of colored water.
3. Hang strips with the end of the strip in the water in the beakers. Use four beakers as controls.
4. After three days, measure each beakerâ##s remaining water.
Section 2
1. Cut 150cm long 3cm wide cotton strips.
2. Fill 400mL beakers with 400mL of water.
3. Hang the 150 x 3 cm strips from the 400mL beakers on the top shelf to beakers on the bottom shelf.
4. When the water levels in the top beakers are below 100mL, measure the water in the bottom beakers; then pour the water back into the top beakers. Repeat as many times as necessary.
5. Measure the remaining water in the top and bottom beakers.

Results
Cotton is more efficient than polyester, and a greater number of thinner strips is more efficient than a smaller number of larger strips. The best combination of material type and width I found is 1 cm cotton. In the second section of this project, the strips of fabric were 150 cm long, rather than 45 cm long. I only tested 3 cm cotton long strips, which I found to be about 327 % more efficient than 3 cm cotton short strips.

Conclusions/Discussion
Section 1
I found polyester to be less efficient than cotton in evaporating water. I thought the polyester would work better because the weave is tighter and the water will be able to wick more easily. However, cotton worked better, so I hypothesize that a tight weave actually constricted the water wicking.
Section 2

Summary Statement
This project explores the most efficient methods of using capillary action and evaporation to passively separate water from solid wastes in wastewater, thereby greatly reducing the mass and volume of the waste and reclaiming purified water.

Help Received
Father helped me to use Microsoft Excel.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Zachary Basherian; Bailey Pass

Project Number
J1102

Project Title
Fog Collector

Abstract

Objectives/Goals
To help the water crisis in the Central Valley.

Methods/Materials
Created a basic frame out of PVC pipe. Used sun screen shade material to cover frame. Attach the screen to the frame using zip ties. One of the PVC pipe used at the bottom of the frame was slotted to catch the water. Used sprinkler pipe to attach milk jug to catch water to the slotted pipe beneath.

Results
We found that it was possible to catch fog which turns into water.

Conclusions/Discussion
We found that the area that had the most fog collected more water. Living in the Central Valley we have a water shortage issue by using this method could be helpful in having another water source other than relying on just rain, lakes, dams to provide the necessary water needed.

Summary Statement
To Collect fog moisture and use the water in different ways.

Help Received
Fathers helped by cutting material & assembling project. Mother's helped with research & organization.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Asta E. Davidsdottir

Project Number
J1103

Project Title
Water Conservation: A Nanoscopic Film Approach

Abstract

Objectives/Goals
The goal of my project is to study how different surfactant monolayers reduce evaporation in order to find a more efficient way to conserve water.

Methods/Materials
Two tests were done. One was conducted by making a monolayer on a surface of water followed by weighing the water in order to calculate the amount of water that evaporated. The second test was done by measuring the rate at which a monolayer spreads.

Materials:
10 ml plastic cups, surfactants, copper sulfate, microbalance, monolayer trough, pipettes.

Results
Water without a monolayer (control) evaporated at an average rate of 0.137 mg/min/cm2. The copper octadecanoic acid, the octadecyl sulfate combined with the hexadecanol, the hexadecanol (liquid), the calcium octadecanoic acid, and the octadecanol, all decreased the rate. Compared to the control, copper octadecanoic acid decreased water evaporation by 57%, octadecyl sulfate combined with hexadecanol decreased the evaporation by 42%, and calcium octadecanoic acid by 33%. All of these were better than hexadecanol at reducing evaporation.

The copper octadecanoic acid spread most slowly with an average rate of 3.34 cm/sec. Most of the surfactants spread at 10 to 11 cm/sec. Hexadecanol dissolved in heptane spread at 15.8 cm/sec, octadecyl sulfate+ hexadecanol at 17.8 cm/sec, octadecyl sulfate at 19.5 cm/sec, and octadecanol at 24.1 cm/sec.

Conclusions/Discussion
Monolayers of copper octadecanoic acid reduced water evaporation by ~50% while hexadecanol reduced the rate by 25%. Monolayers of hexadecanoic acid and octadecanoic acid increased water evaporation. All the acids spread at about the same rate, but the alcohols were faster. Each experiment was repeated five times and evaluated by calculating the standard deviation. The consistent results show that the experimental results were reproducible.

Addition of copper to octadecanoic acid reduced water evaporation by reacting with the octadecanoic acid -COOH groups. This #froze# the monolayer, making it more difficult for the water molecules to escape the surface of the water.

In many countries water is becoming increasingly scarce. I found a compound, copper octadecanoic acid, which works better than hexadecanol. Copper octadecanoic monolayers could help preserve water in

Summary Statement
The overall goal of my project, is to explore different surfactants and the way they reduce evaporation, in order to find a more efficient way to conserve water in resevoirs.

Help Received
Mother and Father helped edit report. Father provided necessary supplies.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Elena B. Dick

Project Number
J1104

Project Title
Garbage to Gas: Fermenting Common Household Wastes into Ethanol to be Used as an Alternative Fuel Source

Abstract

Objectives/Goals
My objective was to discover which common household waste most efficiently ferments into ethanol to be used as an alternative fuel source.

Methods/Materials
I started my experiment by first breaking down fruit peels, flowers, newspapers, t-shirts, and saw dust using sulfuric acid. I then neutralized the acidity of each resulting solution with sodium hydroxide. I used pH tester strips to determine the pH as I adjusted it to a level suitable for the growth of yeast. By filtering out the solids, I obtained a liquid solution that I poured into a beer/wine alcohol hydrometer, to measure the starting specific gravity. By measuring the difference in specific gravity before and after fermentation, I will later determine the relative amount of ethanol produced. I added the yeast and then put each liquid in a sealed jar with an airlock in each top. This prevents the ethanol from evaporating but allows the carbon dioxide to be released. I then again used the hydrometer to measure the resulting specific gravity and used the amount of change to calculate my results.

Results
The resulting net change in specific gravities were as follows (in order of most ethanol produced):
Fruit Peels: 0
Flowers: +.002
Newspapers: +.005
Cotton Shirt: +.005
Saw Dust: +.006
A higher ethanol concentration results in a lower specific gravity, yet the salt produced from the acid and base reaction caused an increased specific gravity. Therefore to determine the most ethanol produced, I looked for the lowest increase in specific gravity to determine which material was the most efficient producer which was fruit peels.

Conclusions/Discussion
I found that fruit peels were the most efficient producers of ethanol, followed by the flower bouquet. Newspaper and the cotton shirt had the same results, both producing less than the flowers. The saw dust ended up with the least ethanol production. These results are due to the high concentration of cellulose in the fruit peels. The yeast feasted on the cellulose of the fruit peels, producing the most ethanol. With fewer sugars in the other materials, the yeast did not consume as much, therefore producing less ethanol.

Summary Statement
In my experiment, I explored which common household waste most efficiently ferments into ethanol to be used as an alternative fuel source.

Help Received
I received help from my parents when ordering supplies such as the necessary chemicals and tools. I then required parental supervision and some aid when dealing with the sulfuric acid, sodium hydroxide, and other harmful substances used in my experiment.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Natalya Dreszer

Project Number
J1105

Project Title
The Algae Challenge for the Future: Gauging the Bioremediation Efficacy of Three Photosynthesizers

Abstract

Objectives/Goals
Global warming is an urgent problem, and is mostly caused by the greenhouse gasses that come from burning fossil fuels. Algae have been talked about as an alternative fuel source, and are photosynthesizing organisms that can clean up CO2. This experiment was designed to see which photosynthesizer would use the most carbon dioxide and that comes from burning fossil fuels and which would grow the best.

Methods/Materials
In this project, exhaust was pumped into three different types of algae/Cyanobacteria growth conditions, and controls without the exhaust and without algae were also run. The pH of the conditions was measured before and after pumping, and after a day of photosynthesizing. The amount of algae was measured before and after a two week period of pumping.

Results
Cyanobacteria, Chlorella and then pond algae were expected to clean up the most CO2 and grow the most, in that order. Pond algae actually grew the best, and used up most of the CO2, while Cyanobacteria and Chlorella were significantly less successful.

Conclusions/Discussion
The Cyanobacteria did not thrive in direct sunlight conditions, so an additional round was grown on a north-facing windowsill. All of the rounds were grown with the same nutrient rich, sterilized pond water, but considering how poorly they grew this may not have been sufficient for the Chlorella algae and Cyanobacteria. Measuring the growth of the photosynthesizers was difficult until a colorimeter was used in the third and final round. The results of this experiment suggest that pond algae may be the simplest to grow, so it can be used immediately to decrease Global Warming!

Summary Statement
Three photosynthesizers were compared to see which could use the most carbon dioxide and the results suggest that common pond algae can immediate be used to decrease global warming!

Help Received
My science teacher helped with ideas and loaned a colorimeter; Dad aggravated and pushed me to finish on time.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kalana L. Dulaney

Project Number
J1106

Project Title
How to Make Your House "Green" with Landscaping

Abstract

Objectives/Goals
The purpose of this project is to investigate the relationship between landscaping and energy conservation.

Methods/Materials
I constructed a cardboard house and a tree made out of shade cloth.The deciduous tree was placed on the north side of the house.An electric thermometer was placed inside the house.A heat lamp(or sun) went through the cycle of one day(an hour),stopping and 0,45,90,135, and 180 degrees measured with a protractor.The lamp would move every 10 min. and the temperature would be take each time.I would repeat this each time placing the tree on the east,south,and west side of the house, representing summer.The process was repeated but this time the tree had no "leaves" on it,representing winter.The whole procedure was performed 5 times.

Results
The average temp. for the leaved tree on the west side was 21.24°C.The average temp. for the leaved tree on the north side was 25.32°C.The average temp. for the leaved tree on the east side was 22.4°C.The average temp. for the leaved tree on the south side was 21.92°C.The average temp. for the un-leaved tree on the west side was 23.05°C.The average temp. for the un-leaved tree on the north side was 23.56°C.The average temp. for the un-leaved tree on the east side was 24.48°C.The average temp. for the un-leaved tree on the south side was 24.88°C.Overall, the tree on the west side would conserve the most energy because it kept the house cooler in the "summer" and very close to the warmest in the "winter",reducing the use of air-conditioning and heating, saving energy and money.

Conclusions/Discussion
My hypothesis was partially supported by my results.I thought the tree on the west side of the house would keep the house cooler/warmer in the summer/winter time,but out of all the tree positions it only kept the house the coolest in the summer.The tree on the south side kept the house warmest in the winter.The tree on the south side kept the house pretty cool in the summer as well.It came in second after the west side and was off by less than 1 degree Celsius.So in all,I would plant a deciduous tree on the west side of your house to save the most energy.This project will give people the information they need learn how the can save #go green#. Anyone living in a home will be able to reduce their cost of air conditioning and heating bills. This will save you money and help save the earth at the same time, all by just planting one tree.

Summary Statement
My project imitated a house, tree, and sun to see which placement of the tree would keep the house coolest in the summer and warmest in the winter, reducing the use and cost of air-conditioning and heating.

Help Received
Science teacher edited my write-ups.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Melissa R. Fagan

Project Number
J1107

Project Title
Solving the Water Crisis: Creating a More Efficient Solar Still

Abstract

Objectives/Goals
Goals: My Science Fair experiment was to determine if the colors of an evaporative basin influenced the effectiveness of solar evaporation distillation. If one particular color is more efficient in distilling a greater volume of pure water, then the solar evaporation distillation device should be that color.

Methods/Materials
Materials/Procedure: I first designed and built a solar evaporation distillation device. The evaporative basins were filled with either 500ml or 1500ml of seawater (for example, there was both a 500ml of seawater green container and a 1500ml of seawater green container). Daily, twenty trials were conducted in October. Each set of experiments had one relevant variable: the color of the evaporative basin. There were two sets of experiments # one using a basin filled with 500 ml of seawater; the other using a basin filled with 1500 ml of seawater. The basins were placed in the same location for every experiment; the seawater came from the same location for all of the experiments.

Results
Results: Each solar still, regardless of the color of the evaporative basin, desalinated the seawater. The yellow evaporative basin distilled the least amount of pure water in both the 500ml experiment and the 1.5L experiment. The clear evaporative basin generally distilled the most pure water. Also, the rate of evaporation was higher for the 1.5L container than for the .5L container.

Conclusions/Discussion
Conclusion: I found that both (a) the color of the evaporative basin and (b) the amount of seawater filling the basin affect how much condensate is collected in solar evaporation distillation.

Summary Statement
My project evaluates the impact of color and volume on the efficiency of solar desalination.

Help Received
No help.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Colin P. Feeney

Project Number
J1108

Project Title
From Physics to Fish: Using Archimedes Screw to Transfer Fish from One Water Basin to Another

Abstract

Objectives/Goals
The purpose of my experiment was to find out whether Archimedes# screw could or could not lift fish over a barrier safely. The fish ladder used in american rivers has many problems and i am trying to fix that using Archimedes' screw.

Methods/Materials
Methods: 1. Cut one 3 inch diameter hole in each plastic storage bin in the middle of the side-wall of the bin; 2. Place one of the two plastic bins on level ground; 3. Place the other of the two plastic bins elevated to attain an angle of 45 degrees; 4. Connect both of the plastic bins by securing the PVC pipe in the holes in each plastic bin; 5. Place the 3-inch by 24-inch metal auger into the 3 inch by 24 inch PVC cylinder; 6. Fill each plastic basin with room temperature water to about three quarters of the way up the bin; 7. Connect the auger to the power drill, then insert the auger into the PVC pipe making Archimedes' screw; 8. Place the small feeder guppies in the plastic bin that is not elevated; 9. Turn on the drill at low speed; 10. Begin to transfer fish in Bin I (Not Elevated) to Bin II (elevated).

Materials: 2 large plastic storage containers; Sealant; Room temperature water; Archimedes' Screw: PVC Cylinder 3 inches by 24 inches; Metal Auger 3 inches by 24 inches; Drill for rotation on the auger; Drill for cutting holes in plastic basins; Fish: Small feeder guppies; Notebook; Pencil; Protractor.

Results
In this experiment, when transferring fish using the Archimedes# screw, 73% survived. The number of fish in the first experiment that went through the screw intact was 19. Of that number 5 were dead, 14 were alive. In the second experiment 29 fish got through intact. Of that number 8 fish were dead and 21 were alive.

Conclusions/Discussion
In conclusion, the survival rate was always much greater than the death rate in all experiments. The fish that got through the screw were never cut up even when dead. The death rate was 27%. The survival rate was 73%. This survival rate compares favorably and is superior to the commonly used fish ladders. Something that could have changed the outcome of the experiment was the number of fish used, the temperature of the water, the size and type of the fish, and the size of Archimedes# screw.

Summary Statement
My project was to see if Archimedes' screw could transfer fish from one basin of water to another safely.

Help Received
My father helped me construct an Archimedes' screw and my teacher helped me format my report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jedediah A. Fitzgerald

Project Number
J1109

Project Title
The World's Soil Saver: Comparing Natural Terracing Agents and Their Erosional Runoff

Abstract

Objectives/Goals
The purpose of my project is to determine the effects of terracing on erosion in order to apply this information to the Jesse Morrow Mountain project.

Methods/Materials
I used a clear plastic tub and with a nail I placed five holes in the bottom. I then filled the container with 20,967 grams of soil and placed it at a 3-degree slope. I then started at the top of the incline and removed two an a half centimeter deep, six and a half centimeters wide and a thirty centimeter long section of soil. Use a wood block to determine the width/ length, and depth 6of the section. Start the next section of terracing by placing a wood block at the base of the terrace. Measure at the bottom of the terrace six and a half centimeters in depth, six and a half centimeters in width and thirty centimeters in length. I poured water down the slope every 24 hours and caught it in the cheesecloth at the bottom. Weigh the runoff on a triple beam balance scale every 24 hours.

Results
I found that the wood blockade was the best natural terracing agent because it had a high of 64.85 grams of soil eroded and a low of 36.05 grams of soil eroded, on average it was 43.3685 grams of soil eroded. On average the wood blockade eroded 22.7840 grams less than the control group and 20.8265 grams less than the pebble blockade. Also on average it eroded 6.87189% of the soil in the container.

Conclusions/Discussion
This experiment demonstrated that using terracing agents and terracing will decrease erosion on the mining of Jesse Morrow Mountain.

Summary Statement
I used this project to determine with rocks of wood or nothing at all would be more effective on the erosion of Jesse Morrow Mountain.

Help Received
Mother and Sister - purchasing of supplies and project set-up; Father - set-up of board; Teacher - set-up and typing

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Aaron A. Ford

Project Number
J1110

Project Title
Car Exhaust and Acid Rain

Abstract

Objectives/Goals
Do catalytic converters eliminate harmful pollutants enough in larger engines? I will test the hypothesis that catalytic converters will do their job quite well in small engines (4-cylinder), but not as well in 6 and 8-cylinder engines.

Methods/Materials
Materials: 1 of each: 4, 6, and 8 cylinder cars
Testing supplies include pH meter, thermometer, testing apparatus of my design.
Method: The apparatus uses 2 1/4" copper tubes connected to a mason jar. The 1st tube funnels gases from the tailpipe into the mason jar filled with water. The gases bubbles in water and dissolve. The 2nd tube vents remaining gases out of the jar.
I tested the exhaust from 4-, 6- and 8-cylinder cars for the change in pH of the water before and after exhaust gases were dissolved in water for 5 minutes. I also measured temperature change, as pH is temperature sensitive.

Results
The 4-cylinder car created the most acidic water sample at 5.83 pH (a negative change of 1.18 pH.) The 6-cylinder car created the next most acidic sample at 6.11 (a negative change of .9 pH.) The 8-cylinder car#s sample was 6.19 pH (a negative change of only .82 pH). The water samples went up in temperature most in the 8-cylinder car, to 129º F, then 114 º F in the 6-cylinder and 106.3 º F in the 4-cylinder car.

Conclusions/Discussion
The results were surprising. I expected the engine with 8 cylinders to have the most potent results, but it actually had the least harmful results. I conducted a test to see if the pH had changed when the temperature was constant between samples. The pH did change, and for the better. All the pH levels went up to more neutral levels. It looked like acid rain is not as harmful if it stays cold. This is what I thought until I did some more research. Another reason this probably occurred is because the jars were not vacuum sealed. The fact that there was air still in the jar meant that the chemical reactions that affected the pH still had the chance to occur. So, it would seem that acid rain is more potent as it is falling, not as it has collected and become stagnant.
As it turns out, our 8-cylinder car had a few engine modifications. This could have altered the results. I think that the reason the 4-cylinder engine creates more harmful pollutants is because more power may have to be directed to get them to produce the horsepower, and so they release more exhaust.

Summary Statement
Catalytic converters do not remove all of the harmful gases produced by combustion engines, and these contributes to acid rain, which is harmful to our environment.

Help Received
My dad helped manufacture the testing apparaturs; my mom and Mr. Gutierrez provided helpful advice.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Eleanor O. Frost

Project Number
J1111

Project Title
Back to Nature: Which Spoon Does It the Fastest?

Abstract

Objectives/Goals
My project is the study of the biodegradability of disposable spoons. I selected 5 different types of disposable spoons and placed them in 4 environments. I observed the spoons as they started to decompose.

Methods/Materials
I placed 5 of each type of spoon in each environment, so that conclusions would not be based on the results of only one spoon. The five different types of spoons are are made of: traditional plastic, vegetable starch, potato starch (2), and corn starch. The environments included in ground, in pond water, in sea water, and in the open air. The test period for each environment was 119 days. during the test period, I observed changes in the spoons and environments. Periodically, I cleaned the spoons, observed and noted changes in the surfaces, weighed the spoons and recorded the results. In this experiment the biodegradation of the spoons would appear as a loss in weight of the spoon.

Results
The traditional plastic spoons did not show any signs of degradation no matter what the environment, except that the in ground traditional plastic spoons did have many surface scratches. The in ground environment produced the most biodegradation. The vegetable starch spoon lost 10.3% of its initial weight during the in ground test. One of the spoons made of potato starch lost 6.8% of its initial weight. In the pond water and sea water environments these same two spoons gained over 15% of their original weight. The corn starch spoons and other potato starch spoons absorbed very little water and gained only 2% in weight.

Conclusions/Discussion
Two of the spoons showed signs of activity in all of the envirments: the spoons made of vegetable starch and one of the spoons made of potato starch.

Interestingly, the other spoon made of potato starch did not degrade in the in ground test. In the water environments, it gained only 2% in weight and these spoons felt and behaved more like plastic than like the other spoon made of potato starch. This suspect spoon, made in China, is called "Taterware" and is currently used for take out food at Whole Foods Markets.

It appeared that the most active spoons gained weight in each environment (even the open air)as they absorbed water. then later in the experimental period, the spoons in the ground started to loose weight.

Summary Statement
My Project is the study of the biodegradability of five different disposable spoons

Help Received
father bought the spoons and supported me in digging up the planter in the front yard. My teacher helped with the design on the tests and my family gave me moral support

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Gabriella P. Glover

Project Number
J1112

Project Title
What Is the Best Method of Desalination?

Abstract

Objectives/Goals
The objective of this project is to determine the best way to desalinate sea water.

Methods/Materials
In this project, I will compare three different methods of desalination; filtration, reverse osmosis and distillation.I will use the appropriate apparatuses for each of these methods to determine wich is the most efficient.

Results
Distillation proved to be the most effective method of desalination.

Conclusions/Discussion
I was very happy with the results from two of the procedures. The Reverse Osmosis procedure didn#t work out as I wanted. The salt water sample that was used for the experiment was contaminated with oil. Therefore, the oil formed a layer over the Reverse Osmosis membrane not letting any water pass. I found the oil in the distilled water from the distillation procedure. The oil had formed a thick and visible layer on top of the distilled water. The distillation procedure worked very well. I was surprised at the large amount of salt collected. The filtration process took a few tries. I tried using 1 filter, then 2 filters, and then finally set in with 3 filters. The process was successful. The water was flowing through the filters at the right speed with 3 filters. In the end the most effective method was distillation because it produced the greatest amount of fresh water.

Summary Statement
My project is about determinibg the best method of desalination.

Help Received
science teacher, mother, father

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Nagy C. Hakim

Project Number

J1113

Project Title

Effect of Increased Light Intensity and Bottle Size on Solar Water Purification

Abstract

Objectives/Goals

There is an urgent need for clean water in areas which lack basic sanitary conditions. Solar disinfection (SODIS) is a cheap and effective way to purify water in only six hours. More that 2.5 million people worldwide use SODIS as their primary source of water purification. However, SODIS does not work when the water is turbid. The purpose of this project is to investigate the effectiveness of reflectors and various bottle sizes on solar disinfection with turbid water. Based on preliminary research, I predict that the purity of water would increase with the intensity of light and the use of smaller bottles.

Methods/Materials

My experiment consists of adding an aluminum reflector to various size bottles to increase the intensity of light and temperature, and study the effectiveness of SODIS in this setup. Water was collected from Stevens Creek Reservoir and the bacteria let to multiply by keeping it in a warm container with nutrients. Two sets of 2 liter, 1 liter, and 1/2 liter bottles were filled with the infected water. The bottles were placed on wooden stands, half of them fitted with reflectors, under direct sunlight for 6 hours. Samples were taken every two hours, and placed on the nutrient agar. After culturing for 2 days, I counted the bacteria colonies in the Petri dishes. Water is considered drinkable if there are 5 colonies or less in the dish. The experiment was done following BioSafety Level 1 precautions.

Results

The results indicate that the reflectors were very effective, and smaller bottles performed slightly better. None of the bottles without reflectors were drinkable after 6 hours due to the turbidity of the water. However, all the bottles with reflectors were drinkable after 4 hours. Smaller bottles were even drinkable after 2 hours.

Conclusions/Discussion

My experiment did agree with my hypothesis: Reflectors and smaller bottles improved the purification of the water. Increased light and hotter temperatures, combined to kill the bacteria, even in turbid water. My contaminating variable was that one small bottle with a reflector fell twice during a 4 hour period, and a shadow of a truck came over all the bottles for about a half hour during the 4-6 hour time period. If I were to repeat the experiment, I would use less turbid water, to test if the reflectors would be as effective in clear water. I would also study which of the temperature or UV light affects more the purification of water.

Summary Statement

This project shows the effectiveness of increased light intensity and small bottle size on solar water purification.

Help Received

Father helped purchase test kits.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Holly V. Haughy

Project Number
J1114

Project Title
Can Limestone Help Reduce Global Warming?

Abstract

Objectives/Goals
When cement manufacturers make one ton of cement, heating and a chemical reaction release 0.87 tons of carbon dioxide into the air. If concrete manufacturers could substitute some ground limestone (no similar CO(2) emissions) in place of cement, it could have a big positive impact on the environment by reducing carbon dioxide emissions. My hypothesis is that you can substitute 20% ground limestone for cement, in a concrete mix, and still make strong concrete.

Methods/Materials
Concrete is made of four ingredients: cement, sand, aggregate, and water. I weighed out the different materials used to make concrete and mixed them. I poured the mixtures into their plastic containers and let them dry. I first made six concrete slabs all the same size. They had no finely ground limestone powder substituted for cement. I wanted to see the variation of the strength. Eleven days later, I took the concrete slabs out of their molds and broke them to measure their strength. I did this by supporting each end and adding to the center until the slab broke. Then I weighed the amount of weight it took to break the slab. The way I'm breaking the concrete is measuring what is called tensile strength. I next made six more batches of the concrete with varying amounts (from 10% to 50%) of finely ground limestone powder substituted for cement. Eleven days later I took the concrete out of their molds and broke them to measure the variation in tensile strength with increasing amounts of limestone substitution.

Results
The data from my project indicate you can substitute up to 30% of limestone for cement in concrete. There was a little bit more variation than I had hoped for, but in the graph you can see a curve indicating the strength decreases a lot after about a 40 to 50% substitution.

Conclusions/Discussion
About 12 million tons of cement is made in California each year. If concrete makers could substitute 30% of ground limestone for cement, 3.6 million tons of cement would not have to be made, which is 3,123,000 tons of carbon dioxide emissions reduction. This could solve nearly one percent (0.9%) of California's green house gas problem. Manufacturers should want to do this because using limestone is about five times less expensive than using cement.

Summary Statement
My project indicates that by substituting limestone for 30% of the cement in concrete mixtures, California could reduce its green house gas emissions by 3.1 million tons per year.

Help Received
The help I received in doing my project was from my mom and Blue Mountain Minerals. My mom supervised me and gave me advice while doing my experiment. Blue Mountain Minerals provided me with materials and a concrete mix design.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Michael L. Janner

Project Number
J1115

Project Title
What Are the Effects of Water, Aeration, and Nitrogen on the Decomposition Rate of Organic Matter?

Abstract

Objectives/Goals
The goal of my project was to determine the effects of three variables; water, aeration, and nitrogen; on the decomposition rate of standard compost. I believed that the compost with all three variables would decompose the fastest.

Methods/Materials
I filled 24 empty water bottles 14 cm high with organic material. Each bottle received a combination of the three variables being tested, water, aeration, and nitrogen, except for the control group, which received none of the variables. There were eight different possibilities for each water bottle. I had three of each possibility, making twenty-four water bottles.
The bottles that received water were given 5 mL of water a week. The bottles that received aeration had twenty holes on the bottle, each measuring 3 mm in diameter. I also shook these bottles ten times every week, which was a substitute for turning the compost inside of them. The twelve bottles of compost that received nitrogen were given 1 tsp of nitrogen weekly. I continued this experiment for four weeks. At the end of each week, I measured the height of the remaining compost in each bottle to determine which variables caused organic matter to decompose the fastest.

Results
My tests showed that Group 7, which received water, aeration, and nitrogen, decomposed the fastest by the end of the experiment, with only an average of 8.4 cm of compost left in each bottle. The group that decomposed the slowest was Group 8, which was not given any of the three variables.

Conclusions/Discussion
My hypothesis was proven correct because Group 7 decomposed the fastest. This was expected because these water bottles were given much more aid to decompose than the others. What did surprise me was that the bottles with nitrogen and air, but not water, decomposed much faster than the bottles with water during the first three weeks, but when they dried out on the last week, they decomposed very slowly. This was also when the bottles that were given water decomposed the most.

Summary Statement
To find what speeds up the decomposition rate of organic matter most effectively, I tested twenty four samples of compost with different combinations of three well-known factors: water, aeration, and nitrogen.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jay Kerschner; Tejas Kumar

Project Number
J1116

Project Title
Garbage to Gas

Abstract

Objectives/Goals
In the US, we cannot control the gas economy since most of the gas comes from the Middle East. Thus, we have to find other sources of fuel such as biodegradable fuel. Our objective was to test if we can obtain an usable amount of "bio" fuel from household organic waste.

Methods/Materials
Materials: household organic waste (vegetable/fruit peels, cofee, tea grounds etc)
Distillation apparatus and thermometer

Methods: We collected organic housewaste in a large can for one week, sealed with saran wrap and stored in a warm, dark place for upto 2 weeks to compost and ferment. Then we transferred it into a large conical jar fitted with the distillation tube. It was heated on a hot plate to 100oF. When the vapor started coming, water was let into the outer wall of the distillation tube.
The resulting liquid was collected in a collecting can.
8. Sample is labeled and sent to a commercial lab for alcohol analyses.
9. Measure volume of collected sample of alcohol and compare with volume of original compost sample.

Results
A total of four experiments were done, three with organic compost and one with grass.
The starting amount of organic house waste was 5 pounds (2.4L) for each experiment.We were able to isolate about 27ml of alcohol from 2.4L(5lbs.) of organic compost; however, no alcohol was obtained with grass. Among the alcohols, the majority was ethanol and methanol

Conclusions/Discussion
We thought that biodegradable fuel could be obtained from sources other than corn, which is a good source of protein and fiber. Further, alternative fuels can improve the economy.In our experiments, we clearly prove our hypothesis and show that organic waste is a good source of biodegradable fuel. We realize that if we control temperature and seal the containers air tight, we can get more fuel. We thought it is very good to have a comparator that may not produce much alcohol and so we chose grass. We think our results make perfect sense since we got a lot of ethanol and methanol, both of which can be used as alternative fuel. We were lucky to be able to find a lab to measure the alcohol. If this project is given to companies, they can perfect the methods and do it in large scale. There will be less pollution, better use of the organic waste, more people will get jobs and we have to buy less fuel from the Middle East. This may be a great way to solve global warming.

Summary Statement
This project showed that one can use household organic waste to obtain biodegradable alternative fuel.

Help Received
My Dad helped get the equipment at a cheap store and My Mom found the commercial lab to test the alcohols. Jay's Dad mowed the lawn to get grass

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Roman Lara, IV

Project Number
J1117

Project Title
Trash Wars: Are Landfills Effective?

Abstract

Objectives/Goals
The objective of this experiment was to determine whether or not landfills are an effective way of disposing of biodegradable trash. I predicted that biodegradable material would decay faster if it was exposed to oxygen and sunlight than if it was deprived of those elements.

Methods/Materials
I took 2 used banana peels and placed each one on its own paper plate; one of them was left unprotected, totally exposed to the outside elements, i.e.: "Mother Nature" and the other was left sealed in a black trash bag, to simulate a landfill. I tested my hypothesis 3 times, each experiment in individually numbered boxes. The boxes were stored outside for 3 weeks.

Results
After 3 weeks, the unprotected banana peels that were exposed to oxygen and sunlight decayed at a much faster rate than the banana peels that were left sealed in black trash bags, which were basically preserved.

Conclusions/Discussion
Based on the results of these experiments, my hypothesis was supported and I learned that oxygen and sunlight decays biodegradable material faster than the more common method of disposal: burying it in a landfill. Further experiments might eliminate the effects of rain in the decaying process and could also include testing different methods of disposal such as incineration to reduce the amount of waste produced. Further investigation could explore the benefits of composting biodegradable materials to return its nutrients back into the soil.

Summary Statement
To determine whether or not landfills are an effective way of disposing of biodegradable trash.

Help Received
Mother helped assemble/decorate display board and did some typing.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Joseph B. Lee

Project Number
J1118

Project Title
From Sea Water to Drinking Water: Can Solar Power Help?

Abstract

Objectives/Goals
My project was to determine if I could desalinate ocean water using a contained environment to duplicate the water cycle, and in addition determine if using solar power would make this process work more efficiently. My hypothesis is that the majority of the saline content of the sea water will be removed. I also expect that solar heating will speed up the evaporation and condensation in the desalination process.

Methods/Materials
I constructed a solar oven using basic household items such as cardboard boxes and foil. I then constructed 6 Desalination Units (DU's) using plastic water containers, E-flasks, small collection cups and plastic cling wrap. 2 DU's were placed in the solar oven; 2 DU's were exposed to the sun; 2 DU's were in the shade for control. Measurements were taken and noted 3 times/day for 6 days (ambient temp., solar oven temp. and water temp.). At the conclusion of the experiment, the condensate of each DU was measured, and the salinity and conductivity noted as well as compared to other types of water.

Results
The quantity of condensate was measured at the conclusion of the experiment, with the sample collected by the DUs in the solar oven yielding the greatest quantity (5.8 ml);The DUs under direct sun collected less (2.4 mg avg); The DUs in the shade collected almost nothing. I then tested the salinity of samples collected in the DUs, which were greatly less than the salinity of sea water. I compared the salinity of the condensate to various types of water, in order from greatest salinity to least: Sea water(29.5ppt), Saline treated pool water (1.6 ppt), Condensate (880-970ppm), Tap water (527ppm) and Filtered drinking water (56.5ppm).

Conclusions/Discussion
My conclusion is that desalination of ocean water can be accomplished by duplicating the water cycle, shown by the much lower salinity the condensed water collected had compared to ocean water. Also, the increased temperatures produced by the solar oven caused more condensation to occur, shown by the larger amount of condensate collected by DUs in the solar oven compared to those that were under direct sun and shade. This proves that increased solar influences improve the efficiency of the desalination process.

Summary Statement
My project shows that ocean water can be desalinated by duplicating the water cycle in a contained environment, and that using solar power helps yield a larger quantity of condensate collected.

Help Received
My parents helped to take the 11am and 1pm temperature readings while I was at school; my science teacher lent me 6 Ehrlemeyer flasks;

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
James M. Levy

Project Number
J1119

Project Title
Let's Drink the Sea! Effects of Design Differences in Evaporation/Condensation Stills on Rate of Seawater Desalination

Abstract

Objectives/Goals
The need for fresh drinking water becomes more urgent as population growth and pollution deplete our supplies. Desalination stills remove salt from ocean water in an environmentally responsible way, but their pure water production rate is slow. This study explored design criteria that might be effective at increasing that rate. It was hypothesized that the best configurations would be those with a large heat differential, and a greater relative surface area available for evaporation.

Methods/Materials
Desalination stills were built from large metal cans and cake pans, graduated cylinders, and funnels. Salt water was placed in each still, covered with plastic that was weighted to sag down into an inverted cone, and subjected to evaporation/ condensation cycles, in order to collect pure water. Rate of collection was recorded as environmental conditions and design elements were varied, including surrounding air temperature, heat differential in the still, surface area of salt water, slope angle of the plastic condensation surface, and color of pans.

Results
All still configurations showed improved rates of pure water production when they were wrapped in black plastic to hide their shiny metal exteriors, and run outdoors in direct sunlight on warm days, as opposed to at identical temperatures indoors. However, the most distinct rate improvements came from physical modifications to the still itself, not these environmental adjustments. The model that outperformed all others was made from a tall, narrow can, providing just a small surface area for evaporation.

Conclusions/Discussion
My results did not support my hypothesis. A large surface area to improve evaporation rate was incorrectly assumed to be the crucial factor in speeding desalination. Instead, rates improved when the condensation surface could drain more quickly, and so be freed up for another round of condensation. This worked best in the tall, skinny still, where the plastic wrap came down to a very steep point. Improving this type of design detail helps make environmentally friendly but slow desalination stills more efficient.

Summary Statement
A homemade desalination still designed to maximize the speed with which water clears from the condensation surface, readying it for another evaporation/ condensation cycle, proved to be a critical element in increasing desalination rates.

Help Received
Graduated cylinders and a balance were borrowed from my school. My family tolerated stills in the bathroom and on the porch for many days.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Brianna Link; Hailey Vance

Project Number
J1120

Project Title
What's in Your Water?

Abstract

Objectives/Goals
Can water with bacteria (E-coli) in it be filtered out using natural substances such as sand, gravel, cotton balls or napkins in 2 different combinations?

Methods/Materials
Two empty 2 liter plastic bottles were used with above ingredients as a filter for the water. The water was collected from local areas and tested for Ecoli first.

Results
it did not kill the E-coli

Conclusions/Discussion
you needs commercial filtering products or chemicals to kill the E-coli water.

Summary Statement
can bacteria/E-coli be filtered out of water naturally

Help Received
project done at school as a group projects by students only, teacher available for assitance or guidance

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Chase C. May

Project Number
J1121

Project Title
How Can Different Polymers Be Identified?

Abstract

Objectives/Goals
How can different types of polymers be identified without looking at the Plastic Identification Code?
The purpose of this science experiment is to identify different polymers (plastics) based on physical and chemical properties so that they can be sorted for recycling before being sent to a recycling center to make recycling easier.

Methods/Materials
In this experiment I will identify the different physical and chemical characteristics of each type of plastic sample: - Color; - Clarity; - If the plastic is Soft and Pliable or Hard and Rigid; - Flame color when the plastic is burned; - Smoke color when the plastic is burned.
I will also determine the density of the plastic samples by comparing them to known densities of liquid solutions. If the sample floats in a liquid solution, the sample is less dense than the liquid solution. If the sample sinks in a liquid solution, the sample is more dense than the liquid solution.

Results
Plastic type characteristics observations:
Each plastic sample has unique physical characteristics, such as color, texture, and clarity.
Each plastic sample has unique chemical characteristics when burned, except for sample 2 & 5, which has the same flame color and smoke color.
Density Test Results:
Plastic type 1 & 4 had the exact same density test results
Plastic type 2 had unique density test results
Plastic type 3 had unique density test results
Plastic type 5 & 6 had the exact same test results

Conclusions/Discussion
Plastic types 2 & 3 can be uniquely identified by using just the density test. None of the other 4 plastic types acts the same as plastic type 2 and 3 which
Plastic types 1 & 4 can be identified by using the density test results and their unique physical characteristics. I compared the plastic color and flame color of each sample. Plastic type 1 is white, and plastic type 4 is green. Plastic type 11 had an orange flame and sample 4 had a very dark orange flame.
Plastic types 5 & 6 can be identified by using the density test and comparing the plastic color of each. Plastic type 5 is off-white and plastic type 6 is black. Also, plastic type 5 had an orange flame and plastic type 6 had a red and dark orange flame.

Summary Statement
The purpose of this science experiment is to identify different polymers (plastics) based on physical and chemical properties so that they can be sorted for recycling before being sent to a recycling center to make recycling easier.

Help Received
My mother helped me conduct the experiment.. My father helped me type the report and the display boards.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Alexandra M. Mowrey

Project Number
J1122

Project Title
Grow with the Flow: The Effect of Aeration on Compost

Abstract

Objectives/Goals
My goal is to motivate people to recycle food waste by finding the best way to compost by differing amounts of aeration and noting the effects by examining its nutrient levels and radish growth in compost.Because the Nature Mill Automatic Composter and the 0-holed trash can received no aeration,inside the composting container it'll be warm and moist,desirable for bacteria,a main component of creating compost.I thought a symbiotic mutualism would occur between the bacteria and the compost,so in return for the moisture and warmth,the bacteria would decompose the organic matter into compost to provide nutrients for plants.I hypothesize compost will be moister in the compost bins with no aeration because of the heat and no air flow within them;so when tested for nutrients and used to grow radishes,these composts will yield the tallest radishes and highest nutrient levels.

Methods/Materials
I added the same amount of food waste to the Nature Mill compost machine and the 4 20-gallon trash cans, each bin varied in amounts of aeration: Nature Mill machine had no holes, 1 trash can with 90 holes, 1 with 45 holes, 1 with 23 holes, and 1 with 0 holes. The Nature Mill machine composted by plugging it into the wall and the trash cans required mixing once a week with a hoe. I tested each compost for their nutrients(pH,nitrogn,potassium,and phosphorus) with the Mosser Lee Test kit. I grew radishes in each compost with controlled conditions.The materials are Mosser Lee Kit, radish seeds,pots,20-gallon trash cans,Nature Mill,and many organic materials.

Results
I recorded results including the number of leaves the radish contained in each pot, the height of the radishes in each pot, and the nutrient levels of each compost compared to the most desirable for radish growth. Data was collected from each compost and the results varied. All of this data helped me determine which compost was the most desirable for radish growth.

Conclusions/Discussion
My hypothesis was disproven,since less aeration did not produce compost with the highest nutrient levels. The Mosser Lee Soil Test Kit was used to determine the most appropriate nutrient levels for growing radishes and along with the data obtained through growing of radishes, the compost and aeration from Trash Can 2 with 45 holes was determined to be the most desirable for radish growth. Other conclusions were made from the various patterns in my data based on aeration variation.

Summary Statement
It's about encouraging people to recycle food waste by discovering the best way to compost through differing amounts of aeration and observing the effects by examining its nutrient levels and radish growth in compost.

Help Received
Mother and Father provided supplies. Father drilled holes in the trash cans.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kelsey J. Pearson

Project Number
J1123

Project Title
Water, More Water, Still More Water

Abstract

Objectives/Goals
We are in the middle of a severe water crisis. This is an experiment to establish whether there is a simple relationship between three environmental factors: temperature, humidity, and length of day, and the amount of water required to maintain grass at a constant moisture level.
If a simple relationship is established, it will have important implications for water management.

Methods/Materials
The basic materials used were a plastic bin, soil, sod, water, and a scale measuring kilograms of weight. The method was to determine the water content in the soil and sod in order to establish a controlled water weight. The sod was then set outside and weighed daily, recording the water lost and adding water to restore the control weight. The environmental data was continually downloaded from a weather station located five miles from the test site. I completed a total of three experiments including two failures. The 3rd trial was performed between
11/21/08 to 2/13/09.

Results
The collected data was evaluated using Excel pivot tables to consolidate the environmental data and Excel graph charts to evaluate a variety of relationships. My graphs demonstrated a predictable but non-uniform relationship that was easily calculated from the environmental factors to maintain a constant moisture in the grass, while standard sprinkler systems provide a constant volume of water.

Conclusions/Discussion
The experiment shows that a simple relationship exists between two environmental factors and water lost from grass. From my results, I concluded that humidity is inversely proportional and temperature had a weak proportional relationship to water loss. Length of day was inconclusive because my test period wasn't long enough. I believe a more economical and cost-effective approach for water conservation can be achieved with common sprinkler systems by integrating inexpensive temperature and humidity sensors. This example could lead to a continuation of my project for effectiveness.

Summary Statement
This project is about water conservation.

Help Received
My mother guided me the with research, support and revising my report; my dad taught me how to make a pivot table and helped with the data tables and graphs; Mr. Cornell for putting up will all my questions.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Austin K. Russell

Project Number
J1124

Project Title
The Water Lover: Water Harvesting and Recycling System for Residential and Commercial Landscapes

Abstract

Objectives/Goals
The objective was to determine if a system could be created to harvest and recycle excess irrigation and rain water in residential and commercial landscape areas.

Methods/Materials
A system was designed, created and tested by irrigating turf placed on sand and cheesecloth above a grate-covered, gravel filled drainage device. Harvested water gravity flowed through a pipe, and into a tank initially filled with eight quarts of water. A fountain pump recycled the water to the riser. This six inch square section of turf was irrigated for five minutes per day over a seven day period. Residual water measurements were taken and compared daily.

Results
The system was successful in harvesting and recycling irrigated water. Over the testing period, an average daily residual water yield of 99.8958% was achieved. Measurements obtained over a one-week period revealed a total savings of 301.2003 quarts of harvested water. It was determined that the amount of harvested water available for recycling would be significantly greater if the system were to be installed under an entire lawn.

Conclusions/Discussion
With a critical shortage of fresh water resources in the Western United States, active conservation measures are being implemented. The Water Lover system would benefit the environment by conserving and preserving scarce fresh water supplies, and reducing runoff in environmentally sensitive areas.

Summary Statement
The Water Lover system was created to harvest and recycle landscape irrigation and rainwater.

Help Received
No help.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Asude B. Sahan

Project Number
J1125

Project Title
Rooftop Gardens: Are They a Cool Idea?

Abstract

Objectives/Goals
Rooftop Gardens (living or green roof) are an environmentally friendly option that provides many advantages: i)creates space for agriculture, ii)adds beauty to the landscape, iii)increases the air quality, iv)diminishes the urban heat island effect by reducing radiation, and v)lowers the energy bill for cooling in hot summer months. The purpose of my project is to study the effect of rooftop gardens on the internal room temperature under the roof compared to traditionally tarred rooftops. I hypothesized that rooftop gardens will reduce the indoor temperature under the roof more compared to rooftops with traditional tars after being exposed to certain amount of heat for a period of time.

Methods/Materials
For this research, I have taken experimental measurement using two same size, color and shape closed shoe boxes to simulate two environmental conditions: i)rooftop gardens were represented by placing a sod on top of the box covered with tar paper, and ii)traditional tar rooftops were represented by covering the box top with only tar paper. I have placed the two boxes side by side with a gap between them in where the red alcohol thermometer was placed to measure the external air temperature. Next, I placed a 250 watt heat lamp one meter above from both boxes. In addition I have placed a digital thermometer each inside one of the boxes. Temperature measurements were collected after both boxes were being exposed to 250 Watt heat for one hour representing the sunlight during a typical summer day. After the 250 Watt heat was turned off, which represented night time, new temperature measurement were recorded for an hour.

Results
After both boxes were exposed to 250 Watt heat, the internal temperature of rooftop gardens was about 8C cooler than the indoor temperature of rooftop with traditional tar. In addition, the indoor temperature of rooftop garden was also recorded to be 4C cooler than the external air temperature. When the heat lamp was turned off for one hour, rooftop gardens cooled down faster to reach the external air temperature compared to rooftop with traditional tar.

Conclusions/Discussion
My hypothesis was supported that temperatures measured under rooftop gardens would be cooler since it takes longer for sunlight/heat to go through sod/grass compared to temperatures measured under traditional rooftop with tar which absorbs the heat faster.

Summary Statement
The purpose of my project is to investigate the effect of rooftop gardens on the internal room temperature under the roof compared to traditionally tarred rooftops.

Help Received
Parents and Dr. Lian Jeeawoody guided me through the scientific methodology; Father purchased supplies and helped with preparing display board, mother and sister proofread report.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Sajan Y. Sanghvi

Project Number
J1126

Project Title
Alternative Water Disinfection Methods: Diamond Electrodes in Water Electrolysis

Abstract

Objectives/Goals
Using chlorine to disinfect water can contribute to health hazards. I read an article this summer about a new method of water treatment through water electrolysis. The objective of this project was to determine if electrolysis was a safe and effective disinfection method, and if so, which electrode combination used in an electrolytic cell would provide optimum disinfection properties. My hypotheses stated that electrolysis would be an effective method of water treatment and that a diamond and diamond electrode combination used in the electrolytic cell would exhibit the most desirable water treatment properties.

Methods/Materials
I performed a total of 210 tests with twelve different experimental electrode combinations consisting of diamond, silver, copper, steel, aluminum, zinc, and iron which were tested on untreated creek water. I plated the water samples using Coliscan Easygel. I incubated the plates, then counted the number of bacterial colonies. Each treated sample was also tested for pH, total dissolved solids, and copper levels or iron levels as appropriate.

Results
My findings showed that electrolysis was an effective method of water disinfection although some of the metal electrode combinations leached metal contaminants into the treated water. The electrode combinations that used diamond electrodes eliminated 100% of the bacteria. My experiments indicated that all the diamond electrode combinations (except the diamond and copper combination) leached no metal into the water. The diamond and diamond electrode combination appeared best suited for electrolysis since it eliminated the microbes and did not contribute any metal contaminants.

Conclusions/Discussion
The diamond and diamond electrode combination completely disinfected the water each time and leached no metals into the water. Electrolysis using diamond electrode technology appears to be a safe and effective method of water treatment for human consumption.

Summary Statement
The goal of this project was to explore electrolysis, including diamond electrode technology, as a safe and effective alternative method of water disinfection.

Help Received
Thanks to my parents for their time, supervision and support. Thanks to John Stewart and Michael Becker for their donations of electrodes. Thanks to my science teacher for her guidance.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Anna N. Shuster

Project Number
J1127

Project Title
Let's Go Native! Habitat Restoration in the San Dieguito River Valley

Abstract

Objectives/Goals
In the state of California, the native plant population has been overwhelmed by invasive plant species. Today, societies like the San Dieguito River Valley Conservancy (SDRVC) would like to discover the most effective way to replace invasive grasslands with native California plants.

Methods/Materials
To test various methods of native plant restoration, I marked off eight quadrants and treated each plot with one of the following methods: no treatment with and without seeding, manual removal with and without seeding, herbicide with and without seeding, and manual removal and herbicide with and without seeding. After marking the quadrants and executing the plan, I mixed the native seeds and sprinkled them evenly across four of the squares. I then monitored, measured, and watered when necessary.

Results
In each quadrant, I documented the germinating plants. I counted hundreds of plants in my plots, then estimated the number for the entire quadrant. Of the eight quadrants tested, only three showed any signs of native growth, Quadrants 1, 3, and 7. Quadrant 1 was an area that had not been treated, but had been seeded and Quadrant 3, was an area that had been manually removed of all plants, then seeded. Both of these quadrants contained many native sprouts. Quadrant 7 was a plot that had been cleared, treated with herbicide and seeded. This quadrant produced some native sprouts as well, but not nearly as many as in Quadrants 1 & 3. The estimated percentage of area covered by native plants was 8.6%.

Conclusions/Discussion
According to the results of this project, the most effective method of introducing native grassland was to manually remove the unwanted plants, then seed. Unfortunately, this is also the most difficult and time intensive method. Still, moderate success was observed through just the addition of native seeds.

Summary Statement
The goal of this project was to discover the most effective way to replace invasive grasslands with native California plants.

Help Received
Field biologist Leslie Woollenweber (SDRVC) assisted in the development of the project

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Madeleine C. Silverstein

Project Number
J1128

Project Title
Wastewater Challenge: Effects of Inexpensive Filtration Methods on Caffeine Removal

Abstract

Objectives/Goals
The objective of my experiment was to determine if an expensive filter would be effective at removing drug residues from wastewater, using caffeine as a model. In this experiment, a UV spectrophotometer was used to test for absorbance at the expected wavelength for caffeine.

Methods/Materials
Approximately 80 test samples were evaluated. Samples of Diet Pepsi were filtered through activated charcoal pellets, zeolite, ceramic, or a Brita filter. In another trial, dilutions of soda were first treated with alum, then filtered through fine sand. Some samples were also filtered through activated charcoal.

Results
In dilutions of 3.3 milligrams of caffeine per 100 milliliters, the absorbance at 274 nanometers was reduced by 20% using activated charcoal and by 25% with zeolite. Treatment with alum alone reduced the "caffeine" (absorbance at 274 nm) by 37%. Adding activated charcoal filtration decreased the "caffeine" (absorbance at 274 nm) a total of 45%.

Conclusions/Discussion
By using flocculation and activated charcoal filtration, it appeared possible to remove nearly half the "caffeine" (as represented by the peak at 274 nanometers) in a test sample. One difficulty with my experiment was that the absorbed UV radiation at 274 nanometers may have represented compounds other than caffeine. For example, there seemed to be another compound present in the Caffeine Free Diet Pepsi that absorbed ultraviolet radiation at 274 nanometers. Still, my results indicated it might be possible to remove harmful substances in wastewater through relatively inexpensive filtering methods.

Summary Statement
The purpose of this project was to determine if a relatively inexpensive filtration method could be used to reduce drug residues in wastewater.

Help Received
Thank you to Byung Lee and Invitrogen for the use of their UV spectrophotometer. Thank you to my mother for her advice and encouragement. Thank you to my science teacher for lending me equipment.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Jennifer A. Starkey

Project Number
J1129

Project Title
Mushroom Mycelium: An Eco-Friendly Insulating Alternative

Abstract

Objectives/Goals

Heating and cooling of households uses one-fifth of the total energy consumed in the USA every year. To reduce energy expenditure, new and existing homes should be better insulated. While traditional insulation products take oil and petroleum to make, other #green# methods are in production. Recently, two inventors have found that mushroom mycelium has a binding effect that creates good insulating traits. To imitate and replicate their material for this project, perlite, sawdust and water were combined with oyster mushroom grain spawn, put into molds, and grown for 16 days, into panels. These grown "mushroom" panels were placed into the interior of a small house-like structure imitating insulation under varying temperature conditions. Results were then compared with similar traditional foam-board insulation.

Methods/Materials

Materials: Sawdust; Perlite; Inoculum (master grain spawn); 6#x6# house structures; R-Tech 1# foam board insulation; Sterile room-framed cubicle sheathed in plastic wrap; Cool mist humidifier; Refrigerator; Oven; Remote temperature gauge with base gauge.

Methods-24 trials as follows:

1.Cube interior was heated using a lightbulb to a temperature of 123 degrees F. Internal temperature was recorded, as it decreased.

2.Cube interior was stabilized to a temperature of 63 degrees F then placed in an oven at 170 degrees F. Internal temperature was recorded as it increased.

3.Cube interior was stabilized to a temperature of 63 degrees F then placed in a refrigerator at 30 degrees F. Internal temperature was recorded as it decreased.

Results

Findings show mushroom insulation is as insulating, or better insulating, than traditional polystyrene foam board insulation in multiple environments.

LIGHTBULB TEST Foam Insulation: 48 degrees F change in 71 minutes
Mushroom Insulation: 34 degrees F change in 70 minutes

OVEN TEST Foam Insulation: 63 degree F change in 46 minutes
Mushroom Insulation: 63 degree F change in 68 minutes

REFRIG TEST Foam Insulation: 20 degree F change in 58 minutes
Mushroom Insulation: 20 degree F change in 96 minutes

Conclusions/Discussion

Summary Statement

My project compared the insulating properties of polystyrene foam board and my homemade mushroom insulation.

Help Received

I would like to thank my Mom for all her encouragement, my Dad for his building and construction expertise, Mrs. Taylor for being a great teacher, and Eben and Gavin for their great mushroom ideas and information.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kylie C. Sullivan

Project Number
J1130

Project Title
Ice vs. Environment

Abstract

Objectives/Goals
This project was used to find if there is an environmentally friendly way to melt ice.

Methods/Materials
Snow freezes over road and forms very slippery ice. the ice is melted bysalt which is bad for the environment. In order to find a more eco-friendly ice-melting alternative, various substances (table salt, epsom salt, fertilizer, cat litter, play sand, plaster sand, and gravel) were spread atop ice blocks to test the aterial's ice-melting abilities. the same substances were mixed into tap water and used to water petunia plants.

Results
Table salt, epsom salt and fertilizer all acted the same (killed plants and melted ice quickly). Plaster sand and cat litter both sustainde the life of the plants, but didn't melt the ice very well. Play sand (a light colored sand) and gravel were both balanced substances meaning that they could melt ice and sustain the life of plants.

Conclusions/Discussion
Either a light colored sand or a gravel will be better to use than salt if the instance isn't urgent and the ice situation isn't too severe. if quick ice melting is a major safety issue, salt will be a beter alternative to melt the ice.

Summary Statement
My project was to find an eco-friendly way to melt ice.

Help Received
Mother and Father helped to aquire the necessary materials and Mrs. Schumacher and Mrs. Gillum helped with editing and getting my project started.

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Nathaniel B. Tweed

Project Number
J1131

Project Title
Clean Water for a Thirsty Third World

Abstract

Objectives/Goals
If you fill a bottle with bad water and use the sun to heat it up, you can kill the bacteria that can make us sick. This can also be a tool for those who don't have good drinking water.

Methods/Materials
Three solar ovens were made from cardboard, foil, and tape because outside temperatures were low. Four bottles were filled with sump water. I spray painted one bottle all black, one half black, and left two clear. One of the clear bottles was called control because it would not be in the sun. After that three of the bottles were put in the sun to see which would get to 149 degrees for two minutes. Then the water was swabbed onto agar plates to see which had the least growth.

Results
The water in the all black bottle reached 168 degrees in just two hours. It had the highest temperature and also had the fewest growths on the agar plate.

Conclusions/Discussion
My conclusion is that some of the bacteria is killed by using the sun and common items we use today.

Summary Statement
My project is about how to pasteurize water, using common items, to make the water drinkable.

Help Received
Dad helped brainstorm ideas and was my safety guide. Mom proofread my report. Miss. Gibson coached me on my display board

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Gopal K. Vashishtha

Project Number
J1132

Project Title
The Effect of Base Soil Composition on the Usefulness of a Levee

Abstract

Objectives/Goals
How does soil composition affect the amount of time a levee can withstand water?

Methods/Materials
1 Iris U.S.A plastic box with these dimensions: 5"L x 6"W x 3"H, 1 bag Earth-Gro topsoil, 1 50 lb bag of Play Sand, water, 1 Sharpie permanent marker, 1 plastic sheet (or something waterproof that fits in the box), 1 timer, duct tape

1. Gather materials. 2. Find a flat area to work. 3. Set the box down. 4. Mark a line 2 cm from the bottom of the box for the depth of the "levee" (letter L). 5. Mark a line 5 cm from the bottom of the box for the height of the soil (letter S). 6. Make sure the bottom of the levee matches the "L" on the box and tape it in place, waterproofing the sides. 7. Fill one side of the box with topsoil until the soil reaches the "S". 8. On the other side, fill the soil until it reaches the base of the levee or "L". 7. Pour water until it reaches the rim of the box on the side where the soil is higher. 8. Start the time. 9. When the water level on the side where the soil is shallow reaches the "S", stop the time 10. Record the time taken for the levee to fail. 11. Empty the box. (Rinsing not necessary) 12. Repeat steps 7-11 five more times. (or four, depending on materials available) 13. Repeat steps 7-12 with sand. 14. Repeat steps 7-12 with a mixture of 4 parts soil and 1 part sand. 15. Repeat steps 7-12 with a mixture of 7 parts soil and 1 part sand. 15. Compile the data.

Results
The average resistance time for the topsoil was 92 seconds. The sand resisted an average of 11.8 seconds. The 4:1 mixture of soil to sand resisted for 33 seconds, and the 7:1 mixture of soil to sand resisted for 54.5 seconds.

Conclusions/Discussion
My hypothesis was only right for the sand. I think that the reason my hypothesis was so wrong was because of how I wrongly estimated the size and composition of soil particles, not accounting for their springiness and the small spaces between them. I also had wrongly hypothesized about the effect of the sand, as it actually served, I believe, to spread out the particles rather then filling in the spaces between them. The waterproofing on the sides of the levee was also sometimes faulty, and the pouring speed definitely changed the results drastically. The time may also have been stopped inconsistently each time, not exactly when the water reached the mark.

Summary Statement
My project's goal was to discover which soil enhanced the performance of a levee to the greatest extent.

Help Received
I would like to express my extreme gratitude to the following people for their enormous help throughout the course of my work: Kate Higgs, my Science Lab teacher, for her guidance and explanation of the Science Fair procedure, my mother, for answering questions about how to do my project, revising my

CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Kenna T. Vecchiarelli

Project Number
J1133

Project Title
H(2)O: From Hazard to Health

Abstract

Objectives/Goals
The purpose of this experiment was to determine the most effective technique in water purification between coagulation, disinfection, and filtration. The hypothesis was that coagulation would be the most effective method, followed by disinfection, and finally filtration.

Methods/Materials
Contaminated water was distributed into twenty jars to create five samples each of untreated, coagulated, disinfected, and filtered water. Aluminum sulfate was used for coagulation. Chlorine was added for disinfection. Layers of gravel, carbon material, and sand formed a filter. The samples were tested for pH, ammonia, and nitrate by using solution drops and color key cards. Using a sterile swab, agar, and a petri dish, each sample was tested for bacteria. The petri dishes were stored in a warm, moist cooler and bacterial colonies were counted after a number of days.

Results
With the least resulting bacteria, coagulation had an average of 55.2 bacterial colonies. It also lowered the pH from 7.84 to 6.8 and resulted in a higher amount of nitrate. Disinfection was most effective removing .25ppm ammonia. Overall, filtration was least effective.

Conclusions/Discussion
The hypothesis was supported with coagulation as the most effective purification method, followed by disinfection, and finally filtration.

Summary Statement
This project examines the effectiveness of processes used in water purification.

Help Received
Parents and teacher helped me acquire materials needed for project.