CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Eris D. Albert-Minckler

Project Number
J0801

Project Title
How Could Global Warming and an Alteration of Wind Speed Affect the World's Deserts?

Abstract

Objectives/Goals
Because global warming is changing convection currents, my objective was to discover how a change in affects sand patterns and desert distribution.

Methods/Materials
Four pieces of large graph paper, in a 2 by 2 rectangle, were sprayed with adhesive. Calcium sand was placed four squares from edge of paper and a hairdryer in a vice blew on the sand for five minutes. This was repeated at three speeds. Spread of both fine and course sand was recorded. Wind speed was measured with an anemometer.

Results
The change of wind speed increased the disbursement of sand and the type of pattern created. The lowest speed only moved the smaller particles of sand. The highest setting moved not only the fine particles, but also many of the course particles as well. The medium setting moved much of the fine particles but only some of the course particles. Each setting created its own specific pattern on the paper.

Conclusions/Discussion
My conclusion is that an alteration in wind speed changed the distance and patterns of sand distribution. Even though scientists are still debating whether or not global warming will increase or decrease wind speed, this change will have an effect on the world#s deserts.

Summary Statement
My project focus is how global warming and wind speed affect world#s deserts.

Help Received
Guidance from science teacher; parents assisted experiment; mother assisted typing and construction of display board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Wyatt G. Alvis

Project Number
J0802

Project Title
Tidal Fluctuations: The Effects of Tides on the Salinity of Elkhorn Slough

Abstract

Objectives/Goals
My project was to determine if tides have an effect on the salinity of water in Elkhorn Slough. My hypothesis is high tides will cause an increase in salinity, by the seawater being pushed up into the slough. Additionally, low tides may have a decrease in salinity where brackish water of the slough is sucked back into the ocean and replaced by fresh water.

Methods/Materials
I sampled water from Elkhorn slough at high (7 feet) and low (-1 feet) tide. I took samples from three locations: (#1)sea level or near the mouth of Elkhorn Slough, (#2)mid-way up the slough at Kirby Park and (#3)the head of Elkhorn Slough. Thirty total samples were taken with five samples taken at each site at both high and low tide. A conductivity meter was used to measure the total dissolved solids (TDS) in parts per million (ppm) of each sample.

Results
At high tide, the salinity was higher, compared to low tide, where the salinity was lower. There was an average of 26,701.7 parts per million (ppm) of total dissolved solids (TDS) at high tide. At low tide there was an average of 23,521(ppm) of (TDS). The salinity at low tide, location #3, was about 17,000 (ppm), and at high tide was about 26,000 (ppm). This shows that at location #3 during high tide the water is mostly sea water.

Conclusions/Discussion
The results of my experiment showed that my hypothesis was correct. At high tide the salinity level is higher, and at low tide the salinity level is lower. The samples at locations #1, #2 and #3 at high tide were similar in salinity level and all in the average range of ocean salinity. At low tide the samples at locations #1 and #2 were also similar to ocean water, but at the sample location # 3 the salinity was much lower. This was because at low tide the ocean water receded towards the Monterey Bay, and fresh water (with lower salinity) moved into the upper slough at sample location #3.

Summary Statement
The effect of tides on the salinity of Elkhorn Slough.

Help Received
Father who drove me to Elkhorn Slough and showed me how to use the conductivity meter.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Matthew J. Chaffee

Project Number
J0803

Project Title
Salt and Subsidence

Abstract

Objectives/Goals
Subsidence has cost billions of dollars in structural damage to buildings,roadways, homes and economic loss in land use. Most devastating consequence of subsidence is that it is responsible for having residents relocate due to coastal erosion and flooding. Based on existing research by Ingles & Aitchson that salt is important component of soil mechanics and the petroleum industry's precedent to shore up the Long Beach harbor by injecting salt into oil bearing rocks.This project investigates whether salt's ionic properties will add stability to ground material's equilibrium and retard the effects of subsidence.

Methods/Materials
This project ran 40 trials of subjecting clay and soil to lateral compression to demonstrate the effects of pressure on ground material. Water was utilized as a transport method to introduce the salt to the two materials. The premise is that salt will act as a bonding agent in both clay and salt and exhibit lower compression compared to the trails without salt.

Results
The results of adding salt didn't meet my hypothesis. Clay mixed with salt water had the greatest compression possibly due to salt's lattice energy assisting clay in re-ordering itself and distributing the change in pressure. Adding water did lower the compression rates. Increasing the volume of material in a "dry state" showed the lowest compression. The USGS indicated that minimal water intrusion is necessary in the "dry state" to make the material pliable to counter pressure changes but to limit the water so there will not be a loss cohesion and cause erosion.

Conclusions/Discussion
While my results were unexpected, I was able to make the observation of whether covalent bonding is stronger than the ionic bonding within the salt/clay mixture. Clay with its high porosity/low permeability allowed it to adapt to various shapes for energy distribution.In the future, I would measure salt's ionization, utilize a vacuum apparatus to measure compression in psi and try different water levels that assist in the pressure stability without causing disequilibrium.

Summary Statement
Can salt's ionic bonding assist in stabilizing ground material's equilibrium and retard subsidence?

Help Received
interviews with the Kern Water Agency and USGS Wetland Reseach Center and my father building the sandbox

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Vivian R. Chiang

Project Number
J0804

Project Title
The Greenhouse Effect and the Warming of the Surface

Abstract

Objectives/Goals
The objective of this experiment is to emulate greenhouse effect and to test how different gases affected the thermal equilibrium temperature. The hypothesis was that carbon dioxide has a stronger greenhouse effect than normal and dry air and that normal air has a stronger greenhouse effect than dry air.

Methods/Materials
Three tests were designed in this experiment: normal air test, dry air test, and carbon dioxide test. In an aquarium tank, a box of sand was placed, along with a container thermometer and humidity sensor, a box of desiccant, and a glass of vinegar. Also, a surface thermometer was placed outside of the tank, with a thermocouple leading into the tank and ending right below the surface of the sand. A tight glass cover was placed on top and a set of lights shone directly above the tank. During the experiment, the surface temperature, container temperature and the humidity were recorded every 5 minutes until the thermal equilibrium was reached. In the normal air test, the tank was filled with normal air and the lids of the desiccant and vinegar glass were closed. In the dry air test, the desiccant lid was opened; in the carbon dioxide test, 8 grams of baking soda was added to the glass of vinegar and the desiccant lid was closed.

Results
In the carbon dioxide test, the thermal equilibrium temperature was about two degrees higher than the ones in the normal and dry air test. The thermal equilibrium temperatures of the normal and dry air tests were very similar.

Conclusions/Discussion
In conclusion, carbon dioxide is a stronger greenhouse gas than normal and dry air. However, the comparison between normal and dry air was inconclusive because the humidity and the room temperature were not controlled very well during the experiment.

Summary Statement
My project is about testing different greenhouse gases and it was found that carbon dioxide was a stronger greenhouse gas than normal and dry air.

Help Received
Parents helped record some of the data

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Kevin M. Cox

Project Number
J0805

Project Title
Cosmic Bullets: Does Local Weather Affect the Intensity of Cosmic Radiation at Sea Level?

Abstract

Objectives/Goals
This experiment examined whether the local variables of temperature, humidity and barometric pressure influence the frequency of muon strikes at sea level.

Methods/Materials
A lead-lined vault with 15.24 cm lead on all sides, ample to stop all terrestrial radiation, was used as a control to determine the frequency of muon strikes at sea level. Using a DSLR camera with a CMOS sensor sensitive to radioactivity, three 10 minute exposures were taken inside the vault with the lens removed and the camera sealed from light. Atmospheric temperature, humidity, and barometric pressure at the time of each exposure were recorded. Each image was enlarged 500% and examined for muon strikes (which appeared under magnification as white or colored dots or trails). This was then repeated for 30 exposures of 10 minutes each, taken in a radiation-shielded container of .635 cm thick lead at the average coldest and hottest times of the day. The data were graphed on scatterplot charts and subjected to regression analysis to determine correlations.

Results
There was a strong correlation between between temperature and muon strikes, which were inversely related. There was a strong direct correlation between humidity and muon strikes. There was no observable correlation between barometric pressure and muon strikes.

Conclusions/Discussion
While it is known that the atmosphere reduces cosmic radiation, there has been little analysis of how local variables of temperature, humidity and barometric pressure affect muon strikes at sea level. This experiment showed an inverse relationship between temperature and muon strikes, suggesting that as higher temperatures expand the atmosphere, it becomes less likely that cosmic radiation will collide with atmospheric gases and be deflected back into space. In addition, as humidity makes the atmosphere more dense, the frequency of collisions is increased and more cosmic radiation is scattered back into space. Further experimentation is needed to explain the lack of correlation with pressure. The correlation with temperature and humidity is promising for the study of local weather, since cosmic rays are already known to influence climate on a global scale.

Summary Statement
Using digital images from a radiation-sensitive CMOS chip in a radiation-shielded lead container, correlations were discovered between local atmospheric conditions and the intensity of cosmic rays at sea level.

Help Received
Mission Hospital donated the use of their lead-lined vault. Pico Metal Products helped me build the lead container. My uncle, a NASA astronaut, explained to me the affects of cosmic radiation on humans in space. My Dad helped me select books and research materials.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Anna Dabney; Kirstin Pianalto; Ashley Yao

Project Number
J0806

Project Title
Let It Snow!

Abstract

Objectives/Goals
Our project is about how global warming is affecting snowfall in the Sierra Nevada Mountains in past 80 years.

Methods/Materials
We did our project in 3 parts
Part 1
Records of monthly total snowfall in the Sierra Nevada Mountain Range and records of the monthly average Sierra Nevada temperature were are materials. We took the records and using excel created graphs showing the correlation coefficent between the two variables.
Part 2
The same tempetature records and records of total precipitation were used. This part was testing if all precipitation as well as snowfall was decreasing as temperatures rose.
Part 3
The materials for this part were plastic bottles, matches, and differtent temperatures of water. We were trying to find out if the strong correlation found in part 1 was really a causality rather than just a coinsidence by doing a cloud in a bottle experiment.

Results
Part 1: Approximentally 28% correlation
Part 2: Only about 2% correlation
Part 3: Colder temperatures create bigger and more noticeable clouds.

Conclusions/Discussion
Our hypothesis is incorrect. It can be concluded that snowfall has decreased as the temperature in the Sierras has increased (Part 1). Through further research (Part 2), it was proven that total precipitation (rain and snow) decreased as well. In order to determine if this was correlation or causality, an experiment was conducted (Part 3)involving the creation of clouds in a bottle with various temperatures of water. The results show there is a causality between the increased temperature and reduced snowfall. There are a number of issues both economic and environmental that are created by the reduced snowfall. Environmentally, many animals will be affected. Additionally, economically the melted snow in the Sierras supplies irrigation water to the Central Valley and West Nevada, which is where one- fourth of the crops Americans eat is grown. The debate between whether global warming is a natural or man made cause is irrelevant; we do know that it is causing changes in the amount of snowfall in the Sierra Nevada

Summary Statement
Our project is about the effect of global warming on precipitation, especially snow, in the Sierra Nevada Mountains.

Help Received
UCR Grad student, Anne Jacobs, helped us gather and organize our data from the NOAA website; my dad helped us word the abstract and conclusion and make the graphs; teachers, Mr. Rozzi and Mrs. Brown helped us prepare to be interviewed and gave us tips on how to improve our project.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
David W. Dewey

Project Number
J0807

Project Title
Tornado in a Box

Abstract

Objectives/Goals
Problem Statement: Is the size of a tornado affected by the water temperature over which it is created?

Hypothesis: I think that when the water temperature rises, the size of the tornado will increase accordingly.

Methods/Materials
Procedure:
Design & construct a chamber made of wood & glass to replicate actual tornado like conditions
Put the dry ice in the chamber with the water (testing at 5 different temperatures) and record the diameter of the core of the tornado with each water sample
The water temperature was the variable I altered to test the hypothesis 10 degrees Celsius in 10 degree increments up to 50 degrees Celsiua
I used 130 grams of dry ice each time and repeated the test twice with each water sample
I measured the diameter of the core of each tornado (based on 5 different water temperatures) in cm

Materials: Dry Ice - Exhaust Fan - Wood & Glass to construct chamber # Metal Bowl - Water - Measuring tape

Results
The tornado had the biggest diameter when the water temperature was at the highest degree of 50 degrees Celsius.

Conclusions/Discussion
My hypothesis was correct. Tornados are much bigger when they are created over hot water. In my experiment, the dry ice sublimated (the process of going from a solid to a gas) at a higher rate, which in turn created a bigger tornado.

Summary Statement
Designed, built and tested a Tornado Test Chamber to observe effects of varying water temperature

Help Received
Father helped with Tornado Test Chamber construction

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Breann K. Garcia

Project Number

J0808

Project Title

Liquefaction: Soils in Motion. How Structures Respond to an Earthquake

Abstract

Objectives/Goals

My objective was to understand liquefaction, the process that causes the soil to collapse and liquefy during an earthquake, and see which soils were more susceptible to this occurrence. My experiment was designed to see what would happen to the soils and structures during an earthquake. My goals were to find out which soils were strong on their own or could be combined with another soil to make it more stable during an earthquake and liquefaction event. The results could help define the type of soil to best build on to reduce earthquake and liquefaction damage.

Methods/Materials

In order to create an earthquake simulation, I built a shake table. Constructing the shake table consisted of these main components: wood, marbles, a glue gun, rubber bands, and closet handle casters. I also researched the four most common soils to build on, and acquired samples of each: pea-sized gravel, clay soil, sand, and loam. These soils were then divided into containers. A block of wood was used to represent a building and inserted into the soil. The tests were first performed without water. The container was shaken for three individual time periods; 30 seconds, 1 minute, and 3 minutes. The soils were then retested including water to simulate liquefaction. Using a protractor I measured the degree the building sank in the soil after each simulation. Observations were made on whether the block shifted, collapsed, sank, or did not move and also on how the soil responded to the shaking and liquefaction simulation; did the soil crack, liquefy, shift or stay intact.

Results

The results were that clay soil on its own or in combination with one of the three other soils responded the best in strength and stability and would possibly limit damage during a liquefaction occurrence.

Conclusions/Discussion

Liquefaction is devastating and more study needs to be done on how we can stabilize the soil, by either adding additives to the soil to react better during an earthquake or improving and increasing the speed of water absorption to limit liquefaction damage. There are real-life examples that show how structures reacted and failed during a liquefaction event. We need to learn from this when we rebuild, and either not rebuild there or make adjustments to the soil by adding a more stable soil to the mix.

Summary Statement

My project investigates liquefaction and how earthquakes and their vibrations affect the stability of soils.

Help Received

My mom helped by driving me to get my supplies. She also drilled the holes for the nails and helped during the experiment with the stop watch. At the local home improvement store, a worker helped cut the wood and pvc pipe. A local construction company helped by donating the soils for the experiment.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jennifer Guzman

Project Number
J0809

Project Title
Does Temperature Disperse with Depth in Different Types of Soils?

Abstract

Objectives/Goals
My hypothesis is that the result numbers of the soil were going to go down. I made this hypothesis because the thermometer was being pushed in further down in all the soils.

Methods/Materials
Materials:
1. Black Gold soils- All purpose potting soil with controlled release fertilizer, Seedling Mix, Cactus Mix, and African Violet Mix
2. Four plastic medium potting pots
3. Digital Thermometer
4. Digital Timer
5. A heat lamp
6. A metric converter

Results
The results were that the Seedling Mix had the highest temperature. The second highest was the African Violet Mix. They might have gotten the highest temperatures because of the elements they were composed of. Some of the main ingredients for these two soils were: pertlite, cinders, worm castings, and soft wood bark. The Cactus Mix, and the All Purpose Potting Soil were composed of very heavy elements which could have caused these two soils to get very low number results.

Conclusions/Discussion
In conclusion my hypothesis was correct because all the numbers (results) of the soils did decrease. The Seedling Mix did get a higher temperature and it could be possible that the heat could have gone further down into the soil because of the soft cartilage and perlite that it had. The second highest temperature was the African Violet Mix. Thanks to its soft elements, its temperature wasn't too low. The Cactus Mix and the All Purpose Potting Soil got very low results because of the hard softwood bark and because of the water "helper" that the Cactus Mix had.

Summary Statement
My project is about how the temperature changes with the depth in soil.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Gabriel Hyun; Thomas Zhang

Project Number

J0810

Project Title

Stable Soil: Comparing Soils Before and After Compaction

Abstract

Objectives/Goals

Our objective was to see how much different types of soils compact when a weight was dropped on them, what their bearing capacities were before and after compaction, and how their bearing capacities changed. The purpose was to see if compacting a soil can make it a better foundation. We thought azalea soil would compact most, gravel would compact least, gravel would have the best bearing capacity before compaction, clay soil would have the worst bearing capacity before compaction, sandy soil would have the best bearing capacity after compaction, and clay soil would have the worst bearing capacity after compaction.

Methods/Materials

We tested four different types of soils: sandy soil, azalea soil, gravel, and clay soil. We put them into cans. To compact them, we dropped a slightly smaller can filled with rocks through a tube into the can. We measured how far down the level of the soil went. To measure their bearing capacity, we put a 1-inch dowel into the can, and we put a weight on top of them. We gradually increased the weight and measured the penetration depth of the dowel for each amount of weight. We tested each soil three times.

Results

The azalea soil compacted most, the gravel compacted least, the clay soil had the best bearing capacity both before compaction and after compaction, and the azalea soil had the worst bearing capacity both before compaction and after compaction. Unexpectedly, the gravel#s average bearing capacity worsened after compaction. This might have happened because the weight didn#t compact the the gravel, but it could have rearranged the gravel so that the bearing capacity measuring tool was able to penetrate further.

Conclusions/Discussion

We were right about the amount of compaction, but we were wrong about the bearing capacities. This could be because the clay soil was very hard and had to be broken into hard chunks to fit into the can, so the clay soil did not let the tool penetrate, and the azalea soil was very light and airy, so the tool could penetrate further than the rest of the soils. Our results mean that compaction has a positive effect on the bearing capacity of a soil when it actually is able to compact the soil. We also conclude that the clay soil we used is the best soil to have as a foundation both before and after compaction out of the soils we tested.

Summary Statement

Our project compares how much soils compact, the bearing capacity of different soils before and after compaction, and how their bearing capacity changes.

Help Received

Teacher helped look over project; Mother helped put together board; Mother helped cut wood

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ethan P. Kearns

Project Number
J0811

Project Title
Red Planet Crater Erosion: The Effects of Geologic Forces on Impact Crater Erosion over the Same Period of Time

Abstract

Objectives/Goals
Mars has a greater diversity of impact craters than any other planet in our solar system. The purpose of my science project was to determine which type of geologic force has the most significant affect on eroding evidence of impact craters on Mars by simulating a flood, wind, glacial movement, and volcanic activity. I believe flooding will have a greater erosion effect on impact craters because water is a very powerful force as evidenced by such flooding activity throughout Earth#s history.

Methods/Materials
I constructed a 1 ft. x 4 ft. wooden table with a 2 in. rim to hold sand and rocks simulating the surface of Mars with impact craters of varying size. Prior to filling with sand, I lined the table with plastic and drilled drainage holes at one end. For the flood test I placed a small fish tank pump in a bucket of water and started the water flow at the higher end of the table to simulate a flood. Before conducting the wind test I covered the entire wooden table with plastic to contain the sand, rocks and flying debris. I then switched on a hair dryer to the highest setting at one end inside the plastic cover simulating a wind storm. For the volcanic activity test I repeatedly poured a mixture of wet sand, dirt and small pebbles into a cone on one end of the table until the cone overflowed simulating lava flow. For the glacial activity test I placed a large chunk of ice on the volcanic cone. I timed each test at 5 minutes noting the effects of each simulation on the various craters.

Results
The results demonstrated that volcanic activity had the most significant effect on eroding the impact craters. Water flow (flood) had the next greatest erosion impact on the craters. The wind and glacial erosion tests showed minor to moderate erosion effects on simulated impact craters.

Conclusions/Discussion
My conclusion is that volcanic activity has the utmost ability to erode and even completely erase evidence of impact craters. Flooding is also a powerful erosion force but not as invasive as volcanic activity. Wind and glacial activity can be considered moderate erosion forces.

Summary Statement
The purpose of my science project was to determine which type of geologic force has the most significant affect on eroding evidence of impact craters on Mars by simulating a flood, wind, glacial movement, and volcanic activity.

Help Received
Father helped build wooden table; supervised geologic force simulations.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Caitriona M. Parker

Project Number
J0812

Project Title
How Differentiated Layers of Sand Are Affected by Lateral Compression

Abstract

Objectives/Goals
The purpose of my project is to determine the affects of lateral compression on differentiated layers of sand. Since I live in Humboldt County, where plate tectonics and crustal folding play a major role in our geology, I wanted to test what would happen to the Earth's crust when it begins to fold from these stresses and pressures. My hypothesis for Trial 1 (1 1/2 cm sand layers) was that I would get anticline folds. Trial 2 (3 cm sand layers) hypothesis was that I would get monocline folds. My final hypothesis for Trial 3 (1 1/2 cm saturated sand layers) was that I would receive divergent results, as in overthrust folds.

Methods/Materials
First, I constructed my sand box, using plywood and Plexiglas. Then, for each trial, I filled the box with the designated amount/variable of sand (1 1/2 cm sand layers, 3 cm layers, and 1 1/2 cm saturated layers). I used a drill to move the piston which compressed the sand in the box. I kept the drill at a steady pace. I stopped my piston every 1/4 of the way across the box. I took notes and pictures of the folds that were formed in the sand. The materials I used were: 3/8 in. plywood, 5/16 in. 3 ft. long threaded rod, expansion bolt, acorn cap, 24 x 9 in. piece of Plexiglas, two 25 lb. bags of play sand, food coloring, oven, screws, nails, drill, hammer, screwdriver, wrench, adhesive spray, wood glue, measuring cups, table saw, mitre saw, and a jig saw.

Results
I charted the results from all three of my variables, in which I compared the top and bottom folds from each trial. After analyzing all of the data, I realized that lateral compression does not have a large affect on sand layers. Even though my results varied from each trial, they all basically gave me anticline folds; however the patterns of syncline, moncline, asymmetrical, overthrust, and recumbant folds were also present in my project. I believe I got the overall result of anticline folds because the angle that the piston was applying pressure automatically pushed the sand upward.

Conclusions/Discussion
My hypothesis was only accurate for the first trial, Trial 1 (with 1 1/2 cm layers). My hypothesis for the other two trials proved to be incorrect. After completing this project, I now understand many of the variables involved in crustal folding and plate tectonics. I believe that geologists will/should continue their studies in this field, in order to build appropriate structures to help keep people safe.

Summary Statement
My project was to determine how differentiated layers of sand are affected by lateral compression.

Help Received
Father helped me with power tools needed to build box

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Emily Rose Randall

Project Number
J0813

Project Title
Infrared Light and Carbon Dioxide Gas: A Planetary Blanket

Abstract

Objectives/Goals
The purpose of my experiment was to verify that Carbon Dioxide gas blocked the transmission of infrared light as I learned in did when my science class studied climate change and greenhouse gasses.

Methods/Materials
Small Glass Bowl, 5 Gallon Fish Tank, Dish Remote Model 5.3IR, Dry Ice, Cyber-Shot Digital Camera, Ring Stand and Clamps, Vernier Labquest, Vernier Light Sensor, Acculab Mass Scale, Lab Notebook, Saran Wrap, 1 Cup Measuring Cup, Spoon, Blue Masking Tape

1.Place the remote control and light sensor in clamps on opposite sides of the tank. 2. Adjust remote control and light sensor to point at each other through the tank. 3. Place masking tape over remote buttons to block their light. 4. Turn off all the lights. 5. Press the aux button on remote, then hold the power button down. 6. Look to see no visible light is shining from the remote. 7. Use camera to make sure the remote is only shining infrared light. 8. Turn on the lights. 9. Pour a cup of hot water into a small bowl and measure its temperature. 10. Put bowl into a tank. 11. Place finger over Vernier light senor and calibrate to zero. 12. Set the sample time to 100 seconds and the sample rate to 5 seconds. 13. Cut a cube of dry ice and measure its mass. 14. Turn off all the lights. 15. Press and hold the remote's main power button. 16. Start time on Vernier Labquest. 17. Wait 10 seconds then drop dry ice into bowl. 18. Cover top of tank with plastic wrap. 19. Record data for 100 sec and repeat with different masses of CO2.

Results
The results show that the more carbon dioxide there was, the shorter amount of time it takes for the infrared light to be completely blocked. The result varified that infrared light is blocked by carbon dioxide gas. When we used a one gram cube of dry ice, the infrared light never got completely blocked but did reduce to about half as much. This result showed that inrared light will pass through small amounts of carbon dioxide gas. The results show that the more carbon dioxide gas in an atmosphere, the more infrared light will be blocked.

Conclusions/Discussion
My hypothesis was that carbon dioxide gas does not block infrared light. I based my hypothesis on the fact that when I use a remote control, it is not blocked by the carbon dioxide in the air. The results of my experiment indicate that my hypothesis should be considered false.

Summary Statement
My project is about designing an experiment to verify that infrared light is blocked by carbon dioxide gas as is stated in theories on climate change.

Help Received
My dad help get the equipment and taught me how to use the ring stand claps. My dad also helps me learn how to use spreadsheets and to write in a lab book. My Brother helped when taking data. My Mom helped me organize my board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Dylan J. Sanfilippo

Project Number
J0814

Project Title
Measuring the Interplanetary Magnetic Field with a Homemade Magnetometer

Abstract

Objectives/Goals
I visited Astro Camp for several days on a field trip and it inspired me to do a science fair project about space, our sun, and our solar system, so I searched for ideas on the internet. I found a very interesting project to measure the magnetic pulses in the interplanetary magnetic field. My goal was to build a device called a magnetometer, which acts as a compass that measures the interplanetary magnetic field. The interplanetary magnetic field is made up of plasma emitting from the sun to create solar wind.

Methods/Materials
The magnetometer I built was constructed of rare earth magnets that are attached to a fiber with a laser beaming off of it. My hypothesis was that I would be able to measure the interplanetary magnetic pulses. I believed the results and graphs from my magnetometer will be in principal similar to devices used by NASA. I thought there would be some errors because the device is homemade. I used a program on the computer to calculate and translate the laser results from my device into a graph. I recorded 115 hours of test data.

Results
I found that 59% of the time, my graphs were similar to NASA's. I concluded that I could measure the interplanetary magnetic field with accuracy a little more than half of the time with a homemade magnetometer.

Conclusions/Discussion
The percentage that I received from my graphs could have been affected by appliances in my house. For example, my refrigerator or any other appliance with an electric and magnetic field, would interfere with the rotating magnet. Even a small degree of rotation would show a lot in the graphs I made. To fix this problem I would build a glass box for wind protection, and place my project outside away from my house appliances. Building the magnetometer was complicated but when I was done I felt successful and excited to measure the interplanetary magnetic field and make the graphs on the computer. I really enjoyed my project and I want to continue my scientific studies in earth and interplanetary sciences.

Summary Statement
I built a homemade magnetometer to measure the interplanetary magnetic field.

Help Received
Mother for encouragement and inspiration; Father helped with oral report; Science teacher for her guidance

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Eric C. Teves

Project Number
J0815

Project Title
Higher Altitude Thin Air

Abstract

Objectives/Goals
The purpose of my project is to see the change of pressure in a container with increasing altitude and the container will act as a pair of lungs.

Methods/Materials
1-2 litter soda bottle empty ,2-16 oz water bottles, rubber cement,coat hangers,electrical conduit wrap,tire pressure gauge

I placed an air gauge on a air tight 2 litter soda bottle. Started at Hollister Ca 289 ft of elevation up to a altitude on Sonora Pass of 9,624 feet in elevation. At different elevations I measured the building air pressure in my test vessel and charted the results.

Results
Results were mixed. The 2 liter bottle did not expand as much as I had expected due to the thickness of the bottle. The smaller thinner walled plastic bottles expanded as predicted with impressive visual effects

Conclusions/Discussion
My hypothesis was correct. Some people have had a hard time breathing at altitude but usually will adjust to the higher altitude. Through my research that i've done people may have other medical difficulties such as not getting enough oxygen to the brain,faster heart beat,hyperventilation,stroke,heart attack,pulmonary embolism and swelling of the brain tissue these serious effects will usually happen at above 12,000 feet

Summary Statement
Why High Altitude air is thinner?

Help Received
Mother Helped Type report, Dad helped me build the mechanics of the project

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Alexander B. Vu

Project Number
J0816

Project Title
Saturated Soil

Abstract

Objectives/Goals
My objective was to determine the effects of different soil amendments on the absorption and retention rates of water in the soil. I used six different amendments: volcanic ash, gypsum, hydrogen peroxide, aluminum sulfate, nitrogen-phosphate-potash fertilizer, and clay.

Methods/Materials
This experiment was over a period of 15 days. On day -15 I laid out 21 bowls of 100 g of soil and designated three for each amendment and three for the control. Starting on this day and every three days afterwards until day 0, I added hydrogen peroxide to the appropriate bowls. On day -7 I added all the other amendments to their respective bowls, except for the aluminum sulfate, which was added on day -2. The maximum amount of each amendment was added without rendering the soil useless, and it was added over the amount of time, determined by research, during which it would be the most effective. On the day of the experiment, at time zero, water was added to the amended soil until it was saturated and the amount added was recorded. One hour later water was again added to the soil until it was saturated and this amount was also recorded. The latter determined the amount of water that had come out of the soil. This whole process was repeated twice more.

Results
I discovered that the soils absorbed water in this order: clay, volcanic ash, fertilizer, control, aluminum sulfate and gypsum, and hydrogen peroxide. I also discovered that the soils retained water in this order: clay, volcanic ash, fertilizer, aluminum sulfate, gypsum, hydrogen peroxide, and control.

Conclusions/Discussion
I concluded that some amendments increased both the absorption and retention rates of water, while others only increased the retention rate. Clay and volcanic ash increased both the absorption and retention rates significantly, whereas the fertilizer increased the absorption and retention rates by only a small amount. All the other amendments were found to decrease the absorption rate but increase the retention rate by a lesser amount then the fertilizer. The applications of this project are twofold. First, this project determines the amount of water that soil with certain amendments would need so that it would not be over-watered or under-watered. It also determines what amendments cause soil to absorb more water than unamended soil so that they could be used in a garden. Through research, I expanded my knowledge of soil classification.

Summary Statement
My project is about the effects of different soil amendments on the absorption and retention rates of water in soil.

Help Received
None

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Nicholas K. Wang

Project Number
J0817

Project Title
How Does the Topography of a Hill Affect Water Erosion?

Abstract

Objectives/Goals
Find out which topography is most effective in reducing water erosion. Measure the amount of water erosion in a soil filled tray using different types of topography. Each type of topography is tested using the same slope, similar soil density, same water flow rate and running water down the slope for the same amount of time.

Methods/Materials
To conduct the experiment, I set up a water erosion measurement station. This station has a water container stand which I can pump water through a 3/4# pvc pipe onto a soil filled aluminum tray tilted to approximately 1 in 3 slope. The top surface of the soil tray is graded with different topography I will be testing. At the lower side of the tray, a fabric is placed below the tray to collect eroded soil that run down with water. Water is drained from the soil sample. The soil sample is then weighed on a gram scale and recorded. 4 types of different topography and 1 control topography are tested. Each type of topography is tested 3 times.

Results
The weights of the eroded soil of different types of topography are measured. The average weight for the control type topography (flat) is 248g. It is higher than other types of topography except the diagonal checkerboard topography. The steps topography has the lowest weight at 104.7g.

Conclusions/Discussion
Topography does affect water erosion. The steps topography is the most effective in reducing water erosion. The results of my experiment show this type of topography has the least amount of erosion. The curvy topography has the second best result. The results of my experiment could be used to generalize that by grading the naturally steep slope with some type of topography, it would help to reduce the effects of water erosion.

Summary Statement
Study what type of topography is most effective in reducing water erosion on a hill.

Help Received
Dad help conduct experiment, Mom help write notebook and Mr. Hillman lent me a gram scale.