CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

M. Paulo Alejo; Thomas Prata

Project Number

J0801

Project Title

Earthquakes: Are You Standing on Shaky Ground?

Abstract

Objectives/Goals

Our goal was to determine which foundation is the best to build structures on to secure safety and stability during an earthquake.

Methods/Materials

Our goal was to determine which foundation is the best to build structures on to secure safety and stability during an earthquake.

Results

As predicted in our hypothesis, rock proved to be the most desirable foundation if one did care for earthquake safety. Rock came out on top in four trials only beaten in one trial by clay. Clay came in second. We figure that these results were evident because of clay's packed texture and energy absorbing properties. Sand came in third. Though sand didn't move as much as soil, it did sink. This was due to sand being prone to liquefaction. Soil came in last. When we first tested soil's stability, we were shocked at the results. The entire model swayed back and forth, even falling over.

Conclusions/Discussion

We Figure that rock came out on top in most of the trials due to its hard structure, absorbent properties, and ability to resist liquefaction. We believe that this experiment will benefit the future in that this project is written by students making vitals parts of earthquake safety easier to understand for the youth which will be building our future. Because of recent findings such as this, we can prevent tragedies such as the earthquake in Haiti.

Summary Statement

Our experiment provides vital information to the survival of structures, especially in the event of an earthquake.

Help Received

Parent supervision while using power tools.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Ian T. Davison

Project Number
J0802

Project Title
An Exploration of the Formation of Trash Islands

Abstract

Objectives/Goals
The objective is to determine if air movements across the surface of a body of water have a greater influence on the development of water currents that form "trash islands" than subsurface events.

Methods/Materials
Volumes of plastic trash, ranging from 250 milliliters to 1000 milliliters, were placed in a 56.775 liter circular metal basin filled with 53 liters of water. The assembly was then subjected to convection, surface, and subsurface currents in order to generate trash islands. Because definitive trash islands did not form, and the convection treatment produced little results, experimentation continued using only surface and subsurface currents. The length of time it took for trash to stop moving, and the volume of floating trash were recorded.

Results
An average of 194 milliliters of trash remained floating after a first trial of 4 surface and 4 subsurface current inducing treatments, while an average of 279 milliliters of trash remained floating after a second series of treatments. The average amount of time it took for the floating trash to stop moving after the first trials was 35 minutes and 57.1 seconds, whereas the average time decreased substantially to 24 minutes and 34.8 seconds after the second trials.

Conclusions/Discussion
It is known that about 70% of the trash where trash islands occur is sunken and 30% is floating. No definitive trash islands formed during this experiment. Trash did float or sink, however, and a relationship between the amount of floating trash and the time it took for the trash to stop moving after the removal of a current-inducing source was apparent. When there was more floating trash, it took less time for the trash to stop moving. Only two trials were run, and more trials are needed to support the findings here.

Summary Statement
My project is an examination of the forces that generate trash islands.

Help Received
My father helped with conducting the experiments and with data formatting and entry.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Alicia N. Hans

Project Number
J0803

Project Title
Getting the Dirt on Soil: Porosity

Abstract

Objectives/Goals
My objective was to find out the effect of the type of soil on its porosity. I believe that the clay soil from my garden will have a lower porosity than sandy soil.

Methods/Materials
I prepared soil samples: 100 mL samples, five samples for each of four soils (fine sand, coarse sand, sifted clay soil, potting soil). I poured in the water, stirred the soil, waited for the water to get absorbed by the soil, and continued to add water until the soil was saturated. I recorded the amount of water added.

Results
The average amount of water held by the sample of fine sand was 39 mL; the average for coarse sand was 29 mL; the average for clay soil was 25 mL; and the average for potting soil was 36 mL. Therefore the average porosity for the fine sand was 39%, for the coarse sand 29%, for clay soil from the garden 25%, and for the potting soil 36%.

Conclusions/Discussion
My data supported my hypothesis. The clay soil from the garden had the lowest porosity and the fine sand had the highest.

Summary Statement
My project is to measure and compare the porosities of different soil types.

Help Received
My mom introduced me to the topic of my experiment, helped find resources about soil porosity, took photos, and helped me measure the water; Dad helped me make my graphs on the computer.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Rose M. Hillebrandt

Project Number
J0804

Project Title
The Golden Spiral in Hurricanes: Does It Predict Severity?

Abstract

Objectives/Goals
I wondered if the Golden/Fibonacci Spiral, which is present in many parts of nature, was present in hurricanes and, if so, would it predict the severity of a hurricane. My hypothesis was if a Golden/Fibonacci Spiral is present in a hurricane the hurricane will be more severe compared to a hurricane with a tighter or looser spiral.

Methods/Materials
I researched hurricanes, including a personal expert interview. Then I collected data about hurricanes from 2002 to 2012, all in September, the most popular hurricane month. I used satellite images of each hurricane and with geometric measurements I calculated how much tighter or looser the spiral in the hurricane was compared to the Golden/Fibonacci Spiral. After this, I evaluated whether there was a correlation between my data points of each hurricane the percent variance from a Golden/Fibonacci Spiral.

Results
I determined there is no correlation (0.06171) between amount of rainfall and a hurricane#s likeness to a Golden/Fibonacci Spiral, a slightly higher, but not significant correlation (0.328564) between # of days as a hurricane and a hurricane#s variation to a Golden Spiral. The speed of wind (0.513176) and barometric pressure (-0.47057) were the most correlated to a hurricane#s likeness to a Golden/Fibonacci Spiral, although still not a high correlation. I confirmed that the variance from the Golden Spiral became greater as the distance of the spiral from the eye of the hurricane became greater.

Conclusions/Discussion
The data did not support my hypothesis that the presence of the Golden/Fibonacci Spiral would predict a more severe hurricane than a hurricane with a tighter or looser spiral. The data shows the more severe a hurricane is, defined as greater wind speed and lower barometric pressure, the less like a Golden Spiral it is. The visual process with which I defined the spirals created some bias within my results. If I did this project again, I would broaden my data to evaluate more hurricanes, keep the time of the satellite image constant, and investigate use of computer imaging to define the spirals.

Summary Statement
There is not a strong correlation between the presence of the Golden Spiral and the severity of hurricanes.

Help Received
Parents helped edit report. Science teacher introduced to experts, and advised in background research.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Jaime Kvaternik

Project Number
J0805

Project Title
The Effects of Water Depths on a Wave's Velocity

Abstract

Objectives/Goals
The objective of this project is to see how different water depths can affect a wave#s velocity.

Methods/Materials
One tank of water is filled with water after many tests and trials. For more accurate data, a contraption was constructed with some construction tools. A block of wood is then dropped from a specific height (.5 cm) into water creating a wave. The whole experiment is filmed with a video camera, which is then sent to a computer. With movie software installed on the computer, the first wave created is timed until the same wave reaches the end. All this is written down in a lab book.

Results
As shown above, the wave velocity will increase if the water level is deeper. The 1cm water level times are in the 1-.7 second range. Then the 2cm water level ranged in .9-.7 seconds. The 3cm water level ranged between the .7-.5 ranges, while in the 4cm water level was in the .6-.5 second ranges.
The wave velocity range for the first few depths were about ten, but then the range between the 3cm depth (73) and 4cm depth (97.9) basically doubled. This data also shows that the average time across test for each water level was relatively similar. Also the first three average times across water depth trials were again going down by ten, but then for the 4cm water level went down by about twenty.

Conclusions/Discussion
My data did support my hypothesis for this experiment. Waves in shallow waters slow down, and decrease their wavelength. As waves move towards shallower waters they start to feel the ocean floor. In a process called shoaling, this causes the wave orbitals to flatten as the bottom shoals. The height of a wave starts to decrease when feeling the water, but later will steadily increase until it reaches the shore, where the water will become unstable and break (Santa Aguila Foundation, 2012).

Summary Statement
My project is about how different depths can change a wave's velocity greatly, due to shoaling when reaching shallower water instead of when at a deeper water depth is slips like a skater on ice.

Help Received
Father helped edit experimental procedure.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Amanda B. Mickelson

Project Number

J0806

Project Title

Seaside Heritage: Investigating Local Eocene Fossils

Abstract

Objectives/Goals

I have been fascinated with paleontology for as long as I can remember. Several months ago, I visited an area of exposed fossils from the Delmar formation, a middle Eocene layer that is the subject of this report. I was amazed at the density of the fossils in the layer. The fossils are located in the cliffs in an area of Del Mar known as Dog Beach. I decided to describe and document the fossil deposits in this 46 to 48 million year-old layer in its current condition at the base of sandstone cliffs near the mouth of the San Dieguito River Estuary.

Methods/Materials

I gathered a laser rangefinder to measure distances, metric rulers, a calculator and a digital camera to document the fossils. I made visits to the site at low tide, when the layer was most accessible. I gathered loose fossils in the rubble that would be washed away or would be eroded quickly by wave action.

Results

I found numerous Ostrea idriaensis fossils in the green-gray Delmar Formation sandstone. The oyster fossils in the sandstone were permineralized brown or gray calcite. The fossilized oysters ranged from 3 cm to 10 cm in length. The density of the oyster fossils in the exposed rocks was as great as 200 to 300 fossils per square meter of exposed rock surface. I also documented other fossilized mollusks, including the bivalves Venericardia and Pelecyora aequilateralis, and the gastropods Potamides carbonicola and Ampullela Schenckii. Potamides appeared to be deposited in great density in some of the softer mudstone in the formation. I visited the Museum of Natural History to learn more about the layer and to confirm species identification with the help of the museum paleontologists.

Conclusions/Discussion

My findings reveal thousands of fossils from a rich, lagoonal, marine remnant preserved in the sedimentary rock. According to my research, the exposed Eocene layer seems to be strikingly more eroded today than how it had been described 20 years ago. It appears this fossil heritage may now be at risk due to seawall construction and sand loss at the beach where it is located. Perhaps a plan for sand replenishment may help preserve this ancient layer for the future.

Summary Statement

I described and documented Middle Eocene marine fossils in the Delmar Formation in their current condition at the base of sandstone cliffs.

Help Received

Mother and Grandfather supervised me in the field; Dr. Tom Demere and the paleontology department at the San Diego Natural History Museum allowed me to use their collection of fossils to help to identify samples that I had collected.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Jenna R. Murphy

Project Number
J0807

Project Title
Effects of Different Irrigation Methods on Various Soil Types

Abstract

Objectives/Goals
My objective was to find the effects of different irrigation methods on various soil types.

Methods/Materials
Using three different soil types; clay, sandy, and loam, and three different irrigation methods, grass was grown from seed. Each soil type was used with each irrigation method which made up nine separate containers of grass. The growth was measured and recorded weekly. The containers were irrigated every other day using the irrigation method specific to each container.

Results
The most growth was surface drip irrigation in sandy soil. The grass in this container grew to 17 cm. The least growth was subsurface drip irrigation and traditional irrigation both with loam soil. The grass in these containers grew to 11 cm.

Conclusions/Discussion
I found my hypothesis was partially correct. My hypothesis stated that the clay soil would work the best with surface drip irrigation. My data suggests that consideration of soil type is an important part of gardening.

Summary Statement
The purpose of my experiment was to determine the most efficient irrigation method for certain soil types.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Grace E. Ochs

Project Number
J0808

Project Title
Investigating Various Degrees of Colloidal Suspended Particles on the Spread of Chemical Pollution in Water

Abstract

Objectives/Goals
The objective of my project is to determine the rate that chemicals travel through colloidal suspended paticles in water. I will investigate which soil sample allows chemicals to travel through its varied amounts of colloidal suspended particles fastest. This investigation will give us a better understanding of how fast chemicals travel through our waters.

Methods/Materials
Collect samples of different soils from lakes and beaches to determine the distance and time it takes for one drop of food coloring to travel and/or cloud up the water. Measure 50 mL of the soil into a 500 mL graduated cylinder. Measure 100 mL of distilled water into the same cylinder. Place two drops of red food coloring in the graduated cylinder. Start a stop watch to see how fast the food coloring travels and stop it once the food coloring reaches the soil. Record data and repeat, 10 trials.

Results
The results of my investigation indicate that beach soil allows the flow of chemicals more than lake soils. Both beach soils allowed the food coloring to travel quickly through the colloidal suspended particles. However, the lake soils only traveled an average of seventy-nine mL in two minutes.

Conclusions/Discussion
After completing my investigation on the various degrees of colloidal suspended particles on the spread of chemical pollution in water, I found that my hypothesis for Ensenada soil blocking the dispersion of chemicals was incorrect. My hypothesis stated that Ensenada soil will block the red food coloring from traveling through the soil. When compared to Catalina Island, Pine Flat, and Millerton Lake soil it allowed the chemical to travel through the water 100 mL with an average of 4.13 seconds. The soil that took the longest to let the red food coloring travel through the water was Millerton Lake soil. It took 2 minutes for the food die to travel approximately 60 mL.
Millerton Lake soil took the longest to travel through water clouded with colloidal suspended particles; therefore we can infer that less of the water in Millerton Lake is polluted. People should be aware of the amount of chemicals in water they get into especially if they have skin problems and to prevent allergic reactions to spread chemicals in certain waters. In conclusion I learned that Millerton Lake will not have as vast spread of pollution as the other samples.

Summary Statement
This project investigated various amounts of colloidal suspended particals on the spread of chemical pollution in water.

Help Received
Parents helped with proofreading, layout of board, and abstract.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Sarah C. Silver

Project Number
J0809

Project Title
Surfing 24/7 in California: Do California Waves Have a Greater Magnitude at High or Low Tide?

Abstract

Objectives/Goals
Because of the observations made while playing in and near the ocean, the question arose as to whether normal tidal variation created larger wave heights. The objective was to discover whether tidal patterns influenced wave magnitudes.

Methods/Materials
A measuring device was designed and employed off the shore of Torrey Pines State Beach in San Diego. It consisted of a six foot length of PVC pipe clearly marked in half foot increments. On several different days, at either high or low tide, this device was placed at a constant fixed distance from the high water shore line and a series of waves were measured. Data was also collected from offshore buoys from the NOAA society to be used as a comparison to close shore data collected. Measurements were taken during twenty high tide and twenty low tide trials. Trails began within five minutes of published tidal extremes.

Results
Measurements of sets of 10 waves were averaged to determine values for each 15- minute trial. Values for each trial were compared to wave heights taken from NOAA buoy data, which measured deep water mass waves. No significant difference was revealed between waves measured at high vs. low tide. A large data gap was shown between buoy data and shore data because of what kind of wave, a shallow water mass wave or a deep water mass wave, was being measured.

Conclusions/Discussion
This data does not support the hypothesis that there is a a positive correlation between tidal stages and wave heights. Wave magnitude is not significantly effected by shifting of tides. Water height created by the tides does not create a different wave height at different tides.

Summary Statement
Thiss experiment tested wave magnitude at high and low tides and did a comparison between this data and data from NOAA offshore buoys.

Help Received
Thank you to both parents for assisting transport to and from the testing beach, mentors Maryanne Fletcher & Dr . Curtis Long at NASA for aiding research, and teacher Mrs. Gillum for providing encouragement and proofreading documents.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Jordyn Harper; Caelen McQuilkin

Project Number

J0898

Project Title

Higher Elevations = Colder Temperatures: True or False?

Abstract

Objectives/Goals

We wanted to find out if it always gets colder as you get higher in the mountains.

Methods/Materials

We used thermochrons (called iButtons) which are thermometers about the size of a quarter that record many air temperature, date, and time samples. We made cases for them using screen, PVC pipes, staples, and wire. We created a recording sheet to keep track of the iButtons, their locations, and placement times. Also, we needed outdoor gear (mountain bikes, skis, snowshoes, etc.) to place the iButtons.

First in our procedure, we programmed the iButtons to record the temperature at ten minute intervals. Next, we placed 11 iButtons around the Eastern Sierra Nevada at elevations ranging from Mono Lake at 6,386 feet (1,946 meters) to the summit of Mammoth Mountain at 11,053 feet (3,369 meters). We picked north side locations, out of direct sunlight, and made sure that the iButtons wouldn't get buried in new snow by placing them more than two meters above the snow surface. We left the iButtons out from January 21 through January 28, 2013. After collecting them, we downloaded the data (approximately 11,000 data points) into our computer. Then, we used Excel to analyze the data and make our graphs. Along the way, we learned that experiments don't always go as planned, because our Mammoth Mountain iButton got frozen in rime ice and took an extra week to recover.

Results

We calculated lapse rates (change in temperature with change in elevation) from our data. Our data supports the conclusion that it usually gets colder as you get higher. For example, at 6am on January 27 it was -3 C at 1,946 meters and -12 C at 3,369 meters, a lapse rate of -6.4 degrees C per 1,000 meters. However, when special weather conditions created a temperature inversion, the data showed that lower elevations were much colder than higher ones.

Conclusions/Discussion

With our data, we found that it gets colder as you get higher in the mountains. Sometimes there are exceptions called temperature inversions, and they happened over two of our testing days, which we are very excited about because they are so interesting. Inversions happen when the air is calm and the cold air (being heavier) sinks down and pools in the valleys and basins. When there is an inversion, low elevation locations are colder than high elevation ones.

Summary Statement

We measured temperature at elevations between 6,386 and 11,053 feet in ten minute intervals for 7 days; the data showed that it usually gets colder as you get higher in the mountains, but there are exceptions called temperature inversions.

Help Received

Dr. Connie Millar lent us the iButtons and discussed inversions with us. Our parents went with us to place the iButtons and collect them, and Caelen's dad showed us how to use Excel. Jordyn's parents collected two iButtons for us. Dr. Millar asked us lots of questions to help us analyze our data.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Ian V. Hughes

Project Number
J0899

Project Title
A New Ancient Community: Discovered Under a Bed

Abstract

Objectives/Goals
The Ediacara Biota are the Earth's oldest macroscopic organisms. They lived 575-545 million years ago and are globally distributed. Scientists excavate fossil beds in order to collect data and understand the ecology of these organisms. For this project, a new fossil bed in Nilpena, Australia was excavated. The research investigated two hypotheses: 1) The fossils that are preserved on this bed are the same taxa as those on other excavated beds and that they are previously described genera and species and 2) The biodiversity pattern is similar to other beds that have been excavated.

Methods/Materials
This newly discovered bed was excavated using pick axes, sledge hammers and shovels. It was then reconstructed and mapped for all fossils. Fossils were logged, photographed and copied using rubber latex. Specimens were later measured and compared. Data from this new bed was compared with other excavated beds from South Australia

Results
Over 30 specimens of a new fossil was discovered on this bed, unknown from any other bed in the area or in Australia of this age. It is a new species and maybe a new genus. Based on its morphology, this fossil is being called "Bundle of Fibers" pending assignment of its Latin name. The presence of this fossil falsifies hypothesis number one because #Bundle of Fibers# is not found on other excavated and described beds. The diversity and abundance of all fossils on this bed were compared to those on the fifteen (15) other beds excavated in this area of Australia. Through this comparison, hypothesis two was also falsified. Both the fossil diversity and abundance is strikingly different than any other excavated bed.

Conclusions/Discussion
This research not only identified a new species but also helps to demonstrate that Ediacaran ecosystems were more complex than scientists thought. Important further research is indicated as a result of this investigation particularly about the ecology of the environment in which "Bundle of Fibers" lived. Was this organism living in shallower waters, is "Bundle of Fibers" an animal or could it be another organism such as algae? In addition, this organism will need to be formally described so that scientists working on Ediacaran fossils throughout the world can compare "Bundle of Fibers" with fossil discoveries in other parts of the world.

Summary Statement
A new fossil species, 565 million years old, was discovered along with a novel ancient community in Earth's oldest multicellular ecosystem.

Help Received
My mother and sister helped to put the poster together. Dr. Jim Gehling (South Australia Museum) facilitated bed excavation and research, musuem volunteers helped with with the heavy lifting of excavation