CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Aiyana Alaino; Teresa H. Netro

Project Number
J1601

Project Title
Pendulum Variables

Abstract

Objectives/Goals
My objecgtive of this project was to figure out if changing either the length, the weight, or the amplitude, would affect the swing of a pendulum, and if so, which caused the greatest change.

Methods/Materials
A PVC pipe base was built in the shape of a swing structure, to take the data. We then used 1, 2, and 3 ounce weights, a stopwatch and a ruler to test our three catigories (weight, length, and amplitude).

Results
The length gave the largest difference in time. As you make the length longer, the time increases because the pendulum has a longer path to travel. Compared to amplitude and weight, which made no difference what so ever in time.

Conclusions/Discussion
My conclusion is that length has an important role in pendulum science, and that pendulums will take more time with longer lengths.

Summary Statement
My project is about pendulums, and which variable will change the time of it's swing the greatest.

Help Received
Mother helped with graphs on Excell; Grandfather helped fine-tune research question; Aiyana Alaimo helped take data

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Nathan G. Behrens

Project Number
J1602

Project Title
Attenuation of Eight Different Sound Frequencies over Distance through Four Different Materials

Abstract

Objectives/Goals
I wanted to know whether (1) a low frequency was harder to attenuate than a high frequency sound, (2) a soft material like fiberglass would attenuate sound better than a hard material like wood, and (3) if sound attenuates linearly with distance.

Methods/Materials
To measure attenuation I constructed a sound insulated testing cube which was open on one side containing speakers connected to an electric piano used to generate different frequencies of constant volume. A sound meter was placed on a tripod at various distances to read decibels for each combination of sound attenuating material, distance, and frequency.

Results
As hypothesized, (1) high frequencies attenuated more than low frequencies and (2) fiberglass, a soft material, was one of the best sound attenuators. However contrary to hypothesis, the hard materials of wood and cardboard were equally good attenuators and Styrofoam, a moderately hard material was the worst attenuator. Contrary to hypothesis, sound does not attenuate linearly with distance as in circular spreading; instead it attenuates with the square of distance as in spherical spreading.

Conclusions/Discussion
The attenuation of all the hard materials was very similar in spite of differing thicknesses. Perhaps they are acting more as a reflector than an absorber. I#d like to test this further by adding thickness as a variable and by measuring the sound inside the chamber rather than just outside.

At my larger distances, sound seemed to switch from spherical to circular spreading likely because the sound waves were bouncing off the ceiling and floor. To better test for spherical spreading at large distances, I would test in a larger open area.

My experiment was also limited by the lower range of the sound meter at large distances especially for high frequencies and good attenuating materials; future work should include a more sensitive meter for quieter sounds.

Summary Statement
Sound attenuation was measured and analyzed for four materials at eight different frequencies over distance.

Help Received
Dad helped design & build the equipment. Mom & dad helped run the experiment. Dad helped in the data analysis and presentation.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Lisa A. Brehove

Project Number
J1603

Project Title
The Speed of Sound

Abstract

Objectives/Goals
I want to find out if the frequency of a sound wave affect the wavelength or speed of that sound wave.

Methods/Materials
First, I put three tones with different frequencies: 400Hz, 500Hz and 600Hz onto my laptop. I hooked up two microphones to an oscilloscope, a device that measures voltage, and placed it with the laptop on a long workbench. Then, I put down a meter stick going across the workbench, with the laptop#s speakers at one end. I put the two microphones facing the laptop speakers, aligned with the meter stick. I played one of the tones, and looked at the screen of the oscilloscope. The screen would show two, identical waves moving together. The vibrations of the air would have moved the magnets in the microphones together, making a similar voltage pattern in the wires reacting to the moving magnet. I would move one of the microphones further and further away from it, until the waves, matched again. The distance between the two microphones was the wavelength, the length of one cycle in the wave. I would repeat this for the other tones with different frequencies, and multiply each wavelength with its frequency to get its speed.

Results
When I did the experiment with the 400Hz tone, my average wavelength was 88 2/3 cm, and my average measured speed was 354 2/3 m/s. When I recorded the wavelength I found using the 500Hz tone, I got an average wavelength of 88 cm and and average speed of 440 m/s. When I repeated the experiment with 600Hz, I got an average wavelength of 70.4 cm and an average speed of 422.4 m/s

Conclusions/Discussion
The results of my experiment were not as a accurate as I would have hoped, and it did not support my hypothesis much. My calculated speed of sound changed from trial to trail, and also changed with the frequency of the tone used. The higher frequency tones were much less accurate than the lower ones. However, as the frequency of the tone increased, the measured wavelength decreased. This helped support my original hypothesis.

Summary Statement
I tried to find out if the frequency of a sound wave affected the wavelength or the speed of that wave.

Help Received
Brother helped with project idea; Father helped with equipment

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jamie L. Ferrell

Project Number
J1604

Project Title
The Incredible Expanding Comet Holmes

Abstract

Objectives/Goals
My project measures the coma (dust cloud) around Comet Holmes. I want to find out if the dust cloud is expanding, and if so, is the rate of expansion accelerating or decelerating?

Methods/Materials
Materials:
Computer, Photos of Comet Holmes, Photos of the Plieades Star Cluster to determine my plate scale, Calculator, Metric Ruler
Methods:
I have nine photos of Comet Holmes taken between Oct. 27, 2007 (after the comet#s outburst on Oct. 24, 2007) through Jan. 30, 2008. (I got them from astronomer, Rick Nolthenius). I measured the diameter of the dust cloud image on each printed photo in centimeters. I measured perpendicular to the direction of the solar wind at the visible edge of the dust cloud, trying to stay consistent on each photo.
I converted the measurements (from centimeters to kilometers) of the diameter of the dust cloud in each of my comet photos to its actual size in space.
I plotted my results on a graph. I have three data sets: One is my measurements for the dust cloud (in kilometers), one shows measurements from cloudbait.com (a website that measured the dust cloud on similar dates). The third is a curve drawn through my measurements showing an average change in the dust cloud size. I used that curve to determine if the dust cloud change in size was accelerating or decelerating.

Results
The dust cloud around Comet Holmes is expanding, but the expansion is not decelerating or accelerating.The comet#s initial outburst was on Oct. 24, 2007. On Oct. 30, the date of my second photo, the comet#s dust cloud expansion starts to decelerate. However, it didn#t keep decelerating. Instead, the curve on my graph climbs at a steady rate which means that the dust cloud is expanding at a steady rate.

Conclusions/Discussion
In conclusion, the dust cloud around Comet Holmes is expanding, but it is not decelerating or accelerating. It is expanding at a steady rate over the course of my data set.
The unsteady solar wind, which I hypothesized might influence the expansion rate, appears to not have a big effect on the steady expansion rate I found of Comet Holmes.

Summary Statement
My project measures the expansion of the dust cloud of Comet Holmes and determines if that expansion is accelerating or decelerating.

Help Received
Astronomer Rick Nolthenius provided pictures of Comet Holmes, the formulas for calculating the arcminutes into kilometers, and helped me understand how things worked in space. He helped me take one of the photos. My mom taught me how to use programs on her MAC, and helped me proofread.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Aileen J. Fletcher

Project Number
J1605

Project Title
Refraction: Density's Child

Abstract

Objectives/Goals
The objective of my project is to show that the density of various liquids affects the refractive ability of light, or index of refraction. I believe that liquids with more additives will refract light to a greater degree.

Methods/Materials
A hollow prism was made by cutting a microscope slide with a glass cutter, bonding the 3 sides with epoxy, and then attaching the hollow prism onto another microscope slide. 5 different liquid solutions were used: Plain water, water with 5%, 10% and 15% sugar concentrations, and ginger ale. The index of refraction was measured by using a laser pointer. The beam of the laser pointer was set to go through the prism filled with the various liquid solutions, with points where the beam hit the perpendicular wall and parallel table marked with a pencil. These various points and measured distances were plugged into a formula to determine the index of refraction for the different liquids. Three trials were performed for each liquid.

Results
Ginger ale had the highest index of refraction, and was also the densest of all the liquids. The results showed that the higher the density, the greater the index of refraction.

Conclusions/Discussion
My conclusion is that density does affect the indices of refraction of different liquids. The understanding of how to measure sugar content can be important, especially to diabetics, because product labels may not always portray accurate sugar content. In the future, a device similar to the one in my project could be developed, and be extremely beneficial to society.

Summary Statement
My project shows how the density of various liquids affects the refractive ability of light.

Help Received
Mother helped buy equipment; Father helped me with trigonometry.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
April R. Gadsby

Project Number
J1606

Project Title
Light Curve of a Binary System

Abstract

Objectives/Goals
To determine if you can tell from a light curve if a variable star is a binary system.

Methods/Materials
I used the Muhlenberg Observatory 35m telescope to take images of the binary system UNSW-V-444. I then documented the intensity, magnitude, and correlated it to the time the image was taken. This data was used to develop the systems light curve. I then compared my light curve to light curves of known binary systems.

Results
My lightcurve and the lightcurve of the known binary stars followed the similar part of large fluxuation,smaller fluxuations, and then large fluxuation.

Conclusions/Discussion
Because the graphs followed a similar pattern, UNSW-V-444 was proven to be an eclipsing binary system. I concluded that by using this method an astronomer can figure out if a variable star is a binary system.

Summary Statement
How an astronomer can tell from a lightcurve whether or not a variable star is a binary system.

Help Received
Kim Miller helped me make contact with astronomers; Dr. Marton Hidas helped me find a system to observe; Dr. Rachel Street, Dr. Jessica Barton, and Dr. Hidas gave me time on the telescope and helped me learn how to use the telescope,

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Tim Hamersly; Gabe Moss

Project Number
J1607

Project Title
Power of Sound

Abstract

Objectives/Goals
Our goals in this project are firstly, to find the relationship between the resonant frequency of a wire compared to it's length and diameter; and secondly, to make a reasonable hypothesis, based on our finding and other research, of how we think the Tacoma Narrows bridge collapsed.

Methods/Materials
We used the following items in our project: 6 steel wires of .025" in diameter, 4 steel wires of .05" in diameter, a block of wood, a 16" speaker, tone generator, glue, and an amplifier.
This is the method we used: Glue the block of wood to the inside of the speaker. Cut the .025" wires so that there is 1 12", 1 11", 1 10", 1 9", 1 8" and 1 7". Cut the .05" wire so that there is 1 12", 1 11", 1 10" and 1 9". Insert the wires ½" into the wood. Attach the tone generator and the amplifier to the speaker. Turn on the tone generator and the amplifier and use the dial on the tone generator to experiment with the resonant frequencies.

Results
We expected a correlation between wire length, diameter, and resonant frequency. We graphed the results with wire length on the X axis and resonant frequency on the Y axis for both sizes of wire (.025" and .05"). We found that as the length of the music wire increased, the resonant frequency (Hz) decreased. We also found that one .025" wire that was 12" long had a lower resonant frequency than one .05" wire that was also 12" long.

Conclusions/Discussion
Our results achieved our goal in identifying the factors that affect the resonant frequency of different sized objects. After doing this project we are now able to better understand how the Tacoma Narrows bridge fell down and further improved our knowledge of the physics of mass in motion.

Summary Statement
Our project is about the factors affecting the resonant frequencies of different sized music wires.

Help Received
Dad gave us good books from the library; Dad gave us a tone generator, speaker and amplifier; Mom helped us get organized.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Foster S. Hengst

Project Number
J1608

Project Title
Faster than a Speeding Bullet

Abstract

Objectives/Goals
The purpose of this project is to see if it is possible to compute the velocity (or speed) of a bullet by measuring the fall of a bullet over a measured distance.

Methods/Materials
We went out and set up the target and bench. We then measured out all of the parts so that the top of the target was lined up with with the rifle's barrel. We did all the measuring and shot the gun. We got our results and went home to figure them out. / dumpy level, masking tape, 22. rifle and bullets, shooting bench, sand bags, 100ft. tape measure, target, 2T-post, card stock, close pins, driver, cm. tape measure, feld tip marker, tripod, bubble level, transit

Results
The results were the first bullet droped 16.5cm. on the first shot and 18.5cm. on the second shot. The average was 17.5cm. We used a formula and got our results. The reason our results were not exact is because we had a slight breeze that day.

Conclusions/Discussion
The conclusion is that it is possible to measure the velocity of a bullet by how much a bullet falls in a measured distance.

Summary Statement
My project is about caculating the speed of a bullet over a measured distance.

Help Received
My mother helped me glue the board together and my grandpa helped me with the project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jordan M. Hisel

Project Number
J1609

Project Title
It's an Alpha! It's a Beta! It's a Gamma! No, It's Cosmic Ray!

Abstract

Objectives/Goals
The objective is to find whether cosmic rays are affected by magnets.

Methods/Materials
I built a cloud chamber using a jar, felt, dry ice, a pie tin, and 91% rubbing alcohol. A compass was used to determine the North and South magnetic poles, so I could line the magnet up with North. A large magnet and a ruler were also used during the experiment, so I could see the exact distance the magnet was from the could chamber.

Results
With no magnet, I counted an average of 16.6 cosmic rays. With the magnet zero centimeters away, I got an average of 8.6; with 1 centimeter, I found 9.2; two centimeters, I found 13.2; and with three centimeters, I found an average of 16.2 cosmic rays.

Conclusions/Discussion
My experiment shows that magnets have an altering affect on cosmic rays. My hypothesis is as follows: if a magnet decreases the number of cosmic ray events in a cloud chamber, then the closer I move the magnet, the fewer cosmic rays I should be able to detect. The data supports my hypothesis by showing that as I moved the magnet further away from the jar, I was able to count more visible cosmic rays within the cloud chamber.

Summary Statement
My project shows how cosmic rays are detected and whether they are affected by magnets.

Help Received
Dad helped make the cloud chamber and make the graphs; Mrs. Usher reviewed the report.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Andrew P. Ho

Project Number
J1610

Project Title
Airplane Take-off and Landing Noise Comparison by Power Measurement and Position Geolocation

Abstract

Objectives/Goals
The objectives of this experiment are (1) to demonstrate the feasibility of the geolocation of sound source by simultaneous noise power measurements at different locations, and (2) to compare the noise level generated by commercial airplanes during take-off and landing.

Methods/Materials
The proposed geolocation algorithm is based on the spherical dispersion characteristics of sound energy. Locations near LAX available for measurements of airplane landing and take-off were selected in advance. A sequence of measurements of the airplane noise level were made simultaneously by noise power meters at two different selected locations. The procedure was repeated with several airplanes to obtain averaged noise power variations during the take-off and landing processes.

Results
A comparison of the noise power difference at the two measuring locations can be translated to a ratio of the ranges to the airplane. The location of the airplane can then be evaluated by triangulation of the ranges. This enables the calibration of the airplane noise level based on the distance to the measurement. In this experiment, the commercial airplanes generated on average 9.5 dB higher noise level during take-off than that in landing at a constant normalized range.

Conclusions/Discussion
Geolocation of sound source can be achieved by multiple simultaneous sound power detections at different locations. This approach can be extended to civilian (airplanes) and military (missiles) applications for locating the sound source and estimating its velocity. Airplanes generate a higher noise level at take-off than that at landing. Off-hour flight scheduling of landing and take-off can consider this factor for environmental noise control.

Summary Statement
Target geolocation is demonstrated by simultaneous airplane noise measurements and applied to airplane take-off and landing noise level comparison.

Help Received
Dad helped in theory discussion and data measurement.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Reed O. Hutcheson

Project Number
J1611

Project Title
Does Temperature Affect the Strength of a Magnet on a Magnetic Levitating Train?

Abstract

Objectives/Goals
My goal is to determine whether or not temperature affects the strength of a magnet on a magnetic levitating train. I believe that the magnets that have been cooled will be the strongest as demonstrated by its ability to levitate the most weight.

Methods/Materials
First I built two magnetic levitating trains and one magnetic track. The trains were built out of balsa wood and magnetic strips. I then built a container to hold the train and the track. One side consisted of a Plexiglass wall so that observations could be made of the train. I heated one train in the oven at 200 degrees F for an hour, cooled one train in the freezer for an hour, and did nothing to the control train. Every train levitated above the magnetic track due to repulsive forces. I tested each one by putting Legos on them until both sides of the train were touching the track magnets below them, and no longer levitating. I then counted the number of Legos for each train observed.

Results
The magnetic levitating train that was cooled held the most Legos on average and therefore the cooled magnets were indeed the strongest.

Conclusions/Discussion
My conclusion is that magnets that have been cooled will in fact be stronger than magnets that have not been cooled. The Japanese super-cool the magnets on their magnetic levitating trains for this very reason. By super-cooling their magnets, resistance to conduction of electrical currents are decreased, resulting in more powerful magnets. This appeared to be true in my experiment as well.

Summary Statement
My project is determining whether or not cooling the magnet will have the effect of strengthening the magnet on a magnetic levitating train.

Help Received
Mother for helping type the report and for getting me though this. Father for helping build the track. Step-dad for helping me with the research. My brothers for not breaking anything. My teacher for helping me find this project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
S. Wali Kamal

Project Number
J1612

Project Title
String Systems in Musical Instruments

Abstract

Objectives/Goals
To generate unique sounds with string systems, and to analyze their wave form and spectrum graphs

Methods/Materials
Using an old guitar, guitar string, wood, and tuning keys, I created an instrument capable of accomodating different string systems. (to clarify about the string systems, a normal guitar string is attached at 2 endpoints. a different string system would be to have the guitar string branch off into 3 or more endpoints). I recorded audio samples of each string system (2,3,4,& 5 endpoints) and analyzed the results with sound editing software.

Results
The sound waves of the normal guitar string had a very distinct wave form pattern. Its sound was very bright. The more endpoints you added onto the string created a more muted sound, causing making it sound similar to that of a drum. With the more endpoints, the wave form pattern's amplitude died down much more quickly than the string with 2 endpoints.

Conclusions/Discussion
My data showed that as you add more endpoints onto the guitar string, the more muted the sound of the guitar would be. Aside from that, the sound died down significantly quicker than the normal guitar string. Overtones were also produced, creating a sound similar to that of a drum.

Using the sounds generated by the different string systems, it is definitely possible to influence culture, as well as to impact music therapy.

Summary Statement
My project analyzes the differences in sound waves of different string systems (instrument strings with 2 or more endpoints).

Help Received
I received help in modifying the guitar so as not to completely damage the instrument and make it unfunctional for my uses.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Andrew V. Kelleghan

Project Number
J1613

Project Title
Why Knot? Experiments in Knot Formation

Abstract

Objectives/Goals
The purpose of my project is to find out the variation of knot formation depending on several factors including string length, material, and thickness. I used different lengths of thin and thick strings, and varying times on the rotator to see if knots form. I then monitored the complexity of the resulting knots.

Methods/Materials
To do my project, I built a rotator to simulate everyday movement and jostling of strings. For my experiments, I used a total of 90 inches of cotton string and 90 inches of shoelace as sample materials.

For each experiment, I started by putting the sample material into my empty tissue box. Then I spun the rotator for 5, 15, or 30 seconds. After I had finished spinning the rotator, I dismounted the tissue box from the rotator. I took the material out of the box carefully so that it did not lose shape. Then I counted the crossings and recorded the results in my lab notebook. Lastly, I took a picture of the knot and recorded the picture number.

Results
After finishing my experiments, I found that the 54 inch cotton string spun on the rotator for 30 seconds yielded the highest crossing number. The 36 inch shoelace spun for 5 seconds had the lowest crossing number of all the tests. The highest crossing number of all the tests was 83 (cotton string, 54 inches, spun for 30 seconds) and the lowest was 7 (shoelace, 36 inches, spun for 5 seconds).

Conclusions/Discussion
In my experiments, I used the crossing number to indicate how many knots would form as the materials were spun in the rotator. The crossing number is the number of times the length of material crosses over itself. If a crossing number is low, then it is a smaller knot, however, if the crossing number is high, then the knot is larger. By doing this project, I hope to learn more about knots and how they form.

My hypothesis was confirmed; the longest, thinnest sample material, the 54 inch cotton string spun for the longest time, 30 seconds, had the highest crossing number. I found that the longer the material is, the more crossings it will have. Also the crossing number is affected by the thickness of the material and the amount of time it is spun. The shoelace was thicker, and, therefore had a lower crossing number than the thinner cotton string.

Summary Statement
My project measures how tangled strings become based on three factors: thickness of the string, length of the string, and time spun on the rotator.

Help Received
None

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Shu Hee Kim

Project Number
J1614

Project Title
Which Roller Coaster Rolls for You?

Abstract

Objectives/Goals
Roller coasters are fun and exciting. But how can I determine if a certain roller coaster is more enjoyable for me? I will be determining the speed of a falling object according to which kind of slope or curve of a ramp the object rolls on.

Methods/Materials
1) Get all materials ready. 2) Wear all necessary safety apparatus. Most important to be used during this experiment are eye goggles and rubber gloves. 3) Place metal wire so that the vertical starting point and the horizontal end point are the same length. 4) Metal wire should be bent in a concave bend unless otherwise noted. 5) No electrical equipment should be used while handling metal wire. 6) All curves and slopes (parabola, cycloid, linear slope, and convex parabola) should have the same starting point and the same ending point. 7) Place balls of the same weight and mass at the top of every curve/slope. Hold a ruler beside it to keep the balls from rolling down. 8) Set up video camera and get a timer ready. 9) Let go of ruler for the balls to roll down, exactly when the timer is pressed. 10) During Data and Analysis, select picture frames in video to use for certain times. 11) Repeat this process with a ball of a lesser weight and mass.

Results
The data acquired to create pictures were accumulated from the video tape with which I recorded the falls of every curve. From each frame, I captured the ball¡#s location and super-imposed it on one frame. The time span of each frame is 0.14 seconds.

The linear slope¡#s speed constantly increased. The concave parabola¡#s speed suddenly increased, but gradually decreased afterwards. The convex parabola¡#s speed first part started slowly, but dramatically increased at the fall. The cycloid¡#s speed maintained the same speed throughout the fall.

Conclusions/Discussion
I observed from my results and analysis that the speed of the falling ball can be controlled with the different types of curvatures. I also noticed that there is a curve that maintains the same speed of the ball throughout the duration of the fall; as conjectured, it was the cycloid.

The speed of cycloid curve maintained the same speed throughout the fall. Thus, if the roller coaster is made into the cycloid curve, it'll be quite easy to ride even though it looks scary. This is the best roller coaster for little kids.

Summary Statement
My project is finding a curve shape on which a ball rolls with a constant speed.

Help Received
Dad helped me with a graphic software usage and a model building.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Bryce H.C. Luna

Project Number
J1615

Project Title
How Do Weather Conditions Affect the Generation of Static Charge?

Abstract

Objectives/Goals
My project was to determine what affect different weather conditions have on the magnitude of static charge produced by rubbing a comb with various types of cloth.

Methods/Materials
A standard black comb was rubbed with each of four types of cloth (fake fur, polar fleece, cotton, tissue paper) for 20 seconds to produce a static charge on the comb. The magnitude of the charge on the comb was measured by placing it near a 1/8th inch stream of water and measuring the deflection of the water stream with a ruler taped in the sink. The temperature of the room was increased using the built in heater. Running the shower increased the relative humidity of the room. I did each measurement 2 times and under conditions of cool-dry, warm-dry, cool-humid, and warm-humid.

Results
The greatest static charge was produced under dry-cool conditions for all of the cloths used to produce static charge on the comb. The smallest static charge was produced under warm-humid conditions for all cloths except tissue paper.

Conclusions/Discussion
My conclusion is that temperature and humidity both influence the degree of static charge that can be built up on an object.

Summary Statement
My project is about how weather conditions affect the degree of static charge that can be generated on an object.

Help Received
My Mom took and printed the pictures and helped type the report. My Dad helped procure the supplies I needed for this project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Aashrita Mangu

Project Number
J1616

Project Title
C MY Kolor?

Abstract

Objectives/Goals
The purpose of this project was to find how colors, represented by a CMYK (Cyan-Magenta-Yellow-Black) model, reflected light. The main goal was to organize the data into a useful chart showing the range of reflectivity of different colors from least to greatest.

Methods/Materials
This was achieved by building a black box apparatus and using a light meter to measure the amount of light reflected from various color swatches, which were then recorded. The color swatches were created by using a CMYK based color Laser Printer. There were a total of five trials.

Results
The tests showed that lighter and brighter colors reflect more than darker and duller colors. They also showed that pastel, or soft, colors are the most reflective. In general, low levels of pigmentation had higher levels of reflectivity. However there were exceptions, such as the Yellows and Cyans. They seemed qualitatively opposite to Magenta and Black; while Cyan and Yellow got more reflective at higher pigmentations levels, Cyan and Yellow behaved conversely.

Conclusions/Discussion
The data chart showing the results can be applied to day-to-day life in many ways. Colors play a suprisingly large role in people's life- from picking cars to painting houses. It is important to make the correct choice of color according to a region's climate because reflectivity (and absorption) of light, and ultimately heat, affect the amount of air conditioning one uses. This, then, directly influences the carbon footprint of the object or person. The scope of this experiment was limited to recording reflectivity of 63 colors representing a cross section of the CMYK spectrum. To make this more comprehensive, the complete Pantone(R) CMYK palette needs should be analyzed.

Summary Statement
The purpose of this project was to find how colors, represented by a CMYK (Cyan-Magenta-Yellow-Black) model, reflect light.

Help Received
Mom and Dad proofread work and helped buy necessary materials; Dad also helped in the woodworking to build blackbox.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Prutha V. Mehta

Project Number
J1617

Project Title
The Secret of the Sky

Abstract

Objectives/Goals
why the sky has multiple colors at different times and places during the day.

Methods/Materials
fishtank,water,milk,measuring cup,flashcard,flashlight. Pour 3/4 of water into tank and shine the flashlight beam through the tank.Record the light you see. Add 1/2 cup of milk,then stir, shine the flashlight beam through tank and record. add 1/2 cups of milk until no light is seen.I added a total of 3 cups.
same results all 5 days.

Results
when flashlight beam is going through water in the tank, you don't see any color in the tank. as you add 1/2 cup of milk you see blue light on the side and yellow on the card at the end of the tank.as you add more 1/2 cup of milk, blue light fades away. keep adding milk until no color is seen.

Conclusions/Discussion
tank with water is sky.light beam is sunlight,milk is atmosphere.The atmosphere has gas and water molecule, dust particles. Light is a form of energy that travels in waves. These waves have 2 properties: wavelength and frequency. light travels in a straight line in space since there is no air. But sunlight has to travel through the earth's atmosphere. and bump into the particles before it reaches earth. The behavior of light depends on two things. The wavelength of light and size of the particle that light hits. When light hits dust particles or water molecules, gets reflected in diff. directions. The reflected light appears white because it as a whole gets reflected. Gas molecules are smaller than the wavelength of the light. when light bumps into gas molecules, the light with a short wavelegth gets absorbed. light with lower energy will pass through the atmosphere and hit earth. As the sun shines, gas molecules can absorb so much of blue light. once gas molecules gets saturated they will emit blue light to make room for more light. emission of blue light is called light scattering. The scattered blue light is 4 times more than the white light reflected by dust and water molecules. so we see the sky as blue. At the horizon, the sky looks pale blue because scattered blue light has to go thru more particles before it reaches you. At sunset, there is not much light from the sun so not much gets absorbed. Little light gets absorbed by the gas molecules, but not enough to get scattered. But the infrared passes through the gas molecules an hit earth, so we see the sky as red.

Summary Statement
My project is about light scattering.

Help Received
My mother helped me peform the procedure and decorate my board, She also took the pictures.My brother held the card at the other end of the tank during my procedure.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Camille L. Miller

Project Number
J1618

Project Title
The Soundpost: Why Is It Called "The Soul of the Violin"?

Abstract

Objectives/Goals
To determine how the placement of the soundpost affects the violin's sound.

Methods/Materials
The A-string on the violin was tuned to 440Hz. Then, the sound wave produced from the standard soundpost position was recorded as a baseline for comparison. All the other tests were documented by their relative location to the bridge and the right f-hole. Next, the soundpost was moved to each desired position using the soundpost setter, the soundpost retriever, and a stainless steel metric ruler. After each move of the soundpost, the sound wave was recorded using a computer running an audio spectrum analysis program. Lastly, all the sound waves were compared and linked to the human perception of the sound heard.

Results
When moving the soundpost as a mirror image to the other side of the bridge, a brighter sound occurred. This result was much different from my hypothesis of the human ear hearing no change in sound. Moving the soundpost towards the right f-hole resulted in a brighter tone, when I originally thought the sound would be edgy. Lastly, when the soundpost was moved towards the left, a banjo-like sound occurred, when I hypothesized the sound would be gentle and soft.

Conclusions/Discussion
My tests concluded with results that somewhat differed from my hypothesis, but didn¡#t contradict the general idea of sound change due to soundpost movement. I thought that when moving the soundpost as a mirror image to the bridge, the human ear would hear no change in sound, because the distance from the bridge would stay the same. In fact, a slight difference in sound occurred, because the f-hole is not perfectly vertical, creating a different relative distance to the soundpost. I also assumed that when moving the soundpost to the right, the sound would be more edgy and harsh, but actually, the sound stayed somewhat standard with many overtones on the A-string, because the upper strings were intensified. Lastly, I thought that when the soundpost was moved to the left, the sound would be gentle and soft, but instead, a banjo-like sound resulted. I think this was because the base bar and the soundpost were too close together creating an imbalanced vibration.
In conclusion, by adjusting the soundpost in these two directions, each violin's tone quality can be fine-tuned to create it's best sound. Now we understand why the soundpost earns its title as "The Soul of the Violin".

Summary Statement
This project shows the correlation between the soundpost location and the quality of the violin sound produced.

Help Received
Dad helped stabilize board (wooden piece taped to back of board); Dr. Kuchera-Morin and Mr. Bell from UCSB helped analyze spectrum analysis graphs; Linda West moved soundpost to different locations (Note: only a professional could do this delicate job because years of training are needed.)

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Dylan E. Moore

Project Number
J1619

Project Title
How Does the Spectrum of an Ionized Gas Affect the Amount of Electric Current that a Silicon Photodiode Produces?

Abstract

Objectives/Goals
The objective of my project was to determine the relationship between the spectrum of an ionized gas in an electro-luminescent tube and the amount of electric current that a silicon photodiode will produce when exposed to it's light.

Methods/Materials
I made a jig for measuring different tubes at a fixed distance in a light sealed box. All tubes were the same size and fill pressure. Using a multimeter clipped to a photodiode I could compare current readings produced by different gases. It seemed like electric current produced in a photodiode by the various gasses was not consistent with their visible brightness. I therefore tested for a relationship between this inconsistency and the ultraviolet light produced by the tubes.
With clear tubes, there was a large comparative drop in electric current from the photodiode exposed to mercury light verses mercury-phosphor light. Using a CD spectrometer and research, I found that mercury produces strong bands of light in the ultraviolet and violet range whereas silicon photodiodes are more receptive to the longer, wavelengths of light, e.g. red and infra-red.

Results
The results showed the photodiode produced the most electric current when exposed to neon light, both with and without phosphor. The photodiode made 15% less current with Ne/Hg/phosphor light than Ne/phosphor light, but pure Ne/Hg light generated 83% less current from the diode than pure Ne light. The photodiode produced 25% less current with pure Ar light than pure Ne light. Visually, Ne and Ne/Hg both give off a strong glow, red and blue respectively.

Conclusions/Discussion
For testing, I assumed silicon photodiodes read evenly across the spectrum. My hypothesis was that the brighter the visible light of a specific ionized gas exposed to a photodiode, the more electric current the photodiode would produce. The results did not support my hypothesis. By looking for the source of the discrepancies in my results, I found that photodiodes generate more current not only with more light but also with longer wavelengths of light.
Initially I was trying to find out why mercury is used in fluorescent lighting and if there is an alternative gas that can be used. As for Mercury, I learned it emits much more ultra violet light than the noble gasses. The UV is converted by phosphor into visible light. This is why mercury is used in florescent lighting.

Summary Statement
In this project, I compared the current produced by a silicon photodiode when exposed to the light of various ionized gasses in phosphor coated and clear tubes.

Help Received
Instructors at the Crucible showed me how to bend the electro-luminescent tubes and they filled them with gases. I handled no toxic materials. My Parents were present when I made my tests.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Auggie W. Nanz

Project Number
J1620

Project Title
How Bright Is the Sky? A Study of Sky Brightness and Its Effect on CCD Imaging in Escondido and San Diego County

Abstract

Objectives/Goals
My project is to measure the sky brightness at various locations in San Diego County, ranging from the darkest part of the county in the desert to one of the brightest areas near the Escondido Auto Park, and to measure how much the sky brightness affects the limiting magnitude of a CCD image.

Methods/Materials
For the sky brightness measurements, I used a SBIG ST-2000 CCD camera with a 45mm f/6.6, 297mm FL, lens. I took more than 100 exposures at 13 different sites on clear, dry nights. For each site, the exposures consisted of a series of three exposures each of durations of 30-, 60-, and 120-seconds. Using MaxIm DL, I measured the median dark-subtracted pixel counts for the background of each image. Using sky brightness data from Palomar Observatory, I converted all measurements into magnitudes per square arc-second. For the limiting magnitude data, I used a SBIG STL-11000 camera with an 8 in. f/5 @ f/6 Newtonian telescope on a Takahashi NJP mount. I took over 60 images consisting of 5-, 10-, 30-, 60-, 120-, 300-, and 600-second exposures at Blair Valley and my house. I used data from Cartes du Ciel and the Rochester Astronomy website to calibrate my magnitude data.

Results
I found that a light-polluted sky is far brighter than a dark sky with a full moon. I also found that the closer that you are to a city, the brighter the sky is. For example, it was over twenty times brighter at the Escondido Auto Park than in the desert. Using the limiting magnitude data, I can conclude that for short exposures (30 seconds and less) the sky brightness does not significantly affect the limiting magnitude of an image. For longer exposures, it appears that the amount of data required to acquire the same limiting magnitude is directly related to the sky brightness in a 1:1 ratio. For example, my house is four times as bright as Blair Valley, which means that for long exposures, I will need to take four times as much data at my house to obtain the same limiting magnitude as data taken at Blair Valley.

Conclusions/Discussion
This research is important because the brightness of the sky directly affects the quality of astronomical work by adding noise to the background. More work can be done on this subject, using different filters for different wavelengths.

Summary Statement
The objective of my project is to measure the sky brightness at various locations throughout San Diego County, and to measure its affect on the limiting magnitude of a CCD image.

Help Received
My dad helped me carry some of the heavy equipment, transported me to my sample locations, and helped construct my display board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Hannah R. Nelson

Project Number
J1621

Project Title
Liquid Heat: How Does a Liquid's Density Affect Its Heat Retention?

Abstract

Objectives/Goals
The objective of this experiment is to test how the density of a liquid affects its heat retention. I hypothesized that if the density of a liquid is increased, then it will retain heat longer; the denser the liquid, the more molecules it contains, and since molecules absorb energy one by one, molecules of denser liquids should absorb more energy, move faster, create more kinetic energy, and create more heat. Therefore, denser liquids should retain heat longer because they are already much hotter.

Methods/Materials
The experiment testing my hypothesis was designed so that boiling water was the energy source to each of the test liquids, and I used a thermometer to measure how well the liquid retained the given energy and heat. After two minutes of sitting in boiling water, the liquid was transferred to a test tube stand, where I recorded its temperature every thirty seconds for five minutes. After four trials, I was able to see which liquids cooled down the least and most.

Results
My hypothesis was proved incorrect; syrup, the densest liquid, did not cool down the least, as I expected it to. Three of four trials, in addition to the averages, proved orange juice to cool down the least from its starting temperature, and to therefore retain heat the best.

Conclusions/Discussion
I concluded that the heat retention of a liquid does not necessarily depend upon its density, but upon the liquid itself. Intermolecular attraction, which depends upon the liquid, is responsible for how quickly molecules in the liquid slow down after being heated, determining the retention of heat within the liquid.

Summary Statement
This experiment tests how a liquid's density affects its heat retention; results showed that heat retention depends upon the liquid itself and its intermolecular attraction.

Help Received
Mother purchased syrup and blank exhibit board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Andrew T. Nguyen

Project Number
J1622

Project Title
Active Noise Control: Searching for the Sound of Silence

Abstract

Objectives/Goals
The objective is to demonstrate the active noise control technique and to measure the effects of noise type, noise frequency, and the separation distance between the noise and the antinoise speakers on the effectiveness of active noise control. The goal is to understand the fundamentals of active noise control to design more effective and affordable active noise cancellation applications.

Methods/Materials
Materials used include a computer to synthesize the noise and antinoise signals, two speakers, and a noise meter. The test apparatus was built of plywood and the walls are lined with acoustic absorbing foam. Tests were conducted using different types of noise (sine, sawtooth, and square wave) at different frequencies (250 Hz to 2000 Hz). The distance between the speakers was varied between 2 cm and 10 cm. to simulate the effect of separation distance on Active Noise Control. The decibel level with and without active noise control was recorded as a function of the noise type, the distance in between the speakers, and the frequency of the noise

Results
At fixed distances between the speakers, the percent reduction in the noise intensity decreases as the frequency increases from 250Hz to 2000Hz. Active noise cancellation is very effective at a small distance between the speakers (25% reduction at 2cm), but not at longer distances (5% reduction at 10cm). Sawtooth functions have the highest reduction rate in noise level (30% reduction), while the square wave function is least effective (20% reduction). 72% of those surveyed are aware of noise pollution, but only 41% understand that active noise control works best at low frequencies.

Conclusions/Discussion
Active Noise Control performs best when noises at low frequency are used in the tests. Active Noise Control is more effective at short distances between the speakers because the noise and the antinoise signals interact with each other without interference from the surrounding. The everyday, broadband noises are not strongly canceled by Active Noise Control. The shape of the narrowband noise does not make a significant difference in the results. In conclusion, the effectiveness active noise control depends on frequency, type of noise, and the distance between the noise and the antinoise.

Summary Statement
Active noise control works best with noise functions at low frequencies and small distances between the noise and the antinoise; therefore it is an effective method to manage the noise pollution problems in an industrial environment.

Help Received
My mother helped format my board. My father helped me construct my test apparatus and edit my report.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Maya A. Norman

Project Number
J1623

Project Title
The Shadow Knows Where You Are

Abstract

Objectives/Goals
This project tested the accuracy of different ancient tools. These tools, the gnomon, the astrolabe, and Ptolemy's box, were used to find the altitude of the sun. From this information a person can then find their latitude. The gnomon is a long rod, the astrolabe is a circular piece of wood with a sighting stick attached to it, and Ptolemy's box is a stone box with a peg in its upper left corner.

Methods/Materials
To simulate the original tools a gnomon, an astrolabe, and a Ptolemy#s box were built with PVC pipe, a plum bob and wood. The three tools were tested at local noon three to four times each in two different places, Woodside California and Belize.

Results
After testing three times in Belize and four times in Woodside it was clear that the gnomon and Ptolemy's box were the most accurate tools. In Belize the gnomon's percent error was .42 degrees, Ptolemy's box's percent error was .36 degrees, and the astrolabe's percent error was .34 degrees. In Belize the gnomon's deviation was .02 degrees,Ptolemy's box's deviation was .06 degrees, and the astrolabe's deviation was 1.30 degrees.In Woodside the gnomon's percent error was .28 degrees, Ptolemy's box's percent error was .28 degrees, and the astrolabe's percent error was 1.28 degrees. In Woodside the gnomon's deviation was .22 degrees,Ptolemy's box's deviation was .19 degrees, and the astrolabe's deviation was .47 degrees.

Conclusions/Discussion
The fundamental hypothesis, that the gnomon and the astrolabe would be the most accurate was unsupported by the results. Ptolemy#s box and the Gnomon were the most accurate. This was because they were the least dependent on human intervention. The astrolabe was the least accurate and the most dependent on the skill of the tester.
There are a few faults in this project such as that light bends once it enters the hemisphere and the equations used don't take into consideration the observer is not actually in the center of the earth. The bending of light may explain why in Woodside the Results were below the actual latitude and in Belize the Results were above the actual latitude.

Summary Statement
The project tested ancient tools, the gnomon, the astrolabe, and Ptolemy's box, to demonstrate their accuracy in determining latitude.

Help Received
My mother proof read my writing for spelling and grammar only; My dad supervised as I built the tools used in the experiment; my science teacher advised me on how to anlyze my results.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Charlie Paulsen; Anthony Rinaldi

Project Number
J1624

Project Title
The Effect of CO(2) on Ambient Air Temperature

Abstract

Objectives/Goals
The objective of this experiment determine whether a container filled with CO(2) would cool at a slower rate than a container filled with ambient air when both containers were heated to the same temperature. Due to the nature of CO(2) molecules, their density, their ability to absorb many wave lengths of radiation, and the long period of time they stay in the atmosphere, the hypothesis developed was that heated CO(2) would cool more slowly than heated ambient air because CO(2) retains heat.

Methods/Materials
Two identical glass aquariums were used for this experiment. Both were fitted with identical Plexiglas lids and thermometers. One tank was filled with CO(2). A wooden framework suspended two identical heat lamps in exactly the same position above each of the aquariums. Glass trays filled with water were placed in identical positions on top of each aquarium to absorb the thermal energy that was generated by the heat lamps so that only visible light radiation was reaching the gases. A black surface was placed under each aquarium so that light radiation from the heat lamps would be absorbed by the black surface and then converted to thermal energy which would heat the gases. This was intended to simulate what happens on the surface of the earth. The heat lamps were turned on, and the temperature of each aquarium was monitored until the temperature inside both aquariums reached 86° Fahrenheit (30° Celsius). Both aquariums reached this temperature at approximately the same time. The heat lamps were turned off and the temperature of each aquarium was recorded every five minutes for 30 minutes. The experiment was repeated twice to confirm the accuracy of the results.

Results
In both trials, the aquarium filled with CO(2) averaged 3°F (1.6°C) higher temperature than the aquarium filled with ambient air. Therefore the hypothesis was supported.

Conclusions/Discussion
Further experiments might involve heating the aquariums for a longer period of time to reach a higher temperature and recording the cooling in five minute intervals for an extended period of time. This would help to further confirm the accuracy of the results. Although the pure CO(2) used in the experiment does not reflect the actual composition of earth#s atmosphere, the results of this experiment indicate that CO(2) may have an effect on global warming.

Summary Statement
This project is about determining the effect of CO(2) on ambient air temperature.

Help Received
Father helped construct experiment apparatus.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Colin B. Ries

Project Number
J1625

Project Title
Temperature vs. Refraction

Abstract

Objectives/Goals
The objective is to determine if the temperature of water affects the refraction of red laser light.

Methods/Materials
A laser pointer and a ruler taped to the bottom of a tall thin tank were used to measure the refraction angle of red light in water. Measurements were taken every 5º C water temperature from 20º C to 65º C. The Refractive Index was calculated by dividing the sine of the incident angle in radians by the sine of the refractive angle in radians.

Results
As the temperature of water increased the refractive index decreased. The mean index at 20º C was 1.3860 and the mean index at 65º C was 1.3438. The regression line through the data had an r2 of 0.995.

Conclusions/Discussion
I found that the temperature of water does affect the refractive index of red laser light.

Summary Statement
This project tested the effect of temperature on the refraction of red laser light from air to water.

Help Received
Mom helped assemble the board. Dad helped with typing and calculations.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Vivian N. Rotenstein

Project Number
J1626

Project Title
The Case of the Hide and Seek Photons

Abstract

Objectives/Goals
My experiment is trying to demonstrate one of the strange phenomena of quantum mechanics; the dual wave-like or particle-like behavior that a particle (electron or photon) exhibits can depend on what we try to find about it, or the way we measure it. In my experiment, I will use a laser pointer as a source of photons, and a polarizing film to create two pathways for the photons. I will then vary the angles of the polarizer and check what angle of polarization of the polarizing film that a laser light needs to go through, affects and erases the information about which side the light photons used.

Methods/Materials
I used a laser pointer six feet from a wall in a very dark room, polarized film for labeler (that will indicate which path the photons took) as well as a straightened staple that I attached to the path labeler. I placed the wire vertically and centered in the light and I observed that light will create an interference pattern. When I used the path labeler the fringes of interference were gone; the left hand polarizer produced vertically polarized light and the right hand one produced horizontally polarized light. I used another polarizer in between the wall and the labeler and I modified the angle: vertical and horizontal orientation, 45, 22.5 degrees, diagonal and vertical labeler, diagonal and horizontal labeler.

Results
When using the polarizer with the vertical orientation all the right passing photons that became horizontally polarized are blocked and there will be a bigger concentration of photons on the left of the screen .The spot on the wall when using the polarizer with horizontal orientation extended to the right. For the diagonal polarizers 45 and 135 degrees, I notice interference fringes looking as if the polarizer erases the information about which side the photons went and that each photon went both sides and interfered with itself.

Conclusions/Discussion
The probability to obtain perfect fringes of interference is small since light can also be unpolarized meaning that some of the photons will have random polarizations and only part of them will get through the polarizer. I would like to continue to investigate the possibility of restoration of the fringes of interference by further modifying the orientation of the analyzer and path labeler, the distances between the path labeler, analyzer and screen and to use a thinner wire for a clearer view of the interference pattern.

Summary Statement
Demonstrating the dual behavior of photons as particles and waves;studying the possibility of creating perfect fringes of interference.

Help Received
Mom and Dad advised me and helped me purchase the optical stand and polarizing film from Edmund Scientifics and setting up the camera. My science teacher from Medea Creek Middle School Mr. Troy Labnow helped with editing.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Lori A. Shirajian

Project Number
J1627

Project Title
Faraday's Second Law of Electrolysis

Abstract

Objectives/Goals
To verify Faraday's 2nd law of electrolysis. m = zIt, where m is the mass transfered from the solution to the electrod measured in g, z is the electrochemical constant in g/C, I is current measured in A, t is time measured in second.

Methods/Materials
Sulfuric Acid, Copper Sulfate, Distilled Water, HCl, Copper Voltameter Model GS-432, 6203B DC Power Supply, Model CS 200 Capacity 200g*0.1g Electronic Balance, Weighing paper, Electrical Cable, 10 ohm 50 watt Rheostat, two DT9508 Multimeters, and Stop Watch.

Results
I verify the Faraday's 2nd law of electrolysis by manipulating current, voltage, time, initial CuSO4 concentration, and catalyses. The result is that the Faraday's 2nd law of electrolysis is correct, where m is directly proportional to I and t, while other factors also affect the mass transfered.

Conclusions/Discussion
All my measurements fit the theoretical yield in the range of 6.8% up to 10.5%.

Summary Statement
Verifying Faraday's 2nd Law of Electrolysis.

Help Received
Worked at Ribet Academy's Lab

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Lacey M. Smith

Project Number
J1628

Project Title
Its Not Easy Being Blue: Light and Color Underwater

Abstract

Objectives/Goals
The objective of my project is to determine whether depth affects the ability to see color underwater. If depth does affect the ability to see color, then I believe colors such as blue, green, and yellow will be distinguishable at a greater depth than colors such as red because of the wavelength differential between the colors.

Methods/Materials
Underwater, at the depth of 22 meters, photographs were taken of a Laminated Color Card, Fish Identification card, and a slate with the depth written upon it with a Digital Underwater Camera. While maintaining neutral buoyancy, pictures were then taken at each ascending meter until we had reached the surface. After developing the pictures, we compared the pictures taken at depth to our control group, the color cards. These pictures would portray the loss of color.

Results
After comparing the pictures to our original color cards, we determined that depth does affect the ability to see color underwater and the color red was no longer distinguishable around the depth of 5-6 meters. Although unsuspected, our data portrayed the loss of the color green around 10 meters underwater. The colors blue and yellow however, remained visible even at our greatest depth of 22 meters.

Conclusions/Discussion
Although the color green was lost before I had expected, my data does support my hypothesis that states that green, blue, and yellow will be distinguishable at a greater depth than red. The actual depth at which blue and yellow disappears was not able to be determined due to proper diving and safety regulations, but the raw data indicates that both colors had not been lost at 22 meters below the surface of the water. Taking a look at my data, it is clear to see that depth does affect the ability to see color underwater, but if effects some colors differently than others due to light wavelengths and the absorption of these wavelengths in ocean water.

Summary Statement
The Effects of Depth on Color Underwater

Help Received
Two certified divers assisted in the dive.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Eli N. Weinstein

Project Number
J1629

Project Title
A Study of Galaxy Clustering

Abstract

Objectives/Goals
The objective of this experiment was to determine whether or not galaxies cluster, and if so, to measure that clustering. Studying this clustering could provide information on the current balance between dark energy and gravity.

Methods/Materials
A list of all the objects found in the COSMOS Survey (done by Hubble) was downloaded. Then, using various parameters, it was cut down to objects that were most likely galaxies. Then a program was written using the programming system MATLAB to quantitatively compare the clustering of the galaxies to the clustering of points in a randomly generated scatter plot.

Results
The results consisted of a plot of two histograms, one showing various ranges of angular separation vs. the amount of galaxy pairs within those separations, and the other showing various ranges of angular separation vs. the amount of random pairs of points within those separations. A second plot was the ratio between the amount of galaxies and amount of random points in each bin of angular separation. This had a negative slope, meaning galaxies are generally found more tightly clustered than random points.

Conclusions/Discussion
Galaxies are not found at random, nor are they tightly clustered, meaning there is somewhat of a balance currently between dark energy and gravity. The measure of the amount of clustering may eventually be able to be used in a model of the universe to solve for the density of dark energy, and thus give a more accurate understanding of the beginning (and possible ending) of the universe.

Summary Statement
This project measured the amount that galaxies cluster compared to random points.

Help Received
Father helped derive the error bar formula, correct the paper, find flaws in the program, and find relevant research done by other scientists. Ms. Laura Berger corrected the paper.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Daniel M. Winget

Project Number
J1630

Project Title
Buoyancy and Displacement

Abstract

Objectives/Goals
I am trying to find the boats ability to carry weight and see the changes in the weight when I change the water types.

Methods/Materials
My materials I used were a big container, a cup like model, marbles, salt,sugar, water,scale,a measuring cup, a stirring spoon, and a towel or rag.

Results
The salt water held a denser boat then second was the sugar water and last was fresh water.

Conclusions/Discussion
There was a 6 gram difference with salt to sugar water. There was also a 5 gram difference comparing sugar water to fresh water.

Summary Statement
The density changes in the boats weight before it sinks in different types of water.

Help Received
My mom helped me get the scale everything else was done by me.