CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Marc G. Akiyama

Project Number
J1601

Project Title
Mr. Drum Drum Needs a Tune-Up!

Abstract

Objectives/Goals
The objective is to investigate whether measuring drumhead displacement is a suitable substitute for measuring drumhead tension, and if it is, whether drumhead displacement can be used to reliably tune a drum to a desired pitch.

Methods/Materials
A snare drum holding fixture allowed a dial indicator to measure the displacement of the drumhead while the drumhead was subjected to the constant force of a barbell weight. As the drumhead tension was incremented, displacement was recorded, the weight was then removed, the drumhead was struck, and GoldWave(TM) computer software recorded the resulting sound. The frequency was calculated from the elapsed time for the first five cycles.

Results
When the drum#s lugs were turned incrementally from finger-tight, the dial indicator reading of displacement decreased from about 4.6 mm to 2.5 mm, while the frequency of the recorded drum sounds increased from about 180 to 250 cycles per second, respectively. Displacement readings and corresponding elapsed times recorded for each setting of drumhead tension showed extremely little group variation, which indicates high repeatability.

Conclusions/Discussion
Once the frequency of the desired pitch is known, the experimental method of tuning drums by measuring drumhead displacement offers a by-the-numbers alternative to the traditional method of tuning by ear. This method may be brand-specific, since different brands of drumheads may require more or less tension to produce a desired pitch due to differences in material properties (e.g., composition, thickness, and elasticity).

Summary Statement
Measuring drumhead displacement for tuning a drum to a desired pitch offers an alternative to tuning by ear.

Help Received
Father helped build the drum-holding fixture; Friend loaned the GoldWave(TM) software for recording sound.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Casey J. Berg

Project Number
J1602

Project Title
Fast Fuel: Vegetable Oils as Fuel

Abstract

Objectives/Goals
My objective with my fast fuel science project was to determine if the available amount of energy in vegetable oil varies when it is cooked. My hypothesis was that used vegetable oil would have a lower caloric value than new vegetable oil.

Methods/Materials
I collected samples of new and used vegetable oil from several restaurants. I built a simple calorimeter that used burning oil samples to heat a known quantity of water. Each sample was weighed and then burned in an oil lamp to heat the water from 10 degrees C below room temperature to 10 degrees C above room temperature. Using the weight of oil lost, and the temperature increase, I calculated the caloric output of each sample. I averaged multiple test runs for each sample. I compared the results for used and unused samples from each source.

Results
I found that the oil samples that had been used in deep friers had a higher caloric value than the unused samples.

Conclusions/Discussion
My results show that heating vegetable oil makes it a better potential fuel source. It appears that heating the oil caused some type of change in the oil and that the oil that had already been heated had more calories because that change had already taken place.

Summary Statement
My project focused on comparing the caloric values of unused versus used cooking oils as a fuel source.

Help Received
My father helped with sample & data collection; mom and dad helped with research.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)

Pia-Maria Bododea

Project Number

J1603

Project Title

Surface Tension: The Relationship between Surface Tension and Density of a Liquid

Abstract

Objectives/Goals

The objective of this project was to determine the magnitude of the surface tension in different liquids, and to verify if liquids with higher density have higher surface tension.

Methods/Materials

First, a scale was built to help measure surface tension. A stiff straw was used as a beam for this scale, a pin for the fulcrum, an aluminum pan to hold the water droplets hanging from one end of the straw, and a section of a paperclip hanging from the other end of the straw. Next, the piece of paperclip was lowered into three different liquids: Isopropyl Alcohol (IPA), simple water, and a mixture of water and detergent. Then, droplets of water were placed with a dropper into the pan to balance the scale. Finally, the droplets of water were counted to calculate the total weight of the water in the pan, which was equal to the force needed to pull the paperclip out of each liquid. The densities of these liquids were obtained from published density tables in the bibliography.

Results

The results showed that the average number of water droplets in the pan that were necessary to balance the scale are: for IPA = 3.8 water droplets, for water and detergent mixture = 4 water droplets, and for simple water = 6.8 water droplets. As the scale is balanced, the force of tension (F) for each liquid is equal to the gravitational force of the water in the pan (G). Since F=2sd, and G=DVg, the surface tension s=DVg/2d. The surface tensions calculated in N/m follow: s(IPA)=0.038, s(water & detergent)=0.040, s(water)=0.069. After the surface tension was calculated the experimental results were compared to surface tensions listed in published tables in the bibliography and they were similar. Densities of the liquids above were also found in published tables in the bibliography to determine if there is a clear dependency between surface tension and density.

Conclusions/Discussion

The project concluded that surface tension in each liquid is dependent on the nature of the liquid. After noting the density of each liquid it became clear that the higher the density the greater the surface tension. The experiment showed that water, the liquid with the highest density, has the highest surface tension; while alcohol,the liquid with the lowest density, has the lowest surface tension.

Summary Statement

The project allowed the investigation of the surface tension in various liquids and it provided the experimental environment to establish the relationship between surface tension and other physical parameters such as the liquid density.

Help Received

My grandfather helped set up the experimental scale and to find published tables in the bibliography. My science teacher reviewed and critiqued my results and analysis.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Amy M. Cao

Project Number
J1604

Project Title
CD Disk Rainbows

Abstract

Objectives/Goals
The objective of this project was to figure out whether a CD disk could act as a spectrometer and distinguish different light sources.

Methods/Materials
A CD disk was placed under different light sources: a classroom fluorescent, an incandescent desk lamp, a halogen desk lamp, a sodium street light, an incandescent car headlamp, a fluorescent light used to light the outside of homes, candlelight, a laser pointer, and an LCD computer screen. After adjusting the angle of diffraction until the rainbow that appeared on the CD disk can be observed, I took pictures of the rainbows, wrote down observations, and categorized each rainbow pattern.

Results
When the CD disk was put under sunlight, the incandescent light, the halogen light, the car headlamp, and candlelight, the rainbow spectrum had a blended, continuous color change. The fluorescent lights had a stepped continuous color change, and the LCD computer screen and sodium light had a discontinuous color change. The laser pointer only had one spot of color. The sodium light, LCD computer screen, and laser pointer's CD spectrum all fit with my research on them. There are two yellow peaks in the spectrum of a sodium light at around 589.0 and 589.6 nanometers. The CD#s spectrum does not seem specific enough to distinguish the two peaks, but instead they merge into one large, yellow smudge. The pixels of an LCD computer screen, when it is white, is made up of red, green, and blue subpixels. The CD disk under this light showed three rings, in red, green, and blue. The red laser#s wavelength is around 670 to 650 nm, and this would be the color red on the light spectrum. On the CD under the laser pointer, there was only a red smudge.

Conclusions/Discussion
My hypothesis was partly correct. A CD disk can be used as a spectrometer to distinguish some light sources from others, although it is not detailed enough to distinguish all of them. It can be deduced that fuzzy colors blended together indicate about the same intensity of each wavelength in the light the CD is under, and bright, sharp lines of color indicate a high intensity of that color, or wavelength. Using this method, it is possible to estimate the relative intensity of different wavelengths in different lights.

Summary Statement
This project determines whether a CD disk could act as a spectrometer and distinguish different light sources.

Help Received
Father provided helpful information on the research and topic

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Peter J. Chodas

Project Number
J1605

Project Title
Do Denser Liquids Always Refract More?

Abstract

Objectives/Goals
Since water refracts more than air, and water is denser than air, it would appear that denser substances generally refract more. Is this always true? My hypothesis is that denser liquids always have a greater index of refraction than less dense liquids.

Methods/Materials
To test my hypothesis, I measured the index of refraction and density of water and three other clear liquids, isopropyl alcohol (91% concentration), mineral oil, and liquid hand soap. To measure the index of refraction, I poured each liquid into a glass container with parallel sides and shone a laser at five fixed angles through a fixed spot into the container. For each of the angles, I marked the spots where the laser hit a piece of paper on the opposite side of the container. I measured the distance of each spot from the line perpendicular to the glass, transferred the points to my working paper, and measured the angles of refraction. I then calculated the sines of the angles, graphed the sines of the angles of incidence vs. the sines of the angles of refraction, and computed the average slope to get the index of refraction, according to Snell's Law. To find the densities of the liquids, I used a measuring cup to obtain a particular volume, and an accurate scale to determine the weights with and without the liquid.

Results
The refraction was much larger than I expected. All of the liquids I tested refracted the laser beam more than water even though two of them (isopropyl alcohol and mineral oil) were less dense than water. Only one liquid (the soap) was both denser than water and had a higher index of refraction.

Conclusions/Discussion
My hypothesis was contradicted: there was no correlation between the density of a liquid and its index of refraction.

Summary Statement
I determined experimentally that there is no correlation between the density of a liquid and its index of refraction.

Help Received
My dad helped me understand Snell's Law and he also helped me mount my pages on the display board.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Alden D. Deran

Project Number
J1606

Project Title
Is Human-Generated Carbon Dioxide Escalating the Greenhouse Effect?

Abstract

Objectives/Goals
Although it is known that CO2 absorption of infrared radiation emitted from the Earthâ##s surface traps heat inside the atmosphere, and that this greenhouse effect has been keeping the Earth at a livable temperature for millions of years, the great debate about human generated C02 goes on. Has the tremendous increase in CO2 caused by humans escalated the greenhouse effect? Is CO2 the most significant greenhouse gas that humans are creating? My experiment attempts to determine if increased CO2 increases infrared absorption, and therefore increases global temperatures.

Methods/Materials
I sealed the ends of a PVC pipe with plexiglass windows, and drilled holes near the ends of the pipe in order to attach two hoses. One of the hoses delivered CO2 from a C02 canister with a pressure release valve, and the other connected to a pressure gauge. I sealed all joints with epoxy glue or hose clamps.

I pointed a heat lamp, which has a variable transformer to regulate intensity, through one end of the pipe, and a wide-range infrared detector with amplified signal, through the other end. First, I measured the voltage output when the heat lamp and detector were turned on, to determine the steady baseline voltage. Then, I opened the valve on the C02 canister, noted the increased pressure in the pipe, and then noted the change in the baseline voltage.

Results
For an increased pressure of about 15 pounds, I detected an average drop in the voltmeter reading of about 0.1 milivolts. The effect of adding CO2 was greatest when I ran the experiment for the first time after airing out the pipe. Then, as I added more C02, there continued to be decreased voltage, but the drops were not as significant. I repeated the airing out and repressrising sequence several times and noted the same results.

Conclusions/Discussion
My calculations determined the percent extra absorption to be approximately 0.12%, per pound, per square inch increase in the amount of CO2. Since this figure is based on a 0.1 milivolt change, I think it would be beneficial to improve the signal-to-noise ratio of my experimental apparatus. This will be the focus of continued research on this topic.

Summary Statement
The purpose is to determine if human-generated Carbon Dioxide absorbs infrared enough to significantly escalate the greenhouse effect.

Help Received
Fat;her acted as a laboratory assistant when I needed extra help monitoring equipment.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Emma R. Dohner

Project Number
J1607

Project Title
Gopher Slumber Party

Abstract

Objectives/Goals
Objective: To study the feasibility of an environmentally friendly and humane method of getting rid of gophers: the use of nitrogen. My hypothesis is that by introducing nitrogen into a gopher run, I can lower the oxygen level in the run to a point incapable of sustaining the gopher (<6%oxygen), making this a feasible gopher removal technique.

Methods/Materials
Methods and Materials: To study the feasibility of using nitrogen to displace oxygen in a gopher run, I simulated gopher runs using different lengths and porosities of 3 in. PVC drainage pipe. I studied variables that I thought would be important (length, flowrate, and porosity) using a 2 level, 3 variable factorial design (8 experiments). I used a commercially available flowmeter to set the flow of nitrogen into the simulated run. I then timed how long it took the oxygen meter at the far end of the run to reach a reading of 6% (a point below which humans, and probably gophers, cannot survive).

Results
Results: My data shows that flowrate and length have an important effect on the time it takes to reach 6% oxygen. Higher flowrates lead to shorter times, while longer lengths lead to longer times. Surprisingly, porosity did not seem to have much of an effect. We were able to achieve 6% in all of our experiments except for one; the long length (80ft), low flowrate (2 scf/m), and high porosity run never got below 8% (this is due to diffusion of oxygen from the surrounding air through the pores, and back into the simulated run). Interestingly, I found that the use of nitrogen to displace oxygen remains effective even with runs that branch and change elevations.

Conclusions/Discussion
Conclusion: Lowering the oxygen level in a gopher run, by introducing nitrogen into it, is a feasible technique for getting the oxygen level below 6%, and presumably for getting rid of gophers. Since faster flowrates yield shorter times, I recommend pumping the nitrogen into the run at a flowrate of 4 scf/m (the maximum value of the flowmeter I used). At this flowrate, a standard 300 cu. ft. cylinder of nitrogen would last for slightly more than an hour. This method would be humane, because the gopher would simply go to sleep permanently, without feeling any pain. It is environmentally friendly, because it uses an inert gas found naturally in large quantities in the atmosphere (air is 78% nitrogen).

Summary Statement
In my project, I evaluated the feasibility of using nitrogen to displace oxygen, in a simulated gopher run, as a technique for removing gophers.

Help Received
Father helped set up the experiment and develop the factorial design. Mother advised me on my poster-board layout.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Zoe E. Dubrow

Project Number
J1608

Project Title
Ice Expansion Generators: A Powerful New Source of Renewable Energy

Abstract

Objectives/Goals
The purpose of this project is to determine if the phase transition from water to ice can be harnessed as a renewable energy source in areas of the world that the go through a daily freezing and thawing cycle. This will be determined theoretically by using the ice expansion (9%) and pressure (206MPa or 30,000psi) values from references as well as by building an ice based gravitational potential energy generator.

Methods/Materials
The four sets of experiments completed in this project tested ice expansion with friction, ice melting rate, ice expansion under pressure, and reproducibility.

Results
It was calculated that a single daily transition from water to ice could generate 1,335 kilowatt-hours per month in a three cubic meter space.

It was proven experimentally that expanding ice can force a pin out of a tube with over 206megapascals of pressure.

Conclusions/Discussion
The hypothesis that the expansion of ice could be used as a new source of renewable energy appears to be realistic.

The energy generated from the water to ice transition could be used in about 25% of the worlds land mass.

In this project, design guidelines were created to determine the optimum tube size to be used for generating ice energy.

Summary Statement
The purpose of this project is to determine if the phase transition from water to ice can be harnessed as a renewable energy source in areas of the world that the go through a daily freezing and thawing cycle.

Help Received
When none of my experiments were working, my father suggested that that I mathematically model the optimum tube size for an ice expansion generator, taking into account friction and burst pressure.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Salvador Eligio; Lily Leighton

Project Number
J1609

Project Title
A Bright Future

Abstract

Objectives/Goals
Our project relates to Global Warming. We wanted to find out how much energy is wasted in the process of making heat in an incandescent light bulb and how much is saved by using a compact fluorescent light bulb.

Methods/Materials
One 3 cu. ft. wooden box with two light fixtures inside, three 15 watt compact fluorescent light bulbs, three 60 watt incandescent (normal) light bulbs. One Pyrex glass tank, one regular Fahrenheit air thermometer and one Celsius liquid thermometer. A timer to time the check intervals and a Plexiglas top for the wooden box. A single composition lab book as a journal.
We tested at different time intervals and recorded along the way. Each light bulb#s experiment lasted for eight hours.

Results
The incandescent light bulbs wasted 163,307 joules. The compact fluorescent light bulbs only used 54,439 joules in heat. Therefore, by using two compact fluorescent light bulbs in 3 cu. ft. of space, you are saving 108,864 joules. The air temperature using the incandescent light bulb went up by 48°F and the water temperature rose by 41.2 °F. With the compact fluorescent light bulbs, the air temperature rose by 16°F and the water temperature rose by 18°F

Conclusions/Discussion
Our hypothesis was not correct but we were close. We thought that the incandescent light bulbs would generate an exceptional amount of heat therefore wasting lots of energy. This was correct but we also thought that the compact fluorescent light bulbs would not waste any energy in the form of heat at all. That is the part where we were wrong, because the compact fluorescent light bulbs did generate some heat.
We also did a calculation that showed that if every home in the United States had ten incandescent light bulbs burning for eight hours every day of the year, that an amount of energy equivalent to 64,500,000 barrels of gasoline is wasted every year. Moreover, since fossil fuels are one source of creating electricity, if everyone started using compact fluorescent light bulbs instead of incandescent bulbs, it would greatly cut back on the quantity of green house gases going up in to the atmosphere.

Summary Statement
We compared how much energy is wasted in the production of heat in the incandescent light bulb vs. the compact fluorescent bulb and related this to global warming.

Help Received
Lily#s father helped construct the wooden box and Ms. Kamitsis, our science teacher edited some of the writing and taught us how to make graphs in Excel.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jacob D. Elliott

Project Number
J1610

Project Title
Do Drumline Drummers Risk Hearing Damage?

Abstract

Objectives/Goals
I propose that if members of a drumline practice in an enclosed area without ear protection, then individual drumline members are put at a high risk of hearing damage.

Methods/Materials
Materials: decibel meter, measuring tape, drumline (trained drummers playing specified drumline instruments.)
Methods: assemble drumline in standard formation inside an enclosed room. Observe and record multiple testings of the "average" and "maximum" decibel levels while drumline is playing. Repeat these observations with various decibel meter placement.

Results
The results of this experiment indicate that the decibel levels experienced during drumline practice are an average of 102 decibels with a maximum level of 107 decibels.

Conclusions/Discussion
Given the amount of practice time, and the measured decibel levels, the levels of sound intensity are well above safety recommendations of the National Institute on Deafness and Communication Disorders, and the National Institute for Occupational Safety and Health. Ear protection is necessary to reduce the risk of hearing damage. All members of the La Colina Drumline are now wearing daily ear protection.

Summary Statement
Drumline drummers may be at significant risk of hearing damage if they wear no ear protection.

Help Received
Mother helped type report.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Kristen R. Ewert

Project Number
J1611

Project Title
If You Can't Stand the Heat...

Abstract

Objectives/Goals
Solar ovens do not have dials so it is very difficult to predict the temperature that the oven will reach. I hope to write an equation that can predict the temperatures that my solar ovens will reach on any given day.

Methods/Materials
2 solar ovens
2 instant read thermometer
log book and pencil for recording data

1.Assemble two solar box ovens.
2.Place the two solar ovens out in the sun on a clear day by 10:00 am.
3.Open flaps of solar ovens and turn the solar ovens so that they face the sun.
4.Place the instant-read thermometer in the temperature port.
5.Record the temperature in the ovens at regular time periods. Record the location, date, time, and temperatures onto the chart.
6.Using software from the University of Oregon, calculate the longitude and latitude of the location.
7.Using software from the University of Oregon, calculate the solar irradiance dependent on the location, date and time.
8.Evaluate relevant data
9.Compare the solar irradiance to time and the oven temperature to time
10.Compare the solar irradiance to the oven temperature
11.Generate equations and correlate results.

Results
Using Microsoft Excel to determine an equation to represent the relationship was reasonably successful. The graph of peak solar irradiance vs. peak oven temperature resulted in a linear equation $Y=0.0353X + 52.252$ with a reliability factor $R2 = 0.7398$. This could be considered a good fit, but not a great fit.

Conclusions/Discussion
The results showed that a direct relationship does exist between solar irradiance and the temperature of the solar oven. Therefore, the hypothesis was supported by the results.

Summary Statement
I tried to write an equation to predict the temperature of a solar oven based on available solar energy.

Help Received
My mother helped me build my ovens and plot my data on the computer.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Dylan Freedman; William Winick

Project Number
J1612

Project Title
Calculating a Projectile's Trajectory

Abstract

Objectives/Goals
Our experiment was conducted for the purpose of determining which angle of a projectile launcher will achieve the greatest distance. We derived a mathematical formula to calculate the optimum angle and built a model projectile launcher to test the results.

Methods/Materials
To perform our experiment, we built a launcher that projected a ball bearing up to 2.5 meters. We tested our experiment by launching the ball bearing at seven different predetermined angles, with velocity as a constant. We conducted ten launches at each angle, measured the distance of each launch, created a chart showing each result, and calculated an average distance for each of the predetermined angles. Using this data, we derived a quadratic graph and equation that best matched the data.

Results
Using the graph's equation, we were able to determine which angle resulted in projecting the ball bearing the greatest distance. At an angle of approximately 34.73°, the projectile traveled its peak distance of approximately 210.13 cm. In addition, we were able to use the derived equation to predict the distance of future launches using different angles.

Conclusions/Discussion
Using calculations from a formula found in our initial research, we expected that a launch angle of 45° would result in the optimum distance of the launched projectile. Using our projectile launcher, we completed a set of test data and derived a formula that we compared against the formula from our research. Our outcome proved that the optimum angle was approximately 35°, significantly less than the predicted 45°. We concluded that this discrepancy was due to the fact that the established formula presumed conditions that did not include dynamics such as air resistance, friction, launcher inconsistency, and human error. The test conditions for our experiment included all of these factors. However, using the test data, we were able to derive our own mathematical formula that accurately predicted launch outcomes in our test environment.

Summary Statement
Our project tested which angle would provide the optimum distance on a homemade projectile launcher, and if we could derive a formula that can accurately predicte launch outcomes in our test environment.

Help Received
Mother and Father helped with our written material and kept us on track

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nitya M. Furtado

Project Number
J1613

Project Title
Magnetic Magic

Abstract

Objectives/Goals
The objective is to determine the effect of temperature on the strength of a magnet.

Methods/Materials
6 magnets of identical size and shape were placed at room temperature(200C), refrigerator(40C), freezer(-160C), or oven at 800C, 1000C, and 2000C for 1 hour. The magnetic strength was measured by counting the number of metal clips picked up by each magnet.

Results
All magnets used in the study were placed at room temperature to obtain the control strength for each magnet(Table #1). In this study, Magnet #1, at -160C showed an increase in the number of paperclips it picked up, compared to clips picked up at room temperature(Table #2). Magnet #2, at 40C and #3, at 200C showed no significant difference in number of clips picked up. Magnet #s 4, 5 and 6, at 800C, 1000C and 2000C resp., however, picked up fewer metal clips(Table #2) Figure 1 shows the average number of metal clips picked up by the magnets at different temperatures. Figure 2 shows the relative magnetic strength of the magnets at different test temperatures.

Conclusions/Discussion
The first thing I did was to test the magnetic strength of all the magnets at room temperature. By doing this, I could compare the experimental data with the control or initial data to estimate differences in magnetic strength. When each magnet was exposed to the chosen temperature, there was a visible difference noticed in the relative magnetic strength. When I placed the magnet at higher temperatures, I observed a dramatic decrease in number of paper clips picked up. Magnet #6, in particular was not able to pick up even a 100 clips. When I plotted my data for all the magnets, I could see much of the magnetic strength appears to be lost due to the exposure to high temperature. I also observed that more metal clips were picked up by magnets in cooler temperatures. From the data, I can conclude that cold temperatures also have a significant effect on the magnetic strength of each magnet. My data shows that as temperature is changed, magnetic strength is affected. Based on my data, I would be interested to use other types of magnets and a wide range of lower temperatures to check the effect of colder temperatures on magnets. The magic of magnetism lies in the arrangement of its molecules. Molecules are made up of atoms and atoms have magnetic properties. I think that increasing the strength of magnets may find new uses in many different fields.

Summary Statement
My project is about the effect of temperature on the strength of a magnet.

Help Received
My cousin helped with use of excel to display my data.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nicole D. Gaudenti

Project Number
J1614

Project Title
How Does the Temperature of a Magnet Affect Its Magnetic Force?

Abstract

Objectives/Goals
This experiment will demonstrate how the temperature of a magnet influences its magnetic force.

Methods/Materials
Method:
1. Record the temperature of the room temperature magnet.
2. Attach the magnet to the bottom of the metal plate.
3. Slowly pull downward on the magnet while observing the weight displayed on the scale.
4. When the magnet lets go of the metal plate, record the highest weight displayed on the scale.
5. Repeat steps 2-4 nine more times.
6. Repeat steps 2-4 at the cold temperature ten times.
7. Repeat steps 2-4 at the hot temperature ten times.

Materials:
Two 2½ by 2 centimeter permanent magnets, Two wooden boards, String, Scale, Stove, Pot of water, Thermometer, Freezer, Metal plate, Oven mitts

Results
The results from the ambient temperature section was an average force of 28.4 ounces. The results from the cold temperature section was an average force of 33.7 ounces. Lastly, the results from the hot temperature section was an average force of 17.4 ounces.

The colder magnet section had a higher magnetic force than the ambient temperature section, and the hotter magnet section had a lower magnetic force.

Conclusions/Discussion
This project proved that the temperature of a permanent magnet affects its magnetic force.

If the experiment was repeated, it would be helpful use some sort of hand crank to pull the magnet down, so it is insured that each and every pull will be exactly the same. It was noticed that if the string was pulled down very quickly, the scale would read a lower value. Also, a digital scale with a feature that holds the highest weight would increase the accuracy.

The fact that magnets are used in many motors is just one way this experiment could be relevant to a practical application. Judging by the experiment's results, one would think it is best to keep the motor's magnets cool, which is good because a motor that overheats is bad for other reasons. A stronger magnetic force will make a more efficient motor.

Summary Statement
This project determines how the temperature of a magnet influences its magnetic force.

Help Received
Father helped with some of the assembly.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nicole E. Hamagami

Project Number
J1615

Project Title
When Waves Collide

Abstract

Objectives/Goals

Problem Statement: A wave is produced when there is a disturbance in a flexible medium. What happens when two waves travel through the same point?

Hypothesis: I predict that when two waves pass through a point, the resulting wave will increase in height.

Methods/Materials

Materials: Metal Spring (slinky), Ruler, Wire, Wood Board,2 Hooks, 300 Pencils, Hot Glue Gun, Meter Stick, Water, Rectangular Tank, Food Coloring, 20 Quarters, Cellophane, Tape, Wooden Spoon (cooking spoon)

Common Methods: I used a video camera because observing these wave collisions with the naked eye is almost impossible. I repeated each experiment ten times, recording measurements of single waves and interactions between two waves.

Specific Methods: Compression Wave: 1) I stretched a spring one yard. 2) To create two waves, my helper and I compressed each end simultaneously. Transverse Wave: 1) I attached hooks to a wood board and stretched wire between the hooks. 2) I glued pencils to the wire. 3) I made a measuring board next to my wave creator. 4) To produce two waves, I tapped both ends of the wire.

Common Water Methods: 1) I filled a tank with colored water for visibility. 2) I taped a ruler onto the tank.

Specific Methods: Water Wave: 3) I pushed the tank three inches creating a single wave then pushed and pulled back the tank three inches to make the second. Circular Water Wave: 3) I set a wooden board on the tank. 5) I placed two wrapped stacks of ten quarters on 9 cm. marks and pushed them off with a wooden spoon.

Results

Results: Single compressional waves ranged from 2 to 6 cm. and averaged 3.75 cm. During the collision, the average was 4.38 cm. with a range of 2.5 to 7.5 cm., an increase of 16.8%. Transverse waves average deltas were 2.48cm with a range of 0.9 to 6.5 cm. Collision waves averaged 3.06 cm with a range of 1.8 to 4.2 cm., a 23.4% increase. Single water waves ranged from 0.4 to 1.7 cm. and averaged 1.02 cm. During the collision they ranged from 1.7 to 4.6 cm. averaging 2.65 cm., an increase of 159.8%. Circular water waves averaged 0.62 cm. with a range of 0.2 to 1 cm. During the collision, the average wave was 1.06 cm. with a range of 0.3 to 1.8 cm., an increase of 70.9%.

Conclusions/Discussion

Conclusion: When two waves are interacting, a larger wave is temporarily formed, diminishing as the

Summary Statement

My project is about wave interactions, specifically measuring wave collisions.

Help Received

My step-father helped me build the wood framework that my apparatus was built on, helped with video recording, and tapped the spring.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Andrew P. Ho

Project Number
J1616

Project Title
Measurement of Gravity by Applying Newton's Laws of Motion to Moving Objects

Abstract

Objectives/Goals
This study performed a simple experiment to determine the magnitude of the earth's gravitational acceleration.

Methods/Materials
The motions of a basketball, a tennis ball, and a marble along a slightly tilted table were observed and the time of travel over a specific distance was recorded. The effect of friction along the surface of the table was calibrated out by rolling the objects both downward and upward.

Results
This approach invokes only a small fraction of the gravity, resulting in a relatively longer time of travel and better accuracy than that of a free falling object at comparable distance. By applying Newton's laws of motion to the data, the averaged gravitational acceleration was calculated to be 9.43 m/s2.

Conclusions/Discussion
The gravitational acceleration measured by the experiment is in fairly good agreement (3.8% error)with the true value of 9.8 m/s2. A simple idea and associated experiment can produce reasonably accurate results by utilizing the relevant theory and selecting the appropriate approach.

Summary Statement
Fairly accurate measurement of gravitational acceleration by application of theory and experimental design.

Help Received
Dr. Shu Ho explained to me the theory basis of Newton's laws of motion.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
James A. Holloway

Project Number
J1617

Project Title
Albedo

Abstract

Objectives/Goals
My objective was to find out the effect of albedo as it relates to global warming.

Methods/Materials
Experiment 1
1) 6 354 ml plastic bowls (not white)
2) 6 pool thermometers
3) 6 pieces of mesh 10cm x 20cm
4) 1 timer
5) 1 glue gun / glue sticks
6) 1 pair of scissors
7) 15 2.5cm x 1.5cm white crystals.
8) 15 2.5cm x 2.5cm squares of white foam
9) 15 2.5cm x 2.5cm white corrugated paper squares
10) 180 1cm white beads (increments of 12)
11) 60 1cm white cotton puffs (increments of 5)
12) 12 liters of water
13) 1 light source

Experiments 2, 3 & 4
The same materials were used for experiments 2, 3, and 4 with the exception of the clear Mylar which was not used in experiment 2 at all nor experiment 3, trials 1 and 2. The amounts of the materials vary in each experiment and are noted in the procedures.
1) 3 3.8 litters refrigerated water
2) 20 400 ml. clear glass bowls
3) 20 thermometers
4) 1 30 cm. square yellow Mylar
5) 1 30 cm. square green Mylar
6) 1 30 cm. square blue Mylar
7) 1 30 cm. square clear Mylar
8) 1 pen
9) 1 pair of scissors
10) 1 single edge razor blade

Summary Statement
This project is about the effects of albedo on global warming.

Help Received
Mother purchased all supplies and helped with board; Professor Arey gave me initial idea; My science teacher provided thermometers.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Michael A. Iorga

Project Number
J1618

Project Title
Laser Cooling and Trapping of Rubidium-87 Atoms using MOL

Abstract

Objectives/Goals
The objective of my project was to laser cool and trap rubidium-87 atoms. I wanted to do this in a short amount of time and with a low cost. Obtaining results would assist in the research of laser cooling and trapping. My question is: Can rubidium atoms be cooled and trapped using a single laser source and no magnetic field? Also, is it possible to build a Laser Cooling and Trapping apparatus only with materials easily available for purchase? My hypothesis is: Rubidium atoms inside a bulb can be cooled and trapped using only one laser source and mirrors to create multiple beams that intersect in one point.

Methods/Materials
Laser Cooling and Trapping occurs when atom#s electrons are hit with photons. From the energy increase, the electrons bounce up one shell. Because of the Pauli Principle, they come back down and release the excess energy in the form of an infrared photon. This photon has more energy than the absorbed photon, and from conservation of energy, this results in lower rubidium atom energy.

In my experiment I measured the volume and concentration of the fluorescent light emitted by the atoms. There is one photon emission per electron bounce, and every bounce means the atom is cooled more. Therefore, volume correlates directly with the amount the rubidium atoms are cooled. To measure this volume I used my apparatus, which consists of an aluminum cube, a laser, laser mirrors, multi-meter, rubidium bulb, CCD camera, and TV. To measure the size of the region being cooled, the camera captures the image and it appears on the TV, where I measure it and use a formula to find the volume.

Results
My results were incredible. My fluorescence experiment varied from 25,000 # 50,000 mm^3*x. My density experiment varied from 5,000 # 30,000 mm^3*x. I added the #*x# because the camera enlarges the image a certain amount. Since I measured my results on the TV screen, my data is on the enlarged image. I tried to find #x# at the beginning of the experiment, but it made my data inaccurate. An interesting thing I noticed was that at 80 and 95 mA, there was a general dip in both experiments. This dip was larger in the density experiment. The highest volume in both experiments was at 90mA.

Conclusions/Discussion
In conclusion, this project was a huge challenge to me. However, it was really fun and a wonderful experience. It was great practice for when I become a physicist or an engineer.

Summary Statement
My project focuses on Laser Cooling and Trapping of Rubidium-87 Atoms by collision with photons through the use of Doppler Shift.

Help Received
Dad helped order rubidium bulb, laser, and mirrors on Ebay. Dad also drove me to The Home Depot and bought aluminum rods, screws, washer, and nuts; also showed me how to use electric saw and drill. Lastly, Dad gave me a variable resistor and showed me how and where to solder it, following the

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nicolaus W. Jannasch

Project Number
J1619

Project Title
The Perfect Solar Oven

Abstract

Objectives/Goals
This project tests three solar oven reflector designs to see which collects sunlight most efficiently. The three designs tested were the rounded panel, the four-panel and the simple parabolic.

Methods/Materials
These ovens were tested in various sunlight conditions for both how fast they heated and maximum temperature. All of these ovens were made of cardboard with tin foil covering them to make the panels. The insulation was the insulation from our house.

Results
Overall, a simple parabolic design proved to be the best, reaching a temperature of much higher than 200 degrees F, with the four-panel cooker close behind. The rounded panel oven was the slowest to gain temperature and the oven with the least overall heat gain. In the final experiment it was about 40 degrees F behind the two other oven designs.

Conclusions/Discussion
In conclusion, the optimal type of solar oven seems to be the simple parabolic, which greatly out-jumped the other two in energy collection and maximum temperature.

Summary Statement
Three basic solar oven designs were tested to see which collected and maintained heat most efficiently and which one reached the highest temperature.

Help Received
My father helped me in builing the ovens, data collection, and assembling the poster.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Rebecca M. Kandell

Project Number
J1620

Project Title
Effect of Temperature on Musical Instruments

Abstract

Objectives/Goals
The objective of this project was to determine the effect of temperature on the sound of musical instruments.

Methods/Materials
The musical instruments used included a quarter size violin with steel strings, a plastic soprano recorder, and a brass glockenspiel. The procedure was to measure the "A" note on these instruments at a cold temperature, room temperature, and a hot temperature. The frequency measurements were done using a tuner.

Results
Results showed different trends based on the instrument type. The violin note frequency decreased as the temperature got hotter due to less tension on the string. The recorder note frequency increased as the temperature got hotter due to the speed of sound increasing with temperature. The glockenspiel note frequency stayed fairly constant because the brass bar expanded and contracted little over the project temperature range.

Conclusions/Discussion
Temperature does affect the frequency of a musical note, and so the project hypothesis was confirmed. The information shows that musical instruments need to be protected from extreme environmental factors like temperature in order to maintain their beautiful sound.

Summary Statement
My project was to run an experiment to understand how temperature affects the sound of different musical instruments.

Help Received
Mother helped type display board.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Robert I. Karz

Project Number
J1621

Project Title
The Power of Sound: How Sound Influences Kinetic Energy

Abstract

Objectives/Goals
The purpose of my project is to see if sound waves can affect kinetic energy, as demonstrated on a Gauss rifle. I believe that when the frequency of a set of sound waves is increased, it will make the projectile from the Gauss rifle travel further at a linear rate.

Methods/Materials
The Gauss rifle is composed of a wood plank, aluminum ramp, neodymium magnets, and steel ball bearings contained in a sound-dampening chamber consisted of foam. AC powered cone speakers in the chamber are aimed at the rifle, receiving selected frequencies from the frequency generator on my laptop computer. A trigger ball in a potential energy state is queued at the top of the ramp. After a frequency is selected, the ball is launched, placing it into a kinetic energy state. It is then accelerated through the Gauss rifle by magnetic energy and launched out the front of the rifle, landing into the sand-filled measurement tray. The 15 frequencies (1-15 KHz) and three baselines were each repeated four times.

Results
From the different frequencies tested, I found that the higher the frequency, the shorter the distance the projectile traveled. Further, there was a slight linear decrease in distance as the frequency increased.

Conclusions/Discussion
My experiment did in fact show that sound waves can affect kinetic energy as demonstrated by the varying distances of travel by a Gauss rifles projectile. Though, I achieved my objective, by affecting kinetic energy with sound, my results did not support my hypothesis. As the frequency increased, the distance of travel did not increase. Instead, it decreased, thus disproving my hypothesis.
These results suggest that sound waves could be used to deflect solid objects, such as altering the trajectory of a Kinetic Energy missile, or redirecting an automobile away from a highway railing, if it is about to crash into it.

Summary Statement
This project is about affecting kinetic energy with varied sound frequencies, demonstrated by aiming sound waves at a projectile launched from a Gauss rifle.

Help Received
My father helped with the power tools to cut materials and to load the Gauss rifle. My mother helped edit information and fix grammatical errors. My teachers helped by giving me a structured format and outlines as guides. Special thanks to family and friends for their encouragement.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Kevin M. Kingshill

Project Number
J1622

Project Title
Temperature Matters: Testing the Velocity of a Marble through Water

Abstract

Objectives/Goals
The objective of my experiment is to determine whether objects fall faster through hot or cold water.

Methods/Materials
For the experimental method, I dropped thirty marbles down a four-foot clear plastic tube. The tube was first filled with 95 degrees Celsius water and then again, using 4 degrees Celcius water. I timed each drop accurately with a stop watch, then recorded the times and determined through which temperature of water the marble dropped more quickly.

Results
The average time it took for the marble to fall through the hot water was 1.48 seconds. The average time it took for the marble to fall through the cold water was 1.709 seconds. On average, the marbles fell 13.4% faster through the hot water than the cold water.

Conclusions/Discussion
When water is near boiling, the molecules jump around and spread apart, thus making hot water less dense. In cold water, the opposite happens; the molecules slow down and come together, making the cold water more dense. This is why the marbles moved faster in hot water.

Summary Statement
In this project, I tested whether objects fell faster through hot or cold water.

Help Received
Physics teacher/friend helped with idea; Father helped assemble tubes; Mother helped type report; Parents helped record times.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Melanie S. Lent

Project Number
J1624

Project Title
Whistling Wineglasses: Is Vibration Frequency Linearly Related to Water Volume?

Abstract

Objectives/Goals
Running a wet finger around a wine glass's rim produces a musical tone. The more water in the glass, the lower the tone's frequency is. I predicted that the frequency is linearly related (straight-line graph) to how much water is in the glass.

Methods/Materials
I tested glasses with 333.0 ml capacity, that were 0% full (bottom control), 10%, 20%, on up to 100% full (top control). For each test, I wet my finger and ran it around the rim. I used a tuner to measure pitch and the error in cents (hundredths of a musical half step). I represented pitch as a MIDI number with a fractional part for the cents. I converted those numbers to frequencies, and I plotted and analyzed the results.

Results
The mean vibration frequency decreased as I added water, from 754.4 Hz for an empty glass, to 313.0 Hz for a full glass. The graph of frequency versus volume (percent full) curves downward for small volumes, but is nearly a straight line when the glass is 60% to 100% full. At 60% full, the mass of water (199.8 g) is 1.510 times that of the glass (132.3 g).

Conclusions/Discussion
While my results partially supported my hypothesis, what was most interesting was that the relation between frequency and volume did not become linear until the mass of water was about 1.5 times that of the glass. It may be that for small volumes of water, the frequency is mainly determined by the glass's characteristics, but when the water's mass is greater than that of the glass, the volume of water becomes the most important factor. In follow-up experiments with three other types of glasses, the frequency curve was also nonlinear for low volumes and linear for high volumes, although it became linear at different points for the different glasses.

Summary Statement
As water is added to a wineglass, the frequency of sound made by running a wet finger around the rim decreases nonlinearly for small amounts of water, but it decreases linearly when the water's mass is more than 1.5 times that of the glass.

Help Received
This project was my idea, based on my observation that adding water to a wineglass lowers the pitch of the sound it produces. My father helped me analyze my data, and my mother helped me paste up my poster.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nathan J. Manohar

Project Number
J1625

Project Title
Quantifying Quality: Violin Sound Analysis

Abstract

Objectives/Goals
I currently play a 3/4-size violin and will soon need a full-size violin. I wanted to find out if it is possible to quantitatively determine the quality of a violin by analyzing the sound waves it produces, so that I will be able to choose the best instrument for purchase.

Methods/Materials
I found a free software program called Raven Lite 1.0, which is used to analyze bird sounds. It plots the wave amplitude as a function of time, and it gives the frequency spectrograph of a digitally-recorded sound wave. I attached an iSight camera with a built-in microphone to a Macintosh computer, and recorded violin sounds using Raven Lite 1.0. I played all the open strings on 13 violins using both up bow and down bow strokes. I analyzed the recorded sound waves using Raven Lite 1.0. I also used Mathematica 5.1 software to compute the Fourier transform of the sound wave, and to obtain additional quantitative information. I performed a total of 120 tests on 13 different violins.

Results
When you play a note on a violin, you do not produce a single frequency. On the spectrographs, the computer-generated tuning A note is just one line, because it is one pure frequency. In contrast, the note A on a violin contains many additional frequencies, which are harmonics (i.e. multiples) of the lowest fundamental frequency. The strength in the harmonics varies depending on the violin. I noticed that higher-quality violins produced similar sound wave patterns and had more strength in the fundamental note. The three best instruments tested, Stradivarius, Marcello Villa, and Schleske violins, had approximately 92, 82, and 70 percent of the sound in the fundamental, respectively.

Conclusions/Discussion
I noticed more symmetry in the sound waves generated by higher-quality violins than in the waves generated by lower-quality instruments. I also learned that violins produce harmonics, and that the strength of the harmonics varied on different violins. I found that higher-quality violins had significantly more strength in the fundamental frequency.

Summary Statement
Violin sounds are digitally recorded and their waveforms are Fourier analyzed to quantitatively measure what is so special about a Stradivarius violin, and to find a way to determine violin quality.

Help Received
Martin Schleske (violin maker in Munich) gave me information about violins; Jeff Thayer (Concertmaster, San Diego Symphony) allowed me to record his Stradivarius.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)

Veronica Maynez; Maikor Xiong

Project Number

J1626

Project Title

Checking Consumer Labeling for Peanuts by Using Calorimetry

Abstract

Objectives/Goals

To run an experiment in order to determine the caloric content and stored energy of a variety of peanuts by using a calorimeter and an equation, so that we can compare our outcomes with the published nutritional facts on the peanut containers.

Methods/Materials

We determined that the example of a calorimeter given to us was too simple. In our case, the original calorimeter lost too much heat, so we improved it by insulating it in more areas. We burned different consumer peanuts: cocktail, dry roasted, and shell roasted peanuts; used to prove our hypothesis.

Results

After running our experiment many times and using an equation to find our small calories then multiplying by 1000, we found that the cocktail peanut had the most Calories with an average of 1.782, next, the dry roasted, 1.403, and last the shell roasted averaging around 1.388 Calories.

To determine the heat loss from our homemade calorimeter, we derived a constant using our big Calories and the ingredients on the cans/bottles of the consumer peanuts. The shell roasted gave an average constant of 8, the dry roasted 7, and the cocktail 6. According to our data, the more calories of the peanuts tested gave the lowest specific heat loss.

Conclusions/Discussion

Our results showed that the heat loss was more than we expected after insulating our calorimeter. Our hypothesis was partially correct. Assuming
that the labeled ingredients on the consumer peanuts are correct, we found a
slight difference in the derived constant of heat loss depending on the size
or type of peanut.

Summary Statement

Our project is to find the energy and caloric content of a peanut by using a calorimeter and an equation.

Help Received

Advisor supervised the experimentation and helped paste things on the board; the physics lab manager at the City College of San Francisco gave us the idea

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jessica J. Pilgram

Project Number
J1627

Project Title
The Monstrosity of Viscosity

Abstract

Objectives/Goals
The objective of my experiment was to investigate the influence of temperature on a liquid's flow. I believe that if a liquid's temperature is increased the viscosity (resistance to flow) will decrease and if a liquid's temperature is decreased the viscocity will increase.

Methods/Materials
My test apparatus consisted of a fluid container, a 480mm length stainless steal tube and a 6.35mm control ball valve which was installed between the fluid container and the stainless steal tube. I measured the viscocity of three liquids (water, motor oil and syrup) at three different temperatures(10 degrees Celsius, 50 degrees Celsius and 90 degrees Celsius) by timing how long it took the liquids to flow down the stainless steal tube after the control ball valve was opened. I tested each fluid at each temperature 10 times and averaged the values. I also determined the percent change in viscosity for all of the tests.

Results
My results showed that a liquid's viscosity increases when a liquid is cooled and that a liquid's viscosity decreases when a liquid is heated. When I determined the percent change in viscosity, I noticed that viscosity is not a linear function. Syrup and motor oil had the same chatacteristics and showed the same percent change in viscosity. Water, on the other hand, was not very viscous and did not show the same percent change in viscosity as the other fluids.

Conclusions/Discussion
My conclusion is that my hypothesis is correct and that temperature does affect a liquid's viscosity.

Summary Statement
My experiment is about the influence of temperature on a liquid's viscosity.

Help Received
My mom (Kathy Pilgram) helped with my board and revisions. My dad (Mark Pilgram) helped me make my test apparatus and opened the control ball valve. My teacher Mrs. Bloom helped me with revisions.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Sean C. Purcell

Project Number
J1628

Project Title
The Effect of Distance and Angle on Red Eye in Digital Flash Photography

Abstract

Objectives/Goals
The purpose of this study was to manipulate angle and distance in digital flash photography to prevent or reduce red eye. I hypothesized that angle and distance would both affect red eye reduction in a positive manner, meaning that by shooting photographs at an angle and taking them from further distances, red eye can be significantly reduced.

Methods/Materials
The procedure involved taking pictures (with a Nikon CoolPix 4600 digital camera) at different distances and angles from a stationary subject and measuring the percentage of red eye apparent in each digitally enlarged photograph. A low average percentage represented angles and distances that affected red eye in a positive way, by reducing it.

Results
Results showed that at three feet from the subject and at a 90 degree angle, red eye was the least apparent, averaging in at 58%. However, when the angle was manipulated to 45 degrees at three feet, once again, red eye was the least apparent, averaging in at 58%.

Conclusions/Discussion
I concluded that there was little difference between the four distances at both angles, with the experimental averages ranging from 70% to 56% with a mere 14% difference. Furthermore, I conclude that by conducting further testing at a large range of angles and distances, more significant results may be found. Overall this experiment shows how angle and distance affect red eye in digital flash photography in both positive and negative ways.

Summary Statement
In my project, I studied the effect of distance and photographic angle on red eye reduction in digital flash photography; thus enabling photographers an easy alternative to expensive,complicated, and unnatural software correction.

Help Received
My sister served as my subject.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Emma R. Sofen

Project Number
J1629

Project Title
Star Light, Star Bright: Atmospheric Extinction and Its Effects in Astronomy

Abstract

Objectives/Goals
The objective of this experiment is to investigate how much atmospheric extinction affects stellar images.

Methods/Materials
To perform this experiment, first you need a photometric or perfectly clear night. Using a tracking telescope with a CCD camera attached (and a laptop with corresponding software) take pictures of a star using clear, red, blue, and green filters every 10-20 min. until the star reaches an airmass of 3.14. The pictures should measure the number of photons striking the CCD camera that are coming from a region very close to the star called Star ADU. Gather information on the time and airmass each time a picture is taken.

Results
The results for all of the filters in the second experimentation show a decrease in the number of photons over time. The clear filter count was the highest, then the green, then the red, and then the blue.

Conclusions/Discussion
My conclusion is that atmospheric extinction definitely affects stars, and it shows more and more as the star gets lower and lower in the sky. There was more green light emanating from the star because on the solar spectrum green has a higher wavelength than blue and red.

Summary Statement
My project is all about measuring atmospheric extinction on stars.

Help Received
Science teacher helped with organization and good project ideas; Greg Spear was mentor; used equipment from Basking Engineering at UCSC under supervision of Greg Spear; mother helped type and advised where to put various parts on board.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Isaac S. Sornborger

Project Number
J1630

Project Title
Liquid Notes

Abstract

Objectives/Goals
My project was meant to see if the density of a liquid inside a narrow-necked bottle would affect the pitch created when it was blown into.

Methods/Materials
To experiment I used three different densities; water, vinegar, and olive oil. I poured 4oz. of each liquid into a narrow-necked bottle and blew into the bottles a few times each recording the pitch from each liquid on a piano. Finding that each liquid was the same pitch, I conducted a counter experiment using 6oz of each liquid and came to the conclusion that with every ounce of liquid the pitch went up a whole step.

Results
My results were that it did not matter how dense the liquid was, but that the volume of the liquid inside the bottle changed the pitch. I tried something else out and found that even 1 teaspoon would change the pitch from the bottle, even though it was only a half step up on the piano.

Conclusions/Discussion
The conclusion of my experiment was that by changing the volume of the liquid in the bottle it resulted in a change of pitch on the piano.

Summary Statement
Examining the effects of liquid density or liquid volume in a narrow-necked bottle on musical pitches.

Help Received
My Dad helped blow into the bottles because the vinegar smell was making me light-headed.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Filippo Velli

Project Number
J1631

Project Title
Our Spotty Sun: Sunspots and the Sun's Rotation

Abstract

Objectives/Goals
The scientific problem is "Can sunspots be used to track and measure the sun's rotation rate and how accurately can they do so?" In this experimental project sunspots were expected to provide a reference of the sun's angular position in the sky, and that the measurement of their recorded position as function of time would provide an estimate of the sun's rotation rate, multiple sunspot measurements allowing the accuracy to be increased.

Methods/Materials
The experiment consisted in creating a pinhole camera and regularly tracking the position and size of the sunspots. To create a pinhole camera a cereal box was taken and a circle was carved in the middle of it. Then a piece of aluminum foil with a pinhole was taped on the circle in the cereal box. After reflecting the sun's rays with a mirror through the pinhole and onto a wall, an image of the sun appeared in projection. Experimentation with the size of the pinhole was necessary to obtain a bright enough image of the sun which was sufficiently sharp and contrasted to show the sunspots clearly. Then sunspot position was taken by drawing and graphing the sun first on millimetric paper and then on the logbook. Estimates of the sun's rotation rate obtained were in the range 24 - 28 days.

Results
After experimentation, the sun's rotation calculated from two of the sunspots, approximately 24 days and 5 hours, turned out to be fairly close to the real rotation of the sun, 24 days and 12 hours.

Conclusions/Discussion
Sunspots can be used as trackers of the sun's rotational period, however their own dynamical evolution and latitudinal drift make a precise calculationof the rotation of the sun's surface difficult. They also provide evidence that the surface of the sun cannot be considered as a solid body.

Summary Statement
In this project a pinhole camera was built to observe the sun and track sunspots to measure the sun's rotation rate.

Help Received
My dad helped me find a flat mirror and looked over my research paper.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Thomas W. Witkowski

Project Number
J1632

Project Title
The Effect of Temperature on the Tuning of a Guitar

Abstract

Objectives/Goals
Exposure to temperature change is known to affect the size of many materials, this test studied whether temperature change had an affect on the tuning of a guitar. The experiment tested if a change in size of the guitar elements would effect the tension on the guitar strings. Therefore if the tension on the strings changed so would the tuning.

Methods/Materials
To accomplish this a guitar was placed in a controlled environment for a designated amount of time and exposed to various temperature changes to see what effect on the tuning could be measured. The guitar had to be given sufficient time in the controlled environment in order for it to have time to react to the temperature change. Therefore it was necessary to allow the guitar to be in the controlled environment for half an hour before testing the tuning.

Results
Temperature increases from 70 degrees to 75 and 80 degrees yielded the most change in tuning. Temperature decreases yielded no conclusive results or no results at all. The strings with the least thickness were affected the greatest and became several cents flat. Cents is a term used in tuning meaning one fiftieth of a full note.

Conclusions/Discussion
These results are important because they demonstrate that temperature increase has a great enough affect on the wood and metal strings of a guitar to change the amount of tension put on the strings. The results show that the metal strings can be altered in temperature changes and are important knowledge to those trying to maintain an in-tune guitar.

Summary Statement
The effect of temperature on the tuning and tension of a guitar and it's strings.

Help Received
Father helped with gathering materials; Plex Products Unlimited helped make test box.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Annabel J. Yates

Project Number
J1633

Project Title
Good Vibrations

Abstract

Objectives/Goals
The purpose of the experiment is to figure out whether changing the depth of the experimental xylophone's keys, when compared to the control xylophone's keys which were thicker, shows a difference in the pitch, or frequency between the two xylophones. This was beneficial to me because being a musician, I was interested in how the instruments I play everyday work and the science behind them.

Methods/Materials
In my experiment, the lengths and the widths were kept constant, while the experimental xylophone's depth was half of the control xylophone's depth. Both of the instruments were made out of walnut wood and screwed onto hardwood frames on top of felt pads. To measure the pitch of the xylophones, I used a Korg Chromatic Tuner, which was more accurate than by ear.

Results
The results proved that the hypothesis was correct, and changing the depth also changes the pitch of each bar on the xylophone. For example, the results for Bar 8 on the experimental xylophone was Eb-311.1Hz, compared to the results for Bar 8 on the control xylophone, which was C- 523.2Hz. The pitch on the experimental xylophone was also an octave lower than the control xylophone.

Conclusions/Discussion
The major finding in Good Vibrations was that sound travels faster through solid objects. This is shown by the fact that the control xylophone has higher frequencies than the experimental xylophone because sound travels through the wood at a number of faster vibrations, thus causing a higher note to be produced. The sound takes an equal amount of time to get through either instrument, so the vibrations in the control xylophone move faster in order to do this. The faster a note vibrates, the higher the pitch of the note will be. The frequencies of the keys on the experimental and control xylophones differ because of the speed the sound waves have to travel through the bars.

Summary Statement
In my project, two xylophones made with different depths, the pitches were compared, and it was found that the changes in depth also changed the pitch.

Help Received
Father helped with supervision of power tools.