CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Cristina Aggazzotti; Colleen Meseck

Project Number
J0201

Project Title
That's the Way the Ball Bounces

Abstract

Objectives/Goals
Our experiment was bouncing many different kinds of balls on a piece of wood. Our original question stated, "Which ball will bounce the highest when bounced off a piece of wood." The experiment tested the hypothesis, "If a ball is bounced from a height of one meter onto a piece of wood, then the ball with the greatest amount of compressibility will bounce the highest."

Methods/Materials
We gathered many different kinds of balls ranging from a soccer ball to a steel ball, a wood surface, a meter ruler, a foot ruler, a brick, and a lever. We then bounced the balls on the wood surface and found their height and number of bounces. We then repeated that step three times to make sure our results were accurate. We recorded the data we had collected into charts. The next step was to perform the second part of our experiment-measuring the compression. We did this by measuring the diameter of the ball and then the diameter of the ball with a brick placed on top of it. We recorded this information into a chart as well. Lastly, we analyzed our results and wrote our conclusion.

Results
Our results show that the ball with the largest compression is always the one with the most bounces and the highest bounce. Our results also show that many of the smaller balls didn't have any compression factor, while some of the larger balls did. They showed that the small bouncy ball had the largest compression factor, therefore it had the largest amount of bounces and the highest bounce. Our results further show that generally balls with a higher compression factor will bounce more times than other balls.

Conclusions/Discussion
Our results proved our hypothesis to be correct. Our experiment shows that balls with a large amount of compressibility will bounce higher than other balls with a low amount of comressibility.

Summary Statement
In our project, we measured the number of bounces done by balls, the height of each bounce, and the compression factor along with the idea of the coefficient of restitution.

Help Received
We recieved help in doing our project from our parents who supervised us in building our apparatus.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Sophie L. Alger

Project Number
J0202

Project Title
What Variable Changes the Speed of the Tennis Ball the Most and Why?

Abstract

Objectives/Goals
My projects goal was to see which of my 27 variables(strings,racquet weight,and serve type)affected the speed of the tennis ball the most .I also wanted to find ou twhy these variables affected it.

Methods/Materials
Method:
1.Place radar on court in service box
2.Serve from baseline of tennis court
3.Repeat steps 1 and 2 23 times
4.Repeat steps 1,2, and 3 for each variable

Results
The heavy racquet with the loose strings had the fastest serve on average,the light racquet with the loose strings had the second highest serve on average,The medium weight racquet with the average tightness of strings had the slowest serve on average.

Conclusions/Discussion
My project was succesful.I found which variables affected the serve and why.Why?The loose strings gave the ball great speed because it acted as a slingshot,it pulled the ball back and then released it.The heavy racquet weight gave the racquet great speed because it gave it momentun from the weight.Because the racquet gained speed so did the ball making the serve faster.The light racquet when swung fast enough gave the ball great speed because the racquet had speed.

Summary Statement
My project is about finding out which variable that I used would change the speed of the ball the most and why this was.

Help Received
Mother edited,used radar gun of Alan Guthry,Miss.Gray viewed board and offered tips,tennis coach,Shannon Smith helped come up with idea for project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Tyler Amos; Andrew Hostetler

Project Number
J0203

Project Title
Does Temperature Affect the Way a Ball Bounces?

Abstract

Objectives/Goals
Our objective was to determine if super balls (large and small), ping-pong balls, and golf balls bounce higher when they are warmer or colder.

Methods/Materials
The experiment involved measuring the bounce effect of the four (4) balls (large and small super balls, ping-pong ball, and golf ball). This was done by first testing the balls at room temperature using a 24 inch ruler to measure the height of the bounce. Then we put the balls in a freezer at -2 degree F for half an hour and retested them. We also tested the balls after one hour and one and one half hours in the freezer. We found out that the four balls bounced higher at room temperature than when colder.

Next, we tested the balls after they had been heated. To do this we set the balls out at room temperature, for an hour, while preheating the oven to 170 degree F. After that hour, we put the balls in the oven (on foil) for ten minutes and tested. We repeated the process at 200 degree F.

Results
Temperature does affect the way a ball bounces. The super balls were most affected by the change in temperature.

Conclusions/Discussion
The experimental data both supported and did not support our hypothesis. It supported our hypothesis in that all but one type of ball bounced higher when warm. The ping-pong ball, however, bounced higher when cold. Based upon our research and experimental results, we believe the reason for this is because the material inside the ping-pong ball is air and air does not act like rubber at different temperatures. How much affect the temperature has on a ball depends on the materials the ball is made of.

Summary Statement
Our project was to determine if temperature affects the way a ball bounces.

Help Received
Mr. Scott (science teacher) for correcting our report. Mothers helped assemble the display board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Casey Berberian; Silvestre Padilla

Project Number
J0204

Project Title
What Baseball Brands Bring in the Fans?

Abstract

Objectives/Goals
The objective is to determine which of the following Little League baseballs will travel the farthest being hit with the same amount of force: Worth, Rawlings, ProSport, Wilson. We believe that the most expensive ball, the Wilson, will be of higher quality materials and construction and therefore will travel the farthest.

Methods/Materials
I built a batting machine out of a clay pigeon target launcher that would consistently swing a bat, mounted to the swing arm, with equal force. I mounted the launcher on a pedestal, which I constructed out 1 1/2 inch square tube iron and 1/2 inch plate to make it waist high. With a Tee ball tee adjusted to the same height to hold the ball, we hit each baseball once, measured the total air and ground distance traveled, and then repeated the process a total of ten times

Results
Our observations and calculations showed that using the same amount of force, the Worth baseball traveled the farthest, followed in order by Wilson, ProSport, and Rawlings

Conclusions/Discussion
Our conclusion was that the most expensive baseball does not necessarily mean it will travel farther than a medium priced or low priced baseball when struck with the same amount of force. And, the material that a baseball is made of may have an effect on how far it will travel

Summary Statement
Our project is about determining which of four name brand Little League baseball would travel the farthest when hit with the same amount of force.

Help Received
My father helped me measure the angle to cut the square tubing for the pedestal legs. He gave me permission to use his shop and tools including the cutoff saw, grinder, and arc welder, under his supervision

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Zachary S. Bobbitt

Project Number
J0205

Project Title
Too Hot to Handle!

Abstract

Objectives/Goals
Which of the three solar ovens that I am going to build, the Windshield Shade Solar Funnel Oven, the Pizza Box Solar Oven or the Double-Angle-Twelve-Sided Solar Oven (D.A.T.S.) will heat the water to the highest temperature?

Methods/Materials
1. Set-up all three solar ovens
2. Focus the solar ovens facing towards sun.
3. Fill four, 3-cup clear containers with 500ml. of water.
4. Place a thermometer into each container of water, and record the temperature of the water.
5. Place one container inside each solar oven
6. Place the last container in the sun for a control.
7. Check and record the temperature of water every thirty minutes. Repeat step 12 six times or until it has been 150minutes.

Results
The data indicated that the Double-Angle-Twelve-Sided Solar Oven heated the water faster than the other ovens.

Conclusions/Discussion
Based on the data from my experiments, my hypothesis has basically been proven correct. The Double-Angled-Twelve-Sided Solar Oven (D.A.T.S.) heated the water to hottest temperature in degrees Fahrenheit in all but one experiment. The experiments also seem to show that the reason behind my hypothesis was correct. The Windshield Shade Solar Funnel Oven, which did not reflect the sun's rays from as many different directions as the Double-Angled-Twelve-Sided Solar Oven (D.A.T.S.), was the second best at heating the water. Since it had only one reflective surface to focus the sun's rays, the Pizza Box Solar Oven heated the water to the lowest temperature in each experiment. It was interesting to note that both the Double-Angled-Twelve-Sided Oven (D.A.T.S.) and the Windshield Shade Solar Funnel Oven still heated the water substantially on overcast days, while the Pizza Oven did not heat well on those days. Further the Windshield Shade Solar Funnel did not do as well on windy days, because its heating surfaces were not stable in the wind.

Summary Statement
I tested 3 types of solar ovens.

Help Received
Mother helped arrange my board and supervised cutting/building the D.A.T.S. oven. Mr. Smith, my science teacher reviewed my project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Kyle D. Chao

Project Number
J0206

Project Title
Band At Tension: Measuring Potential Energy in a Stretched Rubber Band

Abstract

Objectives/Goals
My project is to determine the relationship between the stretching of a rubber band and how far and fast an object would travel. In the process, I am investigating the relationship between potential energy and kinetic energy.

Methods/Materials
I made a cannon basically out of paper towel roll, rubber band, and Ping-Pong balls. I put a Ping-Pong ball into the roll and shot it out by stretching and releasing the rubber band. I measured the distance the ball traveled and the time it took to travel. I experimented with different weights of balls and different angles of the cannon using wood blocks for different angles. I calculated the kinetic energy of the ping pong ball by weighing the ball and calculating its velocity. I calculated the velocity by dividing the distance traveled by time.

Results
The experiment results showed that the farther the rubber band is pulled back, the farther the ball will travel. Also, it showed that a heavier ball would not travel as far as a lighter ball. Furthermore, at 30° angle, the ball traveled farther than at 0°, 10°, or 20° angle. Lastly, the velocity increased as the rubber band is stretched farther. Because the velocity is increased, therefore the kinetic energy is increased.

Conclusions/Discussion
The experiment showed that the farther the rubber band is pulled back, the farther the ball will travel. Also, it supported that a heavier ball will not travel as far as a lighter ball and that at a 30° angle, the ball traveled farther than at smaller angles.
When the rubber band is let go the stored potential energy of the rubber band becomes the kinetic energy of the moving ball.

Summary Statement
My project investigates the potential energy in a stretched rubber band and how it relates to kinetic energy of a ball when the band is released.

Help Received
My dad and mom helped me get all the supplies. My Dad helped cut the baseboard and wood because of the sharpness of the blade.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

Joaquin Chavarria; Tyler K.M. Fortney

Project Number

J0207

Project Title

The Cutting Edge, Smells Fishy to Me: Analysis of Different Cooking Oils Used to Run a Lawn Edger

Abstract

Objectives/Goals

Our experiment was to strain used cooking oils through a filter that we built and then determine and analyze which one would run a lawn edger the longest. We thought that it would be the Wesson Pure Corn Oil.

Methods/Materials

The only variable in our experiment was the type of cooking oil. We used: Corn, Vegetable, Peanut, Canola, Olive, and Safflower Oils. Each oil was tested (4) four times, for a total of (24) twenty-four experiments. French fries and fish sticks were cooked and the oil strained through a filter that we made. We timed how long the lawn edger ran on (100) one hundred ml. of filtered oil. We controlled: brand and amount of food, cooking and cooling times, amount of oil, and the outside temperature. We always used a new filter, new spark plug, and a gas cleaned lawn edger for each experiment.

Results

Our filter worked well and we were able to run the lawn edger on used cooking oil. The (6) six oils that we used in our experiment in the final ranking order, from the best to the worst were: (1st) Crisco Pure Canola Oil, (2nd) Hollywood Enriched Expeller Pressed Safflower Oil, (3rd) Crisco Pure Vegetable Oil, (4th) Wesson Pure Corn Oil, (5th) Bertolli Classico 100% Pure Olive Oil, and (6th) Hollywood Enriched Gold Peanut Oil. The Hollywood Enriched Gold Peanut Oil failed to ever run the lawn edger.

Conclusions/Discussion

Our hypothesis was that the Wesson Pure Corn Oil would run the edger the longest, but the Crisco Pure Canola oil was the best fuel. It was the only oil that had to run out of fuel in order to stop the lawn edger from running. Our analysis showed that there is a correlation between the amount of saturated fat in the oil and the running time. We determined that not all of the saturated fat bonds were broken down during cooking and that this caused them to foul the spark plug.

Summary Statement

Our project was to determine what used cooking oil would run a lawn edger the longest after it had been strained through a fliter that we built, and analysis the differences.

Help Received

My Mom drove us to do our research. Joaquin's Mom bought most of our supplies. Mr. Gottlieb disposed of the cooking oil. Paige Auto disposed of the used spark plugs.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Bryce W. Cronkite-Ratcliff

Project Number
J0208

Project Title
Fire Away Trebuchet: An Investigation into the Physical Properties of a Trebuchet

Abstract

Objectives/Goals
The objective is to study the transformation of gravitational potential energy into kinetic energy using a medieval siege weapon known as a trebuchet. I hypothesize that the trebuchet will throw the furthest and most accurately when using the lightest and smallest projectile, the heaviest counterweight, and the greatest height.

Methods/Materials
A trebuchet is a medieval siege engine that transfers energy stored in a counterweight into the kinetic energy of an (often destructive) projectile. For this project a trebuchet using a 7-foot (84-inch) arm was constructed along with several different projectiles, and counterweight masses. The experiment consisted of over 100 trials in which I varied the projectile mass and size, counterweight mass, height the counterweight falls, and base type (on wagon, not on wagon), and measured projectile range and aiming accuracy.

Results
The results show that the trebuchet's range improved by decreasing the weight of the projectile, increasing the counterweight mass, raising the height, and placing the trebuchet on a wagon. Projectile size had no effect on the performance of the trebuchet. Measures of performance included range, range resolution, transverse range, transverse resolution, and range efficiency. Many of these results can be understood using the law of conservation of energy.

Conclusions/Discussion
My hypothesis proved largely correct. That is, the trebuchet's performance improved when using a lighter projectile, a heavier counterweight, and a greater height. However, I was surprised to find that the size of the projectile had no effect on the firing distance or accuracy. I also concluded that placing the trebuchet on the wagon improved the firing distance, probably because doing so allows the trebuchet to shift its center of gravity. The wagon also raises the trebuchet an additional foot or so above the ground which probably contributes to increasing the range. My final conclusion is that building and testing your own trebuchet is lots of fun!

Summary Statement
This project studied the transfer of potential energy to kinetic energy by means of a trebuchet.

Help Received
My Dad acted as my mentor for this project, Ripcords.com provided basic trebuchet plans

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Kyle D. Dangerfield

Project Number
J0209

Project Title
Speedy Substance: A Study of the Effectiveness of Various Lubricants on a Skateboard Bearing

Abstract

Objectives/Goals
The purpose of this project was to see which lubricant causes the longest rotation time on a skateboard ball bearing. I thought that the Red Devil skateboard lubricant would produce the longest rotation of the wheel and bearing because it is advertised as "wickedly fast bearing oil."

Methods/Materials
A skateboard truck was mounted on a wood base. Lubricant was applied to the bearing, the bearing was then inserted in to the wheel and mounted on the truck. Next I applied a power drill to the wheel until it reached top speed then removed the drill and timed how long the wheel rotated. The bearing was cleaned and the process was repeated a total of three times for each lubricant and the dry control. Bearing weight was recorded to ensure all the old lubricant was removed from the bearing. The room temperature was kept constant.

Results
The dry control resulted in the longest rotation time. Water, WD 40, silicon spray, Red Devil bearing oil, lubricator with Teflon, 2 cycle oil, and Powdered Graphite all reduced rotation time compared to the dry control. Percent slowed down compared to control was calculated. Powdered Graphite reduced rotation time the most, 95.7%.

Conclusions/Discussion
My conclusion is that a skateboard bearing without weight rotates longest when it is dry. Lubricants reduce rotation time.

Summary Statement
I evaluated the effectiveness of various lubricants on the rotation time of a skateboard bearing.

Help Received
Dad helped run power drill, Mom helped put together poster display.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
John D. Dillon

Project Number
J0210

Project Title
The Medieval Trebuchet: An Experiment in Ancient Applied Mechanics and Ballistics

Abstract

Objectives/Goals
I re-created a small Trebuchet, an ancient siege engine from Medieval Europe. I hoped to be able to duplicate the function of ancient examples, in accurately firing projectiles high enough to clear a hypothetical castle wall (+/- 25 feet) and far enough (+/- 150 feet) to be out of arrow range. I hoped to be able to study the ballistic signature or flight path taken by the projectiles fired, and to be able to make precise mechanical adjustments which would improve both its range and accuracy.

Methods/Materials
I built my trebuchet out of wood, with some metal parts. The counterbalance weight is lead, a ball-bearing pillow block on a steel axle forms the fulcrum of the pivot beam. Water balloons standardized at 1/2 lb. weight gave the most consistent results and best ballistic signature.

Results
I built three different trebuchets, each one an improvement on the one before, with mechanical changes to the basic design made as the result of direct observation of ballistic signatures from approximately 200 individual test-firings. The first (Mark I) Trebuchet barely functioned at all. The second (Mark II)Trebuchet unfortunately fired backwards almost as often as forwards; when it worked, its ballistic signature was high and short (well within arrow range of a hypothetical castle's defenders). The third and final (Mark III) re-designed Trebuchet finally fired a low and long ballistic signature (around 30 feet high and up to 170 feet long), similar to that of ancient examples.

Conclusions/Discussion
I discovered that the most important mechanical principle governing the range and accuracy of my trebuchet was release timing; this is the point at which the trebuchet "lets go" of its projectile. Different release timing results in widely different ballistic signatures. Premature release results in a backwards ballistic signature; early release results in a high and short ballistic signature; a perfect release near TDC (top dead center) results in a low and long or perfect ballistic signature; and a late release results in a low and short ballistic signature. What I learned through all of the test-firings, ballistic observation, mechanical modification and trial and error re-engineering of my Trebuchet was that you should only change one variable at a time in order to fine-tune any machine for increased performance.

Summary Statement
My project involved the recreation of a Trebuchet, an ancient Medieval European siege engine, that throws water balloons up to 170 feet with good accuracy.

Help Received
Father helped build Trebuchet, helps load it each time fired, took photos. Mother helped computerize hand-drawn tables. Science teacher Rickertsen reviewed and critiqued earlier versions of report and display board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Jamie J. Florance, III

Project Number
J0211

Project Title
What Performance Part Will Make My Go-ped Go Fastest?

Abstract

Objectives/Goals
To see what performance part installed on my go-ped will increase acceleration and top speed the most.

Methods/Materials
On my Super Bigfoot Scooter, I tested an X-Can exhaust system, K & N high flow air filter and venturi, and .7 mm drive spindle. I recorded the times and top speeds on a 1/10th mile course, completing six running start and six standing stop trials, for each modification.

Results
The bigger drive spindle was the single best performance part. My summary of test results gives the average elapsed time and average top speed for each of the 12 tests performed on each modification. Although the K & N air filter produced similar results, the drive spindle cost $12 less.

Conclusions/Discussion
The best performance part to add to a scooter is a .7 mm or larger drive spindle. The addition of the K & N air filter increased performance slighlty more. The X-Can exhaust system bogs down low end acceleration.

Summary Statement
I ran my experiment to see if popular modifications to go-peds actually improve performance.

Help Received
Father helped design and carry out testing. Mother proofed report and helped type display.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Mark W. Fox

Project Number
J0212

Project Title
Mountain, Road, or BMX: Which Helmet Type Works Best?

Abstract

Objectives/Goals
This project's goal is to determine which helmet materials protect best upon impact with solid ground. It is hypothesized that the Specialized helmet will work best in protecting the melon because of the type of foam, the alignment security of the outer shell, and the number of ventilation holes. The setup procedures were consistent but due to the weight of each helmet there were slight differences in the time it took to hit the pavement because of inconsistent weight.

Methods/Materials
There were three helmets in the comparison group: The Specialized mountain/road helmet, the Bell Rattler road helmet, and the Dynamic Back Trails Jr. BMX (Bicycle Motor Cross-) helmet. General materials included 3 helmets, 2 sacks of potatoes, a pillowcase, and a stop watch and tape measure. Procedures followed: place the melon inside the helmet and attach the potato-filled pillow sack to the bottom of the helmet with duct tape. Drop the melons and helmets out of the car window at 7 kilometers per hour. Then, record results on paper.

Results
The Mountain and Road helmets both received a score of 5 while the BMX helmet received a 4. Melon #1 and Melon #2 were both cracked down the middle. Unlike the other two melons, the Melon #3 (Dynamic Back Trails Jr.) received a score of with only a large bruise.

Conclusions/Discussion
These results indicate that even though the Specialized helmet was more expensive than the others, the least expensive helmet, the Dynamic Back Trails Jr. BMX helmet, essentially performed better offering more protection.

Summary Statement
This project tested the strength of helmets on an impact with the ground to see what type of helmet would protect the head the best in the event of an injury.

Help Received
My mother helped drive the car. My neighbor and my sister helped time the drop. My brother helped secure helmets. Specialized was able to donate 2 helmets for my testing and Bell donated an information packet.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Katelyn Freund; Charlotte Mehaffey

Project Number
J0213

Project Title
Robot Efficiency Test

Abstract

Objectives/Goals
Our project is to test which robot can move more efficiently on both carpeted and smooth surfaces. We are testing out Robot A with legs and Robot B with wheels. We will vary the length of the legs and the size of the wheels to determine if the length and size alter the results.

Methods/Materials
We will be using robots, made from K'NEX, to test our hypothesis. Both robots are battery operated with similar body designs except for their mode of travel - one with legs attached to the center shaft and the other with wheels on the center shaft. After assembling the robots, place the robots on the carpeted area and measure the time it takes to travel 273 cm distance; do the same for the hardwood surface. Then we modified our experiment so that the variable was distance instead of time, to ensure the battery life would not affect the results.

Results
* Walking robot gave inconsistent results kept veering right and left - it also got stuck in the carpet.
* Battery cord could affect the direction the robot would turn.
* Both robots worked better on the hardwood floor.
* The Robot A - best results were with the short legs;
* The robot B best results were with the big wheels.
* Robot B traveled the same distance in less time on both the carpet and smooth surface.

Conclusions/Discussion
The wheeled Robot with the largest wheels is more efficient than the legged robot with any length of legs, because the larger diameter wheels covered more surface area in a shorter period of time. Short-legged robot worked best of the walking robot because it is more stable and has a lower center of gravity. Overall, the wheeled robot was faster than the walking robot because it has fewer moving parts.

Summary Statement
Robotic movement comparison using various sized legs and wheels on different surfaces.

Help Received
Mother helped type report, prepare charts.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Carlyn Girard; Ian Girard

Project Number
J0214

Project Title
Lasers See Like Salmon Eyes

Abstract

Objectives/Goals
We built two low cost turbidity monitors, using lasers, photocells and a data logger. We tested the monitors with different concentrations of sediment, different laser path lengths and different types of sediment. We field-tested the monitors at a local stream called Jacoby Creek under flood and low flow conditions.

Results
Both monitors showed that changes in the voltage from the photocells were directly related to the concentration of sediment in the water. The voltage responded linearly up to 400 milligrams per liter (mg/l). Correlation coefficients between voltage and sediment up to 400 mg/l were above 0.9 for all the data logger tests. Above 400 mg/l the data followed an exponential trend line. Increased path length increased voltage from the photocells for the same turbidity. The finest clay-silt sediment that we could get was just as detectable as the heavier silt-sand sediment. The sand sediment was not detectable up to 450 mg/l. Our turbidity monitors survived a flood. It rained almost 4 centimeters in 24 hours! They were under two meters of water at the storm peak.

Conclusions/Discussion
Our monitors can be constructed for about $150 each and can accurately measure suspended sediment concentration from 20 mg/l to 400 mg/l. We proved that the design works under pretty harsh conditions. Our tests did not give the results we had expected for path length. Increased path length, increased voltage output because the laser light spread out over more of the photocell. Based on our sediment tests our monitors should be able to measure accurately most of the types of sediment that you would find during storms in Jacoby Creek.

Summary Statement
We designed, built and tested two in-stream turbidity monitors.

Help Received
Two hydrologists helped teach us about turbidity and turbidity sampling, our dad helped us with the dangerous parts of construction, our science teacher advised us on the project.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nicholas G. Gomez

Project Number
J0215

Project Title
Let There Be Lift

Abstract

Objectives/Goals
My objective was to create a wheelchair that could go up a common street curb.

Methods/Materials
Wheelchair, electric actuators, skateboard wheels, power supply, hose clamps, threaded bar, four DPDT switches, circuitry box, and wire. The way I achieved my objective was by attaching two actuators to the back of a wheelchair and two to the front. I placed axles through each set of actuators and attached skateboard wheels to each axle. Next I placed the power supply under the wheelchair and wired all the actuators together.

Results
My wheelchair was able to successfully lift a person up and roll him onto a curb. Therfore, my objective was accomplished.

Conclusions/Discussion
My original hypothesis was proven correct. A handicapped person can be assisted in going up curbs with the new wheelchair design. Doing this project also taught me that handicapped persons should be treated with great respect.

Summary Statement
I built a wheelchair that can go up a curb.

Help Received
My dad supervised me in the construction of the wheelchair and with the poster board assemblage. My mom helped with the board and my teacher helped perfect my written work.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Matthew T. Handfelt

Project Number
J0216

Project Title
Will It Fly the Farthest?

Abstract

Objectives/Goals
The science experiment was done to determine what ramp angle would launch a radio controlled car the farthest. The hypothesis was that the vehicle would be launched the farthest at a ramp angle of 45 degrees. This was based on previous studies with projectiles and theoretical trajectory equations which indicate that 45 degrees produces the farthest flight of the projectile.

Methods/Materials
The experiment followed these procedures:
1. Build the experimental ramp and large protractor to measure the angle of the ramp.
2. Set up ramp at given angle and mark distances from ramp and 8 feet in front of the ramp for the starting point on the pavement.
3. Drive the gas powered all terrain vehicle off the ramp five times.
4. Increase the ramp angle by five degrees and perform five more trials.
5. Repeat at each angle until the maximum angle of 55 degrees has been reached.

Results
The results found show that the most successful angle of launch was 30 degrees which launched the vehicle an average of 69 inches which is only 2 inches farther that the second most successful angle of 40 degrees. It also showed that the higher ramp angled had much shorter distances than any of the other angles.

Conclusions/Discussion
The experiment shows that the optimum ramp angle is 30 degrees. This is probably different from the theoretical answers because they were conducted with projectiles that accelerated at the angle of launch. In this experiment, the vehicle was accelerated horizontally and then presented with the ramp, giving it more forward momentum.

Summary Statement
At what angle would a ramp launch a radio-controlled car the farthest.

Help Received
Dad helped record results. Mother helped edit report.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Stefan E. Karlsson

Project Number
J0217

Project Title
Roller Coaster Fun, Falls, Forces, and Physics

Abstract

Objectives/Goals
As a roller coaster fan I questioned the safety of roller coasters and why people do not fall out of their seats on fast turns and loops. I believed that the safety bar and seat belts held the rider in place. My objective was to determine which factors which led to the fastest and most thrilling roller coaster ride while still maintaining rider safety.

Methods/Materials
The factors of speed, gravity, friction, mass, and centripetal and centrifugal force all work together to determine the acceleration of the car and how safely it moves through fast turns and loops. These factors and the aerodynamics of roller coasters is discussed in a separate report. To test these forces and which coaster design led to greater safety I developed five experiments: 1) swinging of water in a bucket to study centrifugal force and speed; 2)studying the free-fall and weightlessness of a rider with cup and water experiment; 3) a roller coaster simulator using tubing and marble to test for speed and mass; 4) a roller coaster internet simulator; and 5) a two part experiment building a roller coaster out of hot wheels track testing differences in mass and length of cars and determining which friction (a hill etc.)provided the safest ending ride.

Results
The tests showed that the car of greater mass built more momentum and greater acceleration on the track. A car of greater length had more friction and slowed the car. The best way to increase the friction is from a design change of the track, with a hill, curve or loop. A loop in the track proved best in slowing the coaster car followed by a curve and then a hill. The curve in the track proved to be the best in actually slowing the car at the end of the test and providing a safe end to the ride.

Conclusions/Discussion
Speed is important for a thrilling ride and greater mass will produce a faster ride. Enough speed is needed to make it through the loop on a track. The challenge in designing a safe ride is to slow the car throughout the ride before the car can gain too much acceleration. The loop proved to be the best at slowing the car however, a loop or hill cannot be used at the end of an actual ride. As I demonstrated, the curve proved best in slowing the coaster car at the end of the ride. Hills and loops add to the thrill of the ride however, the curve at the end is the best and most practical way in actual amusement park roller coasters to bring the car and its riders back safely.

Summary Statement
A study of the aerodynamics of roller coasters finding the fastest and most thrilling ride while maintaining rider safety.

Help Received
Mother and father provided some help in layout of the project. Father typed some portions of the reports.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Evan P. Keane

Project Number
J0218

Project Title
House Saver

Abstract

Objectives/Goals
The objective of my project is to provide a protective shield, which will quickly cloak a house, when it is threatened by a wildfire.

Methods/Materials
I made an inflatable wall out of fire-resistant Kevlar cloth, which was put in the form of a folded hose, around a wooden model house. The outer sides of the wall had a reflective aluminium facing. I inflated the hose, using fire fighting foam, to create a rising curtain. When it was high enough,the top was closed to form a tent over the house. An unprotected model house sat beside the shielded house, and both were set aflame, in a simulated wildfire.

Results
The unprotected house burned completely, while the house protected by the "House Saver" was undamaged.

Conclusions/Discussion
The "House Saver" could be deployed in approximately a half hour. It can readily surround any size house. The foam raises the wall and helps to keep the house cool. An air conditioning unit could be utilized to reduce the temperature inside the house. Cleanup is done by sucking the foam out of the wall, which would keep costs and environmental impact to a minimum.

Summary Statement
My invention would save a house in a wildfire, by providing a protective shield.

Help Received
My dad supervised model building and fire setting.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nancy A. Kedzierski

Project Number
J0219

Project Title
I Don't Want to Hear It! A Study of the Efficiency of Various Soundproofing Materials

Abstract

Objectives/Goals
The purpose of my project was to find out which of 17 different materials [including organic matter, masonry products, paper products, containers, and common insulators] would be the most efficient at soundproofing a room. My hypothesis was that fiberglass, ceiling tiles, and cardboard would be the best at soundproofing, while plastic bottles, empty wall [air], and styrofoam would be the worst soundproofing materials.

Methods/Materials
To test my project, I built six walls using 2 x 4s and dry wall to hold the materials. One was a large wall that was the main testing wall, four small walls to make it more like a room, and to keep the sound from traveling around the wall, and a large wall as the ceiling. The sound generators that I used were a Taboo game buzzer, a car horn, and a muffled car horn. I used these sound generators so that I had a range between the sound levels. Each of the sound generators was measured three times at three different points on the wall for each of the 17 insulating materials.

Results
My results were that, over all, the best soundproofing materials were books [29.57% efficient], crumpled newspaper [29.32% efficient], and fiberglass [29.22% efficient], and the worst were styrofoam [24.85% efficient], aluminum cans [24.19% efficient], and plastic bottles [23.55% efficient].

Conclusions/Discussion
The reason that the books were the best soundproofing material was that the covers of the books provided a padded layer that made it harder for the sound vibrations to pass through by acting as a dampening layer or a shock absorber. The top three insulators also possessed enough density of insulation to keep the sound from travelling through at its maximum level. The aluminum cans and plastic bottles performed poorly because the structure of the containers allowed for a continuous path for which the sound vibrations to travel.

Summary Statement
The project was a study of the efficiency of 17 different sound insulating materials in a room-like model utilizing three different sound generators.

Help Received
Mother helped in design of board and father helped in the construction of the model

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Nitish Lakhanpal

Project Number
J0220

Project Title
Roll... RUMBLE: An Experiment on the Factors that Affect the Unlocking of Magnetic Potential Energy

Abstract

Objectives/Goals
My objective is to explore the unlocking of magnetic potential energy. Using a magnet-gun, I examined two questions: Will changing the distance between two magnets affect how fast the last ball shoots out? Will using additional magnets affect how fast the last ball shoots out? Correspondingly, the two hypotheses for this experiment are:
Hypothesis 1: As the inter-magnet distance decreases in a two-magnet case, the last ball will shoot out faster. Hypothesis 2: As more magnets are added, keeping the distance between the original outermost two magnets the same, the last ball will shoot out faster.

Methods/Materials
Materials: 5 magnets; 9 iron balls (half-inch diameter); Wooden track (79" long); Tape measure; Wood glue; Spirit level; Pencil.
Procedure:
For hypothesis 1, using a wooden track, two identical magnets were placed 16" apart on the track with two identical iron balls on the far side of each magnet. Another identical iron ball was released from the closer side of the first magnet; this ball was at rest and was just within the magnet's range of influence. When released, this ball was attracted towards the first magnet and eventually struck it resulting in a chain of events that ended in the last ball on the far side of the second magnet shooting out. The distance traveled by the last ball was recorded. 9 more trials were conducted in the same manner, for a total of 10 trials. The measurements from the 10 trials were then averaged. Identical steps were performed for inter-magnet distances of 14", 12", 10", 8", 6", 4", and 2".
For hypothesis 2, the same procedure was performed and the distance traveled by the last ball was recorded in 10 trials with two magnets placed 12" apart. The measurements from the 10 trials were then averaged. These steps were repeated with 3 magnets, 4 magnets, and 5 magnets, without changing the distance between the original two outer-most magnets.

Results
As the inter-magnet distance was decreased, the last ball traveled longer distances, indicating that the ball shot out faster. Also, as the number of magnets was increased, keeping the same distance between the outer-most magnets, the last ball traveled longer distances, indicating that the ball shot out faster.

Conclusions/Discussion
The data support both the hypotheses. My experiment shows that magnetic potential energy can be an eco-friendly way of accelerating objects, such as satellites, in the future.

Summary Statement
This project explored the factors affecting the unlocking of magnetic potential energy by examining the distance traveled by the last iron ball at the end of a chain of events in a magnet-gun.

Help Received
Parents provided transportation and helped in constructing the wooden track.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Steven Leal; Ryan Welker

Project Number
J0221

Project Title
Maglev Trains

Abstract

Objectives/Goals
Hypothesis:
Magnetic levitated trains are more efficient with top magnet support instead of from the bottom

Methods/Materials
To test our hypothesis, we followed the standard steps on the scientific method. We designed an experimental model which included miniature magnetic trains with magnetic support from top and from bottom. Then we included speed, tilt angle, and payload capacity, as variables to compare. We did 15 experiments for each type of train, and we did analysis of the data found in our experiments.
Materials
We used: Neodymium magnets, ferrite magnets, cedar wood, silicone, Krazy-glue, plastic spacers, Plexiglas, electric tape, paint, plastic tube, metal screws, a saw, sand paper, an stop watch and markers for color the model trains.

Results
In our experiment we found that in the three variables top magnetic support was faster by 0.75 seconds, 0 degrees tilted (2 degrees for bottom supported), and the payload was the same for both (10 grams.)

Conclusions/Discussion
Conclusion
Based on the result of our experiment, we concluded that the hypothesis was true
Discussion
We found that the center of gravity was lower in the model with support from top, therefore the train is more manageable and the gravity force acts in the lower part of the train as stabilizer. We also conclude that the length of the train has a direct impact on the levitation and on the horizontal traveling, because: The shorter the train the more unstable, to the point that the magnetic force from the rail can turn upside down the train, and the longer the train the shorter the inertia. For our model, we found that 2½to 3 inches was the optimal train size, and probably is a recommended proportional size for a live size magnetic train in the USA.

Summary Statement
We suggest for the magnetic trains in the USA to consider magnetic support from top and use the gravity force as stabilizer for easier control.

Help Received
Dad helped with power tools, mom helped with typing and driving

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Cameo A. Mahan

Project Number
J0222

Project Title
Environmental Conditions that Affect a Rubber Ball

Abstract

Objectives/Goals
I think increasing the temperature would make the rubber ball bounce higher due to the increase in the flexibility of the material.

Methods/Materials
The materials used were, masking tape, a tape measure, an eight-foot ladder, a Tupperware container with a lid, 12 hollow rubber balls, an oven, a vegetable steamer, a freezer, and a thermometer. I took the 12 balls and numbered them 1 through 12 and paired them for each environmental condition. The pairs of balls were subjected to the following conditions. Wet: submerge two balls in water for 30 minutes in a sealed container. Freezing: submerge two balls in water for 30 minutes in a sealed container. Then remove the balls and place them in the freezer for 60 minutes. Cold: place two balls dry balls in into the freezer at #300 f for 60 minutes. Humidity: place two balls in a vegetable steamer above boiling water for 10 minutes. Heat: put two balls in an oven at 1100 f for 40 minutes. The control balls were left dry and at the room temperature of 680f. After the balls reach the desired state they were removed and dropped from a height of 10 feet onto a concrete patio three times each. I used masking tape and the tape measure to mark a spot ten feet up on the wall and lines six inches apart from the bottom of the wall. The height of each bounce was measured and recoded.

Results
The results of the experiments were that the heated ball bounced the highest at an average of 67.5 inches and the frozen balls bounced the least at 17.66 inches. The control ball averaged a bounce height of 53.83 inches. The balls became more flexible after being heated.

Conclusions/Discussion
My hypothesis was proven correct because in the experiment the heated balls bounced higher than the control balls.

Summary Statement
How will different environmental conditions affect how a rubber ball bounces?

Help Received
Barry Mahan (dad) helped me make the measuring chart on the wall and recorded the height of the balls bounced.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Ryan W. McMorrow

Project Number
J0223

Project Title
Rubber Meets the Road

Abstract

Objectives/Goals
Rubberized asphalt is supposed to reduce noise levels as well as help the environment by using recycled tires as eighteen percent of the asphalt mixture. The purpose of this experiment is to see if rubberized asphalt reduces noise volumes for communities neighboring major freeways.

Methods/Materials
A sealed box was constructed to model the absorption level of each surface and to discover which surface reduced noise most. Four different surfaces were tested; one with wood; one with non-rubberized asphalt; another with 18% rubberized asphalt; and the last with 36% rubberized asphalt. The 18% rubberized asphalt represented as close as possible the real rubberized asphalt used by Caltrans. All the variables were controlled so they could not effect testing.
In addition to the model, two places were picked along freeway 280 to determine if my results accurately corresponded with sound along the freeway; one test site which used regular asphalt and the other rubberized asphalt. The noise level was measured in two ways, the first in the car while driving over each surface, and second readings were taken at 30, 40, and 60 feet from the freeway.

Results
The rubberized asphalt surfaces reduced noise levels sufficiently in the small space for testing because of the rubbers' ability to absorb noise. The wood absorbed very little sound, but more than the non-rubberized asphalt.

Conclusions/Discussion
The rubber reduced the noise levels by absorbing sound. Rubber absorbs sound because soft materials like rubber absorb sound by allowing the sound's pressure changes to use their energy bending the materials. After all the energy is taken out of a sound wave there is no longer enough energy to shift the molecules of the medium it is traveling through. Rubber does not take all the energy from sound waves, but can take a great deal of it.
My conclusion is that rubberized asphalt reduces noise levels and also helps the environment. Because of its ability to absorb noise, rubberized asphalt can reduce noise levels from cars by 2-5 decibels which will help communities near freeways a lot.

Summary Statement
Testing the benefits in noise reduction of rubberized asphalt

Help Received
Mother helped glue down backings on the display board. My father drove me to the freeway test sites and also helped cut the wood.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Aaron John Mendonsa

Project Number
J0224

Project Title
Seismometers: Earthquake Detection Devices

Abstract

Objectives/Goals
Problem Statement: Which seismometer is the most responsive and sensitive? The Lehman or the Earth Movement Sensor?

Methods/Materials
Materials:
· Base: 3/4" plywood approx 12" x 18".
· Pendulum Rod ½ " threaded rod, ~24" long..
· Support Wire Light steel guitar string
· Horseshoe Magnet
· Single Pole Magnet
· Frame A upside down U made of 1" black pipe
Procedures:
The Lehman Seismometer
· After built, pour one quart of damping oil in the vertical and horizontal damping paddles.
· Make sure the pendulum is centered to receive more accurate readings.
· Next, connect the voltage cables to the pickup coil in the originated spots.
· Next, adjust the ohmmeter to the required voltage to get appropriate readings.
· Adjust the chart recorder to the center point.
· Take readings for ten to fifteen minutes.

Results
Forty trials were conducted on both the Lehman and the Earth Movement Sensor devices and the data was represented in a graphical format.The line graph data readings from the Lehman device are far more sensitive and of greater magnitude with differentiated magnetic current values. In contrast, the data from the EMS device, indicates a lower magnitude in terms of magnetic current and does not provide much difference in value.This indicates that the changing magnetic field caused by the bipolar magnet moving over the pickup coil is not sensitive enough to produce very accurate data. On observing the bar graph,the Lehman device is far more active in comparison to the EMS device.

Conclusions/Discussion
This was an extremely good way to experiment with seismology. In conclusion, the Lehman was more responsive and sensitive than the EMS. This was because the Lehman was much better designed and has a stronger magnet.

Summary Statement
To learn and understand how seismometers work and to test the sensitivity to two seismometers.

Help Received
Dad helped with building; and sister took the readings.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Mark A. Rocha

Project Number
J0225

Project Title
Slip and Fall: Determining the Most Effective Non-Slip Surface

Abstract

Objectives/Goals
My objective was to learn which substance would best prevent the shoe from falling off the tile.

Methods/Materials
I used a shoe,tile,(5 tiles w/all different substance surfaces)41/2 ft. wire, bucket, sand, a flat surface, clips, and candle wax as a friction reducer. What I did was put the shoe on the tile and hooked the wire to the hook on the shoe. I added sand to the bucket until the shoe fell off the tile and recorded the amount of weight.

Results
I found that tile mixed with pummice best prevents people from slipping. It took about 12.6 pounds of sand for the shoe to fall of the tile.

Conclusions/Discussion
My hypothesis was correct. It stated that pummice would best prevent the shoe from falling and it did. This project gave my knowledge of what I can do to prevent people from slipping on any surface.

Summary Statement
My project is to determine which surface would best prevent people from slipping.

Help Received
Mom and Dad helped paste and type some of my papers.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Garrett D. Rueda

Project Number
J0226

Project Title
How Does the Nigerian Pot-In-Pot Refrigeration System Perform in the Climate of Ramona, California?

Abstract

Objectives/Goals
This project was to test the efficiency of the Nigerian Pot-in-Pot Refrigeration System. I became aware of Professor Bah Abba's System from an article in Popular Sceince, Jan. 2001. I learned of this evaporation-driven refrigerator used in the desert of Nigeria and how a simple sytem can change lives of towns and even a country. Although it has been qualitatively shown to be a success in Nigeria, no one, including the originator of the system has scientifically gathered data to show the quantitative cooling ability.Therefore, this experiment set out to first build the system using products that could be located in San Diego. This accomplished, the system was tested and temperatures taken daily to quantitate the average temperature maintained and the maximum temperature delta during the warmest days.

Methods/Materials
5 large terra cota pots, 4 small terra cota pots, 1 large saucer/lid, 4 burlap sandbags,5-50 pound bags of Blast Silica Sand, 6 ACURITE thermometers, 1 roll chain link fencing.Pot#1- CONTROL POT, a large pot with burlap cover.Pot#2,#3,#4- small pot placed in large pot with sand in outer well. Burlap covers.Pot#5-Same as #4 with saucer for lid.Pots 3,4,5 saturated with water.For 30 days, temperatures were read at 6am, noon, and 6pm.

Results
At night, all pots reached a temperature equillibrium of the outside temperature. At noon the evaporation of the water in the pots that had the wet sand maintained a much lower temperature. On average, there was a 14 degree C difference bewteen the outside temperature and the system which had wet sand. This translates into a 23.5 degree F difference. In other words, when the outside temperature was 28 C (82.4 F) the pots that had the wet sand had a temperature of 15 C (59 F).

Conclusions/Discussion
The System has now been proven to be capable of lowering the temperature inside the pots sufficiently so that products such as food and medicine can be kept at lower temperatures. The question, "How does the Nigerian Pot-in-Pot System Refreigeration Perform in the Climate of Ramona, California?" can easily be answered. It performs very well.These results have been forwared to Professor Bah Abba in Nigeria, as well as my suggestion for improving the System with a lid to keep insects and animals out. He is thrilled to have a study done on his invention, and I am excited to have made such a good friend.

Summary Statement
To systematically and scientifically measure the performance of the Nigerian Refrigeration System.

Help Received
Professor Mohammed Bah Abba of the Jigawa Polytechnic University of Dutse, Nigeria for the original design, Walter Anderson Nursery for materials, Dixieline Lumber for sand selection and my parents for support

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Peter N. Salveson

Project Number
J0227

Project Title
Anti-Gravity Vehicles?!?!

Abstract

Objectives/Goals

The objective of this project is to test a magnetically levitated car and a wheeled car and compare their results. Each car will be tested in three different tests multiple times. The tests will show results of friction and speed. My hypothesis is that the magnetically levitated car will out perform the wheeled car in all three tests because it does not have any fiction on the bottom of it because it is floating above the track.

Methods/Materials

The materials used to perform the experiment and to build the tracks, cars, etc. are the following.

3 each - plexi-glass panels 8" x 48"
2 each - plexi-glass panels 8" x 8"
1 each - Plastic glue
1 each - Double faced tape
50 each - magnets 1 7/8" x 7/8"
1 each - Plastic sheeting
1 each - Turbine Motor
1 each - Battery
1 each - ON/Off switch
1 each - Carbon Fiber Rod
3 each - Rubber Bands
4 each - Wheels
4 each - ball bearings
2 each - Axels
Balsa wood
Solder
All purpose Glue
WD - 40
Soldering iron
Electric Saw
Hand Saw
Electric Drill
Electric Sander

Summary Statement

This project is about seeing if a magnetically levitated car has less friction and thus be able to travel faster thana wheeled car.

Help Received

My father supervised when I used power tools.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Joshua R. Schroeder

Project Number
J0228

Project Title
Which Bat Has the Most Pop?

Abstract

Objectives/Goals
My objective is to find out which bat has the most pop.

Methods/Materials
5 bats; 3 aluminum senior league bats, 1 little league aluminum bat, and 1 wood bat. To find out which bat has the most pop I rolled a ball down a ramp and let it hit one of the bats. The ball would hit the bat I selected for that use. Then I would measure how far the ball went in millimeters. I repeated this process 5 more times and then chose a new bat.

Results
The Louisville Slugger Air Attack 3 hit the ball the furthest. The Louisville Slugger Gen1x followed the Air Attack3. The Easton Connexion followed it. The Rawlings Wooden Bat closely trailed it, and to cap it off was the Nike Air Barrage.

Conclusions/Discussion
While doing this project I observed that the newest bat isn't always the best.

Summary Statement
My project was finding out which bat would hit the ball the furthest due to the trampoline, or "pop" effect

Help Received
My dad helped engineer the project, my mom helped edit my reports, my brother took pictures, my grandpa helped me work the computer, and my friend lent me three of his bats.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Brianna N. Smet

Project Number
J0229

Project Title
Batters Up

Abstract

Objectives/Goals
My objective is to determine which bat alloy can hit the bat the farthest.

Methods/Materials
The materials needed to accomplish this experiment are; nine numbered flags, a batting tee, a tape measure, the Mechanical Hitting Device, bats, new softballs (one for each bat you test), a pen, paper or composition book, a clipboard, one helper, and finally a big field for testing.

At the field assemble the swinging device onto its base and pick a bat to do the experiment with. Place two hose clamps onto the bat and attach the bat to the mechanical swinging arm. Slide the bat handle down to where it is touching the end of the arm. Then tighten the clamps around the bat handle and the swinging device arm. Get a new ball and set on the tee, so that the sweet spot of the bat will strike the ball. Grasp the bat and pull back until you hear a click. Hold the barrel of the bat with your finger and when ready let go. The first swing is a test, so that you can see if you need to change the height of the tee. Next, put the same ball back on the tee and then repeat the last two steps. Let the ball roll until it comes to a complete stop and then take your first flag and place against the back of the ball, and press into the ground. Repeat with the different numbered flags until you have finished a total of nine trials. Measure from the back of the tee to each flag and record each distance. Unlatch the bat from the swinging device arm by loosening the clamps and repeat all steps until you have finished testing each bat.

Results
The SC777 alloy, the Connexion bat, had the longest average distance of how far the ball traveled after being hit. The wood bat had the shortest average distance.

Conclusions/Discussion
My conclusion is that the combinations of alloys that make up a bat have an important role on how far the ball travels after being hit.

Summary Statement
My project compares the distance of how far the different alloys hit the balls.

Help Received
My mom helped type my report and my dad and one of his co-workers helped me build the Mechanical Swinging Device.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Griffin P. St.Hilaire

Project Number
J0230

Project Title
Effects of Stiffness and Density on a Material's Natural Frequency

Abstract

Objectives/Goals
My objective was to find whether stiffness, density, or both, affected a material's natural frequency.

Methods/Materials
First, I gathered five springs of different stiffness' and eleven different weights. By hanging weights on the end of spring, I determined the natural frequency. I did this by pulling the weights down and releasing them, measuring the spring's vertical motion in cycles per second. I then graphed my test results, finding a mathematical relationship between stiffness to frequency and mass to frequency.

Results
From the graphs of my test data and the equation of each trendline, I made an equation using both stiffness and mass to determine a material's natural frequency. I made this equation so that I would be able to find the natural frequency of any object using it.

My equation was Frequency = 0.346 (stiffness^ 0.4072/ mass^ 0.486)

Conclusions/Discussion
I looked up the real frequency equation in a math book and found that:

Frequency = ½'pi' or 0.159 (stiffness^0.5/mass^0.5).

I found that the equation I had derived was slightly off. Using my equation, I could find the natural frequency of any given structure, such as a fence, bar, or even building. The concentrated mass on the end of each spring represented, and served the same purpose as, the density of any given structure.

Summary Statement
In my project I wanted to find whether stiffness, density, or both, affected a material's natural frequency.

Help Received
Interviewed an Acoustical Engineer, Andy Harris, at BF Goodrich Aerospace. My father Randy St.Hilaire, a Structural Engineer at Northrop Grumman, helped me think of ways to do my experiment, interpret my data, and build my test apparatus.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Mark P. Stainer

Project Number
J0231

Project Title
The Need For Speed: A Comparison of Solar Cells vs. Fuel Cells for Powering a Model Car

Abstract

Objectives/Goals
The objective of this project was to determine the speed of a model car powered by a solar cell vs. a car powered by a hybrid cell (solar cell plus fuel cell) with the solar panel attached at 55 degrees and 0 degrees and traveling in 4 directions (North, South, East, West). My hypothesis was that the hybrid cell with the solar panel attached at 0 degrees would travel faster than the other cells in all directions.

Methods/Materials
I built at model car to race with an engine that could be powered by either a solar cell or hybrid cell (a combination of a solar cell and fuel cell). Both required a solar panel attached to the car. I marked out a track on a straight, flat stretch of asphalt. I allowed the car to accelerate over a 3.66 meter track and then measured its speed in seconds over a 15.25 meter straight track in all four directions (north, south, east, west). I angled the solar panel at either 0 degreees or 55 degrees and repeated the experiment. The cars were each tested 12 times in each direction. Measuremments were obtained with a stopwatch. Temperature and wind direction were recorded. The tests began at 12 noon so the sun's postion would be as directly overhead as possible.

Results
Results showed that the hybrid cell with the 55 degree solar panel was faster than the hybrid cell at 0 degrees as well as the solar cell with the panel attached at 0 degrees and 55 degrees. In fact, the 55 degree hybrid cell was the only car that ran in every direction. The solar cell car had a faster time when it ran, but was very dependent on the direction it was traveling and the position of the sun.

Conclusions/Discussion
The results do not support my hypothesis. The only car to run in every direction was the hybrid cell with the 55 degree panel. The results show that not only is the angle of the solar panel critical , but also the direction the car is traveling in relation to the sun's position at the time it was tested. The fact that the solar cell alone only worked when receiving direct sunlight on the panel is very important to future studies. Air pollution is a huge concern for our environment and we must find an alternative to the polluting fossil fuels. The hybrid cell might be a more reliable source of energy to power a car since it appears to be less dependent on the sun's position.

Summary Statement
My project is about the speed of a model car that is powered by a solar cell vs. a car powered by a hybrid cell (solar cell and fuel cell combination).

Help Received
My father helped me build the model car and test it. He also helped me understand how the hybrid cell worked. My mother helped me assemble my board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Brandy L. Toby

Project Number
J0232

Project Title
Effects of Hardness vs. Softness on Roller Skate Wheels

Abstract

Objectives/Goals

The problem that I wanted to find out is, if you change the hardness of the roller skate wheel, does it affect the outcome of the speed or distance in which it will travel?

I feel that if you test the different types of wheels, it will change the speed. I think that because when you work with different types of hardness or softness the wheel is going to roll differently such as a ball most likely will bounce differently.

Methods/Materials

The procedures are:

1) Obtain a flat even surface that is at least 100 ft or more.
2) Build a ramp.
3) Place the wheel guides. From point A to B= 1 ½ in.
4) Place the wheel guides. From point C to D= 3 in.
5) Obtain different types (soft or hard) of wheels.
6) Place the wheels above the metal gate at the top of the ramp in the guides so when you release the gate the wheels can roll down the ramp.
7) Test each wheel in distance
8) Test wheels in seconds (time each wheel one at a time and record the seconds when the wheel reaches the mark of 20 feet).
9) Record tests.
10) Repeat tests 5 times for each wheel on both time and distance
11) Convert the feet into centimeters
12) Figure the speed that each wheel traveled.

Materials:

1) Different types (soft or hard) of wheels
2) A ramp (pieces to make the ramp are below)
3) 1- 30in. x 55in. piece of plywood # in.
4) 3 # 1in. x 3in. x 8ft. pine boards
5) Cut into pieces of 10 # 1x3x6 in. pine board
6) Cut into pieces of 10 # 1x3x12 in. pine board
7) 1- 2x4 in. x 6 ft. (or x 8 ft.) cut into 2- 2x4x18 in.
8) 1- 4x27in. piece of metal that you can pull up by using it as a gate.

Summary Statement

Testing the effects of hardness vs. softness on roller skate wheels for speed and distance.

Help Received

Dad helped build the ramp for testing, mom helped photograph and product testing, brother helped with mathmatical formulas.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Charles R. Wulke

Project Number
J0233

Project Title
The Effects of Newton's Laws of Motion on an Ancient Weapon, the Trebuchet

Abstract

Objectives/Goals
The objective of this project is to see how the distance a projectile is thrown by a trebuchet (an ancient catapult)is affected; (1) by increasing weight to the counterweight, and (2) by adding wheels to the trebuchet platform.

Methods/Materials
I made a scale model trebuchet. I then made a series of firings of the trebuchet with different weights as counterweights, first with the platform held stationary, and then with the platform free to move on wheels. I analyzed the results in light of Newton's three laws of motion, and formulated my conclusions / explanations.

Results
I discovered that increases in the counterweight resulted in increases in distances that the projectile was thrown. Furthermore, when the platform was allowed to move during the firing, the distance the projectile was thrown increased still more, although not always in a manner I would have predicted.

Conclusions/Discussion
By increasing the counterweight on the pendulum arm, and permitting the platform to move during the act of firing a projectile, the arc of the falling counterweight, in a free-swinging weight basket, is lengthened when compared to the arc of the end of the weighted pendulum arm. This increase in distance the weight falls, by the actions of Newton's Second and Third Laws of Motion, results in an increase in the force applied to the "free" end of the pendulum and the projectile is thrown farther.

Summary Statement
In studying and observing how a trebuchet operates, I learned the relationships between Newton's Law of Motion, and how this ancient weapon generated such awesome power.

Help Received
My family supported me in this project by helping: to build the model; edit the report; and, advise on the arrangement of the display board.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Ricky M. Yacko, Jr.

Project Number
J0234

Project Title
Which Golf Ball Goes the Farthest?

Abstract

Objectives/Goals
My project was to determine the distances that different brands of golf balls travel when hit with equal force, and whether any major differences can be explained. My hypothesis was that for a group of similar golf balls (two piece, durable cover), the more expensive the ball, the greater the distance it would travel.

Methods/Materials
A consistent ball-hitting device was designed and built, tested, and modified for the project. The controls were a stable base, a "stopper rod" to ensure equal force on each hit, and a tee to ensure consistent height of each ball. Three balls of four different brands were hit twenty times each with the device, for a total of 240 trials. The balls were hit onto a sand volleyball court and the distance measured from the tee to the rear of the ball mark in the sand for each trial.

Results
The distances traveled were from 224 cm. to 261.5 cm., a range of 37.5 cm. The Brand D ball had the smallest range at just 20 cm. Brand C had the widest range at 32.5 cm. The longest hit was Brand C, the shortest was Brand A. The cost of the balls was from $16.95 to $24.95 per dozen, with Brands C and D being the least expensive.

Conclusions/Discussion
According to my data and observations, my hypothesis is incorrect. The distance each ball traveled did not increase with a higher cost, and I did not identify any reason for the differences. Number of dimples and cover thickness were not consistent with distance, possibly due to the short distances hit. I learned from this experiment that higher cost does not guarantee greater distance. I also learned that the Brand D (Nike) was the most consistent ball, so it is the ball I will choose in the future for my short game (chipping, putting, etc.).

Summary Statement
My project was to determine which brand of similar golf balls would go the farthest when hit with an equal force, and whether cost was relative to any differences.

Help Received
Uncle welded device to my design and assisted with modifications; Mother showed me how to use Word to set up and automatically update a Table of Contents in my report; Dr. Shevinsky and Mrs. Hamilton reviewed my research and encouraged me to improve the detail.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Matthew M. Zarachoff

Project Number
J0235

Project Title
Does the Size of a Flywheel Affect How Much Energy It Can Store?

Abstract

Objectives/Goals
The purpose of my experiment was to test the relationship between the diameter of different flywheels of equal mass and the energy they each could store. I believe that the larger the diameter of the flywheel, the more energy it will store.

Methods/Materials
I constructed five flywheels of varying diameters and equal mass out of particleboard. I also made a test set-up consisting of a motor with a hub and axle to which I attached each flywheel. I then spun each flywheel at the same speed, as measured by a speed sensor, and measured the energy discharged with a chart recorder. Each flywheel was tested five times.

Results
The largest diameter flywheel consistently discharged the greatest amount of energy, while the smallest diameter flywheel discharged the least amount of energy.

Conclusions/Discussion
The size of a flywheel does affect how much energy it can store. The larger the flywheel diameter, the more energy it stored. Looking at the graph of my results, I was disappointed to see that the energy produced by the largest diameter flywheel did not follow a linear upward slope. This may have happened because there was too much mass taken off this flywheel during the sanding, it ended up with the least mass of all the flywheels.

Summary Statement
My project was about testing the relationship between the size of a flywheel and the amount of energy it can store.

Help Received
Friends and family helped me with machining various parts.

CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Taylor K. Patrick

Project Number
J0299

Project Title
Water Waves: The Ultimate Energy Source

Abstract

Objectives/Goals
I wanted to build a water wave machine that would generate electricity. I wanted to know if bigger waves generate more electricity. I also wanted to see if the number of waves or frequency affected the amount of electricity created. I think that higher waves will produce more electricity and that greater frequency will also generate more electricity.

Methods/Materials
A 32 ft. wave tank was constructed and a paddle device was attached at one end of the tank to generate the wave action. There are three types of devices that can harness electricity from ocean waves. I decided to concentrate on two types: a flotation device and an oscillating water column (OWC).
The bicycle seemed like the logical start because I had to use something that could convert the vertical or seesaw action of the waves into a spinning action that would turn a generator, which would then allow me to see if electricity is created. I made modifications on the bicycle as well as a micro-computer fan and boogie board. Using aluminum and steel pipe I constructed a flotation device. A volt-ohm meter was used to measure the electricity generated.
The OWC design was made after reading about a company specializing in wave energy. Using 4 one-way valves, acrylic pipe tubing,and micro computer fan I constructed an OWC device.

Results
After 150 tests with the flotation device I found that higher amplitude waves produced more electricity. On average the highest amplitude produced the highest voltage up to 1.914 volts. However, frequency was harder to determine. It looked like the mid frequency range produced the most electricity. Frequency was one variable which I had difficulty controlling. Unfortunately, I could not get the OWC to work properly. I found out that if you took the whole system and forced it into the water and lifted it back up you could actually generate enough air pressure to get the fan to move.

Conclusions/Discussion
My hypothesis was partially correct. Higher waves did produce more electricity. However, I could not determine for sure if higher frequency of waves produced more electricity. According to research, if we could harness just .1 to .2% of energy from waves we could supply the world with twice as much electricity it now uses. Why are we still so dependent on oil when we should be developing alternative energy sources?

Summary Statement
I wanted to see if larger waves and/or higher frequency of waves would generate more electricity which was tested by using a flotation device and OWC I designed.

Help Received
Dad and friend assisted me in building the 32 ft. wave tank. Dad help cut the pieces of acylic tubing and to cut the blades off the fan with the rotozip also special cuts so that the fans would fit properly. Parents helped with trials. I needed 3 people to help me with the trials. Mother help review and edit my report.