CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Joseph J.W. Arriola

Project Number
J1101

Project Title
Reflective Materials and Solar Power

Abstract

Objectives/Goals
The objective of this experiment is to compare the reflective values of different products on solar cells. The goal is to determine which product produces the most energy output on solar cells. The product with the greatest reflective value will produce the highest energy output and may be used in the future design and construction of public buildings, residential homes, and possibly transportation in the U.S.

Methods/Materials
A 12x12 inch solar panel was set up outdoors and hooked to an amp meter.The solar panel was placed away from the sun. Nine different materials were strategically placed a foot away from the solar panel at an approximate 45 degree angle to reflect sunlight into the solar panel. The materials consisted of mirror, aluminum, silver photo reflector, white plastic, white ceramic tile, white foam board, plywood, cardboard, and black fabric.The reflective value of each of the products was measured with the amp meter. The experiment was repeated 3 times and the results were averaged.

Results
The silver photo reflector produced the highest miliamp reading. The average was 140.3 milliamps. The mirror tested just behind the reflector at an average of 135.3 milliamps. Next was the white foam board at an average reading of 65 milliamps,then the aluminum with an average of 46.3 milliamps,then the plywood at 43.3 milliamps. The white plastic and white ceramic tile tested at 41.3 and 38.5 milliamps. The cardboard tested at an average of 33.3 milliamps.Finally,the lowest milliamp reading came from the black material at an average of 13 milliamps.

Conclusions/Discussion
The silver photo reflector possessed the most reflective value. It produced the highest milliamp readings.The black material actually decreased the milliamp readings by absorbing the light. The results from this experiment could prove to be important for the future of the building industry. In cold climate regions,roofing and other building materials could be made to absorb sunlight for a more energy efficient design. In warmer regions, building products made with reflective qualities could be made to reflect sunlight off of roofs, producing a more energy efficient building.This same idea could be used to produce alternative energy for cities or states by capturing the reflected light from rooftops of government and commercial buildings via solar panels.

Summary Statement
This project will compare the reflective values of different materials on solar cells.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Taylor M. Avery

Project Number
J1102

Project Title
Will Trapped Air Improve the Insulation of Clothing Materials?

Abstract

Objectives/Goals

The purpose of this experiment was to expand upon the project I conducted last year. Last year, I determined which clothing material would provide the best insulation when subjected to extreme cold. As warm blooded animals, humans must take precautionary measures to protect themselves when exposed to extreme cold. One way to protect the body is by wearing clothing that will reduce the body's heat loss. Last year, I determined that fleece was a better insulator (worse conductor) than leather and denim.

The hypothesis: Trapped air will improve the insulation value of the clothing when exposed to extreme cold.

Methods/Materials

Over a period of approximately four weeks, at periods of two hours each, a vessel containing two cups of water heated to 37 degrees Celsius (C) was placed in a freezer (-20 degrees C). The temperature of the water was read every 15 minutes using a digital thermometer. Ten trials were taken of the vessel without any insulation. Next, twenty trials were taken of the vessel insulated by fleece. Finally, twenty trials were taken of the vessel insulated by two layers of fleece with trapped air (bubble wrap) in between the layers.

Results

The results of the study showed that the average temperatures of each type of trial after two hours in the freezer were:
Baseline (no insulation) -.62 degrees C
Fleece 7.45 degrees C
Fleece and trapped air 10.32 degrees C

It is concluded that the trapped air did contribute to improving the insulation of the fleece. The hypothesis was correct.

Conclusions/Discussion

This result supported the hypothesis that the trapped air would further improve the insulating capabilities of fleece. The temperature of the vessel wrapped in fleece & bubble wrap was the best insulator. This is true because it was the least dense. The atoms in air are far apart, making it a poor conductor. This allowed for less conductivity. While the vessel used was not the best model for a human, nor did it react exactly as a human would, it is important to remember to limit exposure to extreme weather temperatures.

Summary Statement

Will a vessel insulated by fleece and trapped air have a higher insulation value than the same vessel insulated by fleece alone when exposed to extreme cold over a period of two hours?

Help Received

My mother helped to type report and plot graphs and my father helped to assemble backboard.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Desiree B. Bagby

Project Number
J1103

Project Title
The Beet Goes On: Finding the Best Edible Dye

Abstract

Objectives/Goals
The point of my projest was to test whether coffee, beets, spinach, mustard, or blueberries make the best dye. I dyed cloths with these foods and saw which one faded the fastest.

Methods/Materials
My methods for testing were five washes and seven days of sun exposure. After all of this I compared the test subjects to a chart of shades and the shades varied from zero to ten.

Results
While the test subjects all faded throughout the experiment, beets faded the most while mustard faded the least.

Conclusions/Discussion
At the end of my project, I came to find that mustard had the best colorfastness and washfastness. I also found that beets were eaisly washed out and they were eaisly broken down by light exposure.

Summary Statement
The point of my project was to test the dying capablities of various everyday substances.

Help Received
Michael Davis helped with report

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Heather M. Barnes

Project Number
J1104

Project Title
The Effects of Arrhenius Accelerated Aging on O-rings

Abstract

Objectives/Goals
On January 28, 1986 America was shocked by the o-ring malfunction which led to the obliteration of the space shuttle Challenger, and the death of its seven crew members. My project examines the relationship between age and strength of o-rings. I used the Arrhenius equation in this experiment to artificially age o-rings through heating. I compared the strength of artificially aged o-rings to those naturally aged by time and newer o-rings. I applied the Arrhenius equation and calculated the length of time and temperature required to age nitrile o-rings. According to the equation, the o-rings were aged for four and one half years, six years, seven and one half years, nine, ten, fifteen and twenty years. These artificially aged o-rings were tested for strength and elongation against the same type of Nitrile o-rings that were either new or truly four and one half years old.

Methods/Materials
To determine ultimate strength an empty five-gallon (20 liter) bucket was hung from a step ladder by an o-ring. The bucket was filled with sand until the o-ring broke. The weight at which the o-ring broke was recorded. A second test was conducted with an #elongation machine# I constructed. In the elongation device o-rings where stretched until they snapped. The length at which the o-rings failed was recorded to the nearest tenth of a centimeter.

Results
After testing a sample size of two hundred o-rings these were the results. New o-rings failed at an average ultimate tensile strength of 18.1 MPa (29.3 kilograms; 287.1 Newtons). Aged o-rings failed at 5.9MPa to 7.5 MPa. The ultimate strength decreased gradually but consistently with age. For the second test on average new o-rings stretched to approximately 3.9 times their natural length (an elongation percentage of 390%). Aged o-rings were not quite as elastic and stretched to only 3.3 to 3.7 times their original length. The elongation capacity decreased over time.

Conclusions/Discussion
The results of the elongation tests demonstrated that o-rings lose elasticity, don#t stretch as far before breaking, as they age. The results of the ultimate strength tests showed that o-rings gradually lose tensile strength in the first twenty years of aging. All results in these tests show that o-rings lose tensile strength and elasticity over time and may malfunction in use as a result of the aging process.

Summary Statement
This project examines the effects of natural and accelerated aging on o-rings as demonstrated by elongation and ultimate strength tests.

Help Received
Thanks to my dad for helping build my machine (for safety precautions); Thanks to my teacher, who for proof reading my report.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Sean P. Batir

Project Number
J1105

Project Title
The Unseen Enigma: Can Sunscreens and Sunglasses Really Protect against UV Rays?

Abstract

Objectives/Goals
As UV rays from the sun grow more intense due to the deteriorating ozone layer, finding the appropriate UV protection will be important toward safeguarding against the threat of skin cancer. This investigation was designed to find out how sunscreens and protective lenses effectively provide protection against harmful UV rays. Hopefully by performing this experiment, the common household conception that simply applying a bit of sunscreen and protective lenses will protect against UV rays will be either supported or disproved.

Methods/Materials
This experiment was performed with the usage of solar energy beads. Coming in five colors, the beads were separated according to their color and placed into groups of ten. They were then applied with sunscreens bearing different SPF ratings, while others were placed under protective lenses. They were tested upon two different dates in about two hour intervals between 10am - 4:00pm, when the rays of the sun are commonly at their highest intensity. The beads reacted to sunlight, producing different shades of the same color. A UV intensity meter was also used in this experiment to measure the intensity of UV rays as revealed on the card with low, medium or high and is correlated to the SPF ratings from 8 to 70. A scale was then created to quantify these ratings, and they were then recorded and graphed.

Results
From the results of this experiment, the findings suggest that lighter beads required less of an SPF rating than darker colors, while a recently new innovation known as polychromic lenses proved to be better at UV prevention in comparison to polarized sunglasses. Also, it was noticed that by about SPF 45 the results remained the same, regardless of a higher SPF rating.

Conclusions/Discussion
Contrary to popular belief, it was found that using sunscreen and polychromic transition lenses did provide some protection, but they did not totally eliminate all of the harmful rays. Even upon a cloudy day UV rays were just as intense, sometimes even more! Hopefully these findings will encourage scientists to develop more efficient methods of UV protection. As the ozone layer is thinning due to global warming, UV rays will only become more intense until they ultimately prove to become fatal.

Summary Statement
This project focused on determining if sunscreens and protective lenses really do provide maximum UV protection using solar energy beads and a UV intensity meter.

Help Received
Mother helped take pictures; Teachers assisted in providing guidance and support.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Harrison G. Bieker

Project Number
J1106

Project Title
How Does the Species of Wood Used in a Fire Affect the Resultant Temperature Produced?

Abstract

Objectives/Goals
The objective is to determine which wood would serve as the best firewood for home heating. Five different woods were burned in order to test which of the five would produce the greatest temperature.

Methods/Materials
Five different woods (Black Walnut, Pine, Douglas Fir, Oak and Redwood) were ignited from underneath a metal screen with a butane lighter. Each burning five gram wood block was set to burn underneath a beaker of water for two minutes. The temperature was measured using a thermometer which hung into the beaker of water, just above the base. The temperature rise was then measured and averaged after the completion of five trials of each wood.

Results
After the completion of the experiment, the average temperature rises were calculated. The following results were recorded from least temperature to greatest temperature rise: Redwood, Oak, Douglas Fir, Pine and Black Walnut.

Conclusions/Discussion
My original hypothesis was that the "harder" a wood is, the higher the maximum possible temperature that it could produce is. My results and research from my Background Information contradict my hypothesis due to the fact that the maximum temperatures that woods can produce are independent of hardness and density. The experiment that I conducted provided proof of this, for the "harder" woods did not produce a corresponding list of maximum temperatures.

Summary Statement
With the goal of discovering the best firewood in mind, I tested which woods of five different species would produce the greatest maximum temperatures.

Help Received
Mother helped with procedure organization; Father helped cut wood into five gram blocks; Science teacher helped with organization/revision of the report; Bob Devoe, a retired professor and engineer, provided blocks of wood with a 0% moisture content for use in the experiment.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Kate M. Borchard

Project Number
J1107

Project Title
Polyester vs. Nylon: Which Material Is Best for Swimsuits?

Abstract

Objectives/Goals
My objective was to learn if the type of material and care procedures used on swimsuits repeatedly exposed to chlorine affected the swimsuits durability. I believe that the polyester material would be the most durable swimsuit material and that washing in cold water with Woolite would be the best care procedure.

Methods/Materials
Four swatches of nylon fabric and four swatches of polyester fabric were immersed in the local community pool for one hour, four days a week, for approximately eight weeks. Each of the fabric swatches were labeled with one of the four different care procedures and washed with this method after the immersion period. The four different care procedures were: Cold water, cold water with Woolite, warm water, and warm water with Woolite.

Results
I examined the fabric samples under a microscope and looked at four different criteria. The different washing procedures did not seem to affect the polyester fibers, but all the polyester samples did show minimal fading equally. As for the nylon, the different washing procedures did affect the fabric. Washing in warm water alone caused the most damage, shown by the largest amount of fiber changes. The nylon samples washed in cold water or cold water with Woolite showed the least fiber changes.

Conclusions/Discussion
In conclusion, the best care of your suit is to wash it in cold water or cold water with Woolite. Also, the polyester fabric is more durable than the nylon fabric and would therefore last longer.

Summary Statement
I examined what type of swimsuit material and what care procedures were the best for swimsuits repeatedly exposed to chlorine.

Help Received
I used the microscope at Mesa School under the supervision of Dr. Dunn; TYR swimsuit manufacturer provided the fabric samples; my mother helped me design the board; my father helped me with computer difficulties.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Tyler K. Bremer

Project Number
J1108

Project Title
Which Material Blocks the Most Sound off a Simple Drum Roll?

Abstract

Objectives/Goals
The objective of this experiment is to determine which material will muffle the most sound off a drum roll on the snare drum.

Methods/Materials
The materials used in this project were felt, foam, rubber, a sound meter, drum sticks, and a snare drum. Place the sound meter four feet and seven inches away from the snare drum. Put the decibel level on 110 decibels. Monitor the decibel reading of a drum roll with no material on the drum three times. Take the average decibel reading from the three decibel readings. Place the felt material over the face of the snare and monitor the decibel reading three times. Take the average decibel readings of the three decibel readings. Change the decibel reading to 100 on the sound meter then place the rubber material on the drum. Monitor the decibel readings three times with the rubber material then take the average of the three. Switch the decibel back to 110 on the sound meter when placing the foam material on the snare drum. Monitor the decibel readings of the foam material three times then take the average.

Results
Here are the results for the project. Trial one's results for the felt was 104 decibels, trial two's was 103 decibels, and trial three's was also 104 decibels. The average decibels for the felt were 103.5 decibels. Trial one's result for the rubber was 95 decibels, trial two's result was 96 decibels, and trial three's result was also 96 decibels. The average decibels for the rubber were 95.7 decibels. Trial one's result for the foam was 101 decibels, trial two's result was 101 decibels, and trial three's result was 99 decibels. The average decibels for the foam were 100.3 decibels.

Conclusions/Discussion
The rubber material muffled the most sound off the drum roll. It's average decibel reading was 95.7 decibels which muffled the most sound by about five decibels.

Summary Statement
My project was about finding out what material would block the most sound off a drum roll.

Help Received
My brother helped record the decibels.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Anna A. Chen

Project Number
J1109

Project Title
A Method to Quantify the Efficacy of Solvents to Remove Petroleum Contamination from Avian Plumage

Abstract

Objectives/Goals
The purpose of this project was to develop a scientific method to accurately measure which washing solution was most effective in cleaning the petroleum off the birds in an oil spill. Instead of using live birds, a safer and more controlled method was developed.

Methods/Materials
The feathers retain the oil so an experiment was constructed using individual bird feathers dipped in oil. The challenging aspect of the experiment was how to quantitatively compare the effectiveness of each solution, because the feathers are not exactly the same size. The smaller feathers would retain less oil than the larger feathers, so the measure of effectiveness used is the percentage by weight of oil removed obtained by dividing the weight of the oil washed off by the weight of the oil before washing. Thereby, it is possible to accurately quantify and compare the effectiveness of each solvent using different individual feathers.

Results
For the 4 feathers used in the control cases, no change in weight was observed over the duration of the experiment indicating that there were no uncontrolled or external processes that adversely affected the accuracy of the measurements and experiment results. Dawn Dishwashing Detergent, All-free Laundry Detergent, and T-Gel Shampoo proved to be the most effective with 100% of oil removed from among the 10 common household solvents tested.

Conclusions/Discussion
Although Dawn Dishwashing Detergent is traditionally used to wash oil off of birds, it was discovered that T-Gel Shampoo is just as effective and has the advantage of being gentler and eye-safe. The scientific method developed in this project provides an accurate, quantitative method of measuring and comparing solvent effectiveness without any special equipment or risking live birds.

Summary Statement
A scientific method was developed to accurately measure the effectiveness of solvents in cleaning oil off of birds.

Help Received
The pigeon feathers used were collected by Ann Lynch, Director of the South Bay Wildlife Rehabilitation.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Shelby L. Constance

Project Number
J1110

Project Title
Determining How Effective RIT Sun Guard and Scotchgard Are at Blocking UVR after Multiple Washes

Abstract

Objectives/Goals
The objective of my project is to increase a fabrics ability to block ultraviolet radiation (UVR) in sunlight. I believe that the combination treatment of RIT Sun Guard (RSG) and Scothgard (Sg) to fabric will provide the greatest UVR blocking potential.

Methods/Materials
Nine fabrics were tested using 2 different procedures. Fabric samples (2 ½ x 2 ½) were cut and raw edges finished with a serger. For trial #1, 4 unwashed samples of each of the 9 fabrics were attached to a clear page protector sheet. One sample treated with RSG, one treated with Sg, one treated with RSG & Sg and one left untreated as my control. This same process was used for trial #2 using samples washed 2 times, trial #3 using samples washed 4 times, and trial #4 using samples washed 6 times.
PROCEDURE #1: In the dark room a sheet of Black & White Photosensitive Paper was inserted into each page protector sheet, then placed in a contact printer and exposed for 1 second to a 15-watt germicidal lamp. The paper was then developed and compared to a grayscale and all sample areas given a numerical value. This entire process was then repeated and results of both sets of trials averaged.
PROCEDURE #2: Sun-Sensitive Nature Paper was slipped into each page protector sheet and exposed to sunlight for 2 minutes, then a water bath for 1 minute and dried. The developed paper was then compared to a blue scale and given a numerical value. This process was then repeated and the results of both sets of trials averaged.

Results
After comparing the averaged test results of both procedures the most effective treatment after 6 washes was the combination of RIT Sun Guard and Scotchgard on fabrics of 100% silk, 100% cotton, and 97% cotton & 3% spandex. Fabrics which tested to provide the least protection were the untreated control samples of 50% polyester & 50% rayon, and 55% linen & 45% rayon.

Conclusions/Discussion
My conclusion is that both methods of testing proved that a fabric with a high percentage of cotton and silk treated with RIT Sun Guard and Scotchgard will provide the best protection from UVR after multiple washes.

Summary Statement
I tested 9 different fabrics using Black & White Photo Paper and Sun-Sensitive Nature Paper and found that the combination treatment of RIT Sun Guard and Scotchgard on cotton and silk fabrics provided the best UVR blocking after 6 washes.

Help Received
Tamela Ryatt, High School photography teacher, allowed me to use her dark room to conduct my test trials, and my mother helped with typing.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Taylor A. Davis

Project Number
J1111

Project Title
The Effects of Acid Rain on Roofing Materials

Abstract

Objectives/Goals
Objective: The problem that the experimenter investigated was the effects of acid rain on residential roofing materials. The experimenter hoped to discover that clay tiles are the tiles that would be least affected by acid rain. The experimenter#s hypothesis was that all of the roofing materials would be affected by the acid rain. But the clay tiles would be the least affected.

Methods/Materials
Materials and Methods: The experimenter used vinegar to simulate acid rain and tested various types of roofing tiles in solutions with a pH of between 5.0 and 4.0. The tile samples were weighed and compared to a color chart before and after exposure to the acid rain. The vinegar solution was measured using a pH pen before and after the tiles were immersed. Each test was performed three times to simulate repeated acid rain exposure.

Results
Results: The experiment showed that clay and concrete tiles neutralized the acid rain solution better than the other tiles. However both clay and concrete showed a significant change weight and color which was not measured in the other tile samples.

Conclusions/Discussion
Conclusions: Although both clay and concrete performed better than the other three roofing materials, concrete seemed slightly more durable than clay, proving the hypothesis to be incorrect.

Summary Statement
The effects of acid rain on residential roofing materials

Help Received
Gradmother help do trials; Mother helped design backboard

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Kayla A. Doyle

Project Number
J1112

Project Title
Fire It Up!

Abstract

Objectives/Goals
Since my dad is a firefighter I have an interest and knowledge of fire, so for my science project I wanted to see how damages from fire could be prevented. I thought that if I painted the inside of one wooden box with No-Burn Plus, a second with Latex Paint, leave one alone and then light them each on fire for five minutes, then, the No-Burn Plus will keep the wooden box from getting the most damaged by the fire.

Methods/Materials
To test my hypothesis I built three wooden boxes and painted the inside of one with Latex Paint and the other with No-Burn Plus. Then, I filled them all with ten pieces of newspaper. Next, I lit one on fire and recorded the temperatures and my observations for five minutes. After five minutes I had an adult put out the fire and I recorded how the box looked. I did this with all three boxes.

Results
It turned out that the Latex painted box was the most deeply charred and #alligatored# box, which made it the most damaged by the fire. The No-Burn Plus foamed up and prevented deep charring, so it was the least damaged by the fire.

Conclusions/Discussion
By doing this project I learned that No-Burn Plus does prevent fire damage such as #alligatoring# and deep charring. I hope that this project will show people how much of a difference No-Burn Plus makes, and that they use it to safe guard their house.

Summary Statement
My project is about testing a product to see if it can really prevent fire damage.

Help Received
Dad helped with safety issues such as lighting the fire, putting the fire out and nailing the boards together to make the wooden boxes.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Leslie S. Gray

Project Number
J1113

Project Title
Examining the Effect of Pretreating Hair Before Going Swimming

Abstract

Objectives/Goals
My project was to evaluate the effectiveness of pretreating hair prior to going swimming to minimize or prevent the uptake of chlorine/copper which tends to turn blonde hair green.

Methods/Materials
My method would be to pretreat hair by immersing or saturating hair with 4 different variables and then soak them in pool water for 8 hours. I used my own hair that was long and I cut several inches. I chose my variables based on products that use daily: Spray on detangler, a leave-in conditioner, hair gel and distilled water. I had a control in which I did not treat at all prior to soaking in pool water. I soaked in excess of 10 strands of hair for each variable. After soaking the hair I let it dry. I determined the results by measuring the hair strength through a hair stretching method. I ran 10 tests for each variable. I recorded the amount each strand of hair stretched prior to breaking. The hair stretching method involved adding small amounts of weights (rice kernels) until the hair broke. I also recorded the amount of weight the hair strand withstood to it#s breaking point.
Materials included human hair (my own), chelating shampoo, 4 variables (hair gel, Altima leave-in conditioner, Integrity spray on detangler, distilled water), swimming pool water, homemade hair stretching device that was a ring stand and clamp with cup hooks attached to hang hemostats from, 2 pair of hemostats, Triple Beam Balance scale, rice kernels, ziplock bag and funnel.

Results
The results showed that Altima, a leave-in conditioner provided the best protection from exposure to pool chemicals. This conclusion is based on the highest level of the hairs ability to stretch. The hair treated with Altima allowed the hair to stretch an average of 52% of its original length. This was 10% greater than the control, which showed a 42% stretch capacity. The distilled water, Integrity spray on detangler, and hair gel had very similar results to the control with a 40%, 39%, 38% respective stretch capacity.

Conclusions/Discussion
This was an interesting experiment that had mixed results. I was hoping to get a definitive answer to a pretreatment that showed significant results. Although Altima did have the strongest results it was surprising to me that the control (in which I did nothing to) had similar results. Through all the research, I learned that hair is fragile and anything I can do to protect my hair would be smart.

Summary Statement
My project was to evaluate the effectiveness of pretreating hair prior to going swimming to minimize or prevent the uptake of chlorine/copper which tends to turn blonde hair green.

Help Received
Mr. Whittington provided equipment. My mom helped type the report.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Scott K. Hempy

Project Number
J1114

Project Title
Sound Busters: Which Material Best Insulates Sound?

Abstract

Objectives/Goals
The objective was to determine which of nine common materials best insulated sound when tested at a variety of frequencies. I wanted to find which material I could use to further insulate my room, because my family complains when I practice my drums.

Methods/Materials
A PVC pipe, four inches in diameter and four feet long (cut in two foot segments), was used as the testing device. A speaker was secured to one end of the pipe, then connected to a frequency generator. At the other end of the pipe I secured a digital decibel reader. Each of nine materials was placed between the two segments of pipe and the sound level was recorded at six frequencies. This was done to determine which substance insulated the sound traveling from the speaker at one end to the decibel reader at the other end. Each reading was then compared with a control reading when no insulating material was placed between segments and the sound level was recorded.

Results
The hard substances (pine, drywall, plywood and glass) insulted the most effectively. When pine wood was placed in between the segments, it reduced (from the control reading with no substance) the decibels recorded by an average of 38.17 decibels over the six frequencies. Drywall recorded 37.67 average decibels reduced, plywood averaged 36 decibels, and glass averaged 30.83 decibels. The soft substances reduced the decibels recorded as follows: sponge 23.33, bubble wrap 15.33, smooth foam 12.83, egg shell foam 10.67, and packing peanuts 10.00.

Conclusions/Discussion
There was a significant difference between the sound insulating quality of the various substances. The hard substances insultated more effectively. The hard substances reflected the sound back to the source, and less sound reached the decibel reader on the other side of the insulation. The soft and porous materials absorbed more sound, reflecting less of the sound back to the source, but allowing more to reach the decibel reader. Builders use drywall and plywood between rooms for a reason.

Summary Statement
The objective was to determine which of nine common materials best insulates sound at a variety of frequencies.

Help Received
Used a frequency generator under the supervision of Matt Cheresh at Accsense, Inc.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Avery C. Hunker

Project Number
J1115

Project Title
The Heat Is On: Flammability Comparison of Residential Siding Materials

Abstract

Objectives/Goals
Last summer, a wildfire burned towards my neighborhood. We were given orders to evacuate. Luckily, the fire was brought under control, but it made me wonder about the old cedar shingles that cover the front of my house. I designed an experiment to test the flammability of several common residential siding materials: cedar shingles, both old and new; pine siding, composite siding, and stucco siding. Based on my research, I hypothesized stucco and composite siding would be the least flammable siding materials, and pine siding would be the most flammable.

Methods/Materials
I obtained test materials from my home, construction sites, and Home Depot. Using a saw, I cut the siding materials into squares. I traced each square on graph paper. I made a box from fire-rated gypsum board. I nailed each test sample to the gypsum board similar to the way the siding would be nailed to a home. I exposed each test square to a flame for 30 seconds using a propane torch.

Results
All of the samples except the stucco, ignited when exposed to a flame. The stucco glowed red-hot, and the paint scorched, but the stucco never caught fire. I traced the burned areas and calculated the percent that was burned for each sample. Both the old cedar shingles and the pine siding had the greatest percentage of burned area (65% and 67% respectively). There was no significant difference between the two! Composite siding had the second least surface area burned (39%), and the stucco pieces showed only a scorched stain where the flame had contacted.

Conclusions/Discussion
Cedar shingles are rated class "B" and should be more fire resistant than pine siding which has a class "C" fire rating. This was demonstrated by the new cedar shingles, which had a lower average percent burned area than the pine siding. According to the results of my experiment, the age of the cedar shingles increased their flammability. This implies that aged cedar shingles are more similar to class "C" fire-rated materials.

Summary Statement
This project investigated and compared the flammability of various common residential siding materials, including new and aged cedar shingles.

Help Received
Thanks to my father who took me to construction sites to otain the materials for my project. Thanks to Rob McGarvey who provided the materials I needed at the construction sites.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Otana A. Jakpor

Project Number
J1116

Project Title
Do Artificial Nails and Nail Polish Interfere with the Accurate Measurement of Oxygen Saturation by Pulse Oximetry?

Abstract

Objectives/Goals
My objective was to determine whether or not artificial nails & nail polish interfere with the accurate measurement of oxygen saturation by pulse oximetry. A pulse oximeter works by shining light through the nail, so I hypothesized that artificial nails & nail polish would interfere. My purpose is to provide data to aid decision-making by medical personnel faced with caring for patients wearing nail polish with acute asthma. Fumes from removing nail polish can cause asthma to worsen.

Methods/Materials
I did three experiments. In Experiment 1, I tested 23 subjects to find the effect of 6 colors of artificial nails. I left one fingernail bare as a control. I measured the O2 sat on each test finger & subtracted each subject's color reading from their control reading. I calculated the mean change in O2 sat reading, standard deviation, standard error of the mean, & 95% confidence intervals. I repeated this experiment using two different brands of pulse oximeters-Nonin & Nellcor. In Experiment 2, I tested the effect of the same six colors of nail polish painted directly on the nails of 23 subjects. In Experiment 3, I tested the effect of 27 colors of nail polish on one subject.

Results
I found most colors of artificial nails & nail polish have little or no significant effect on the measurement of O2 sat. In Experiment 1 (Nonin), only the wine-colored artificial nails caused a statistically significant drop-only 0.44% +/- 0.42%. In Experiment 2 (Nonin), there were also trivial drops in O2 sat reading when fingers with blue, pink, & white nail polish were tested. These drops were too small to have much clinical significance, especially because the pulse oximeter itself has a range of error of +/- 2 % pts. In both Experiments 1 & 2, the Nellcor pulse oximeter readings did not have any statistically significant change with any color. In Experiment 3, I tested 27 colors of nail polish & found little change.

Conclusions/Discussion
Most artificial nails & nail polish do not interfere with the accurate measurement of O2 saturation by pulse oximetry. This study contradicts the widely held view of uninformed medical personnel that nail polish interferes with the accurate measurement of O2 sat. A Medline search shows no previously published studies on colored artificial nails & pulse oximetry. The colored artificial nail study is original research that I hope contributes valuable new information to the medical community.

Summary Statement
I determined in this study that most artificial nails and nail polish have little or no effect on the accurate measurement of oxygen saturation by pulse oximetry.

Help Received
I performed all experiments for my project. My mother helped me understand the technology of pulse oximetry and lent me her pulse oximeters. My parents helped edit my writing. Mr. Falk, a statistics teacher at Woodcrest Christian School, reviewed my statistical calculations.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Brandon R. Johansen

Project Number
J1117

Project Title
The Flame Game II

Abstract

Objectives/Goals
My objective was to determine which kind of wood gives off the most heat when burned.

Methods/Materials
In my investigation I burned eight different types of shredded wood. When wood burns, it gives off heat to it's surroundings. In my investigation I measured the heat output of the burning wood by placing an aluminum pan full of shredded wood underneath a grate with a pan of water on top of the grate. I got the heat of the burning wood to transfer into the pan of water so I could safely measure the heat given off and compare the different types of wood. After lighting the wood on fire, I measured the water temperature every thirty seconds with a thermometer and recorded the temperature. I repeated the process several times for each type of wood and averaged the results.

Results
When the data I collected was presented graphically, it showed the rate at which the water heated up from the burning wood and allowed me to equally compare the different types of wood. In my data table I also calculated "Max Change", which was the maximum temperature change of the water during each trial. Since the same amount of each type of wood was burned for the same amount of time, Max Change was another way to determine which wood gave off the most heat. As a result of my project, I discovered that Olive gave off the most amount of heat when burned and Mulberry gave off the least amount of heat.

Conclusions/Discussion
I obtained my objective in determining which type of wood gives off the most heat, but my results did not support my hypothesis. My hypothesis stated that eucalyptus wood would give off the most heat when burned, but Olive wood was actually the one that gave off the most heat. I also discovered an interesting relationship when I compared this year's results to my project last year. My project last year was to determine which type of wood burned the fastest, and the results were that Mulberry burned the fastest while Olive burned the slowest. In comparing the two projects, Olive burned the slowest and gave off the most heat, while Mulberry burned the fastest and gave off the least amount of heat. This information could be useful in determining which type of wood has the most potential for use as biofuel.

Summary Statement
Which wood gives off the most heat when burned.

Help Received
My father helped obtain and shred the wood. My mother helped with layout of my display board.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Olivia R. Kuljian

Project Number
J1118

Project Title
Gum Hair

Abstract

Objectives/Goals
My objective was to learn what would remove gum from hair the best; peanut butter, vinegar or rubbing alcohol.

Methods/Materials
I rubbed 3 sticks of chewed Wrigley's Doublemint gum into 3 identical bundles of hair given to my by my hairdresser, Olimpia Avelar*. (*Olimpia had given me a number of bundles; all washed and all from the same person.) I then placed one bundle in a cup of vinegar, one in a cup of rubbing alcohol and rubbed peanut butter into the third bundle. I attempted to comb the hair out of the gum in each bundle and used my observation skills to determine the results. I repeated the experiment using gum from the same pack and hair from the same source.

Results
I was unable to comb out much of the hair in the peanut butter sample; approximately ½ of the hair remained matted to the piece of gum. I was able to comb out more of the hair in the vinegar sample but still approximately 1/5 of the hair remained. In the alcohol sample all but a few strands slipped off of the gum with very little combing. Rubbing alcohol loosens hair from gum the best.

Conclusions/Discussion
The rubbing alcohol acted as a solvent in removing the hair from the gum. It decreased the stickiness of the gum much in the same way it decreases the stickiness of adhesive labels.

Summary Statement
The goal of my project was to learn what got gum out of hair the best; peanut butter, vinegar or rubbing alcohol.

Help Received
My teacher helped me with my hypothesis and resources. My brother, Geddie, and a neighbor, Kasper, chewed the gum; my hairdresser, Olimpia Avelar, gave me the hair samples; my mom proofread and took pictures; my dad helped me glue my pictures on the backboard.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Colin P. Landeck

Project Number
J1119

Project Title
Fleece, Cotton, or Wool: Which Will Keep You Warmest in the Rain?

Abstract

Objectives/Goals
To test which material keeps you warmer when it is wet and which material keeps you warmer when it is dry, by testing which material will best insulate hot water. The materials that to be tested are polyester fleece, cotton, wool and there will be a control with no material used as an insulator.

Methods/Materials
Procedure:
Cut materials to correct sizes. Wrap the material around each yogurt container and secure with rubber bands. Drill a hole into the top of each lid. Fill each container with hot water. Secure lid to container. Lay material circles on top of lid. Every 5 minutes for 50 minutes, remove material from lid, insert thermometer into water through the drilled hole, allow thermometer time to reach the temperature of the water,read and record temperature into Science Log. For #Wet Experiment#, spray each container eight times with spray bottle around the sides and twice on top. Conduct the above process twice for wet and twice for dry and enter data into a chart.
Materials:
Three Yogurt Containers and Lids. One Deep Fry and Candy Thermometer. One 28# x 5# Piece of Fleece, Cotton & Wool & two circles that are 15.17 inches in circumference. One timex watch. Twelve Liters of Water. Six Rubber Bands. One Tape Measure. One Sharpie pen. One pair of scissors. One Spray Bottle.

Results
The results of my experiment show that fleece keeps you the warmest when it is wet and also when it is dry. On average, the fleece-insulated water lost the least amount of temperature both when it was wet and when it was dry. The results showed me that it is warmer to not wear a shirt than to wear a wet cotton shirt. According to the results, if you have no insulation (clothing) you will lose less heat when you are wet than when you are dry. Based on my personal experience, this is most likely due to an error in the experiment.

Conclusions/Discussion
In conclusion, the results supported my hypothesis that fleece would keep you the warmest when it is wet and when it is dry. However, I believe that the experiment might have been slightly flawed because some things that should have been controlled were not. For example, the temperature of the water in the third trial began at 134 degrees but the fleece container started at 130 degrees. There may have been a few errors in measurement of the temperature because the thermometer should have been in each container for the same amount of time.

Summary Statement
Using wet and dry materials (polyester fleece, cotton and wool) determine which insulates hot water best.

Help Received
My parents helped to type the report and to buy the materials

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Seth G. McFarland

Project Number
J1120

Project Title
Structural Protection in Wildfire Hazard Areas

Abstract

Objectives/Goals
To determine which fire retarding treatment would best protect a structure from wildfires.

Methods/Materials
I constructed boxes to test the effectiveness of different fire retardants. I set a torch at three different temperature settings to simulate wildfire temperatures of 260°C, 540°C and 815°C. I put each box into the flame and measured the time it took the treatment to fail (catch fire).

Results
The untreated boxes failed much quicker than any of the other treatments. The treatment of water worked much better than no treatment at the lowest temperature with an average of 238 seconds for water, as compared to 29 seconds. At the higher temperatures, especially 815°C, the water evaporated off very quickly and failed after 32 seconds as compared to the untreated boxes which failed after 22 seconds. The treatment of foam was slightly more effective than water in all of the tests. Foam#s time to failure decreased significantly at 815°C, but still did better than water taking an average of 23 seconds longer to fail. The sodium polyacrylate gel failed after a far longer amount of time than any of the other treatments. At 260°C gel took 695 seconds to fail as compared to foam which took an average of 267 seconds, the second longest lasting treatment.

Conclusions/Discussion
Both foam and gel are nontoxic compounds which work better than water at keeping structures from burning. Foam worked better than water in all temperatures, but sometimes only by a little. The gel protected my test boxes much longer than any other treatment. I have concluded that the best thing to protect a structure from a wildfire would be sodium polyacrylate gel.

Summary Statement
I tested three different fire retardants: water, class A foam, and sodium polyacrylate gel to see which would be most effective in protecting a house from wildfires.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Lauren S. Mittelman

Project Number
J1121

Project Title
Seize That Stain!

Abstract

Objectives/Goals
My project goal was to determine which laundry detergent works most effectively on a pizza sauce stain. I used five different detergents. Besides the detergents, nothing in each trial was changed.

Methods/Materials
MATERIALS
Five two-tablespoon quantities of Tide laundry detergent (liquid), Cheer laundry detergent (liquid), All laundry detergent (liquid), Purex laundry detergent(liquid), and Gain laundry detergent(liquid),
Teaspoon for measuring
Tablespoon for measuring
Twenty-five one-teaspoon amounts of pizza sauce
Twenty-five three-inch by three-inch pieces of cotton
One glass bowl
One toothbrush
One porcelain plate
One digital timer
One water temperature thermometer
Two tweezers
Seventy-five cups of water at 106 degrees Fahrenheit

I hand washed pieces of cotton laundry detergent with pizza sauce stained into the cotton. I mimicked how a washing machine would wash this item by hand. Doing my experiment, I didn't change any aspect except for the laundry detergent. You can see how I conducted each trial by looking at my procedures in my notebook or on my backboard.

Results
My results varied much from detergent to detergent. Each laundry detergent had a specific number which was the average coming from all the trials of that specific detergent. The averages are as follows: Tide-8.2; All-7.4; Cheer-7; Purex-6.2; and Gain-5.4. You can see what the color of each average on my scale of results in my notebook, or on my backboard.

Conclusions/Discussion
My conclusion was that Tide laundry detergent worked most effectively on stains. This might be because the Tide laundry detergent formula leaves out quite a bit of water to make their formula more

Summary Statement
I tested different laundry detergent brands to see which one was most effective on a pizza sauce stain.

Help Received
Mother paid for and bought all supplies; Science teacher answered my questions.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Adrian A. Molzon

Project Number
J1122

Project Title
The Effects of Glass and Plastic Protective Covers on Paper Fading

Abstract

Objectives/Goals
The goal of this project is to measure the effect of glass and plastic covers on the amount of fading of paper exposed to sunlight.

Methods/Materials
The project was done by exposing 4 identical pieces of black construction paper to sunlight for 12 days. Each was either uncovered or covered with a different type of glass or plastic: window glass, museum glass, acryllic plastic, uncovered. The four samples, plus an unexposed control sample, were photographed with a digital camera. The amount of fading was found by measuring the brightness of the digital picture in both RGB and CYMB color scales using Photoshop.

Results
I found that the paper protected by museum glass faded the worst, window glass was second worst, acryllic plastic did second best, and the unprotected paper faded the least. On the CYMB scale, the black faded the most, followed by cyan and magenta (nearly the same) and then yellow, which faded very little.

Conclusions/Discussion
I conclude that using glass or plastic covers to protect construction paper exposed to sunlight from fading is not useful. This is unexpected since I thought that the covers would absorb some ultraviolet light, which I thought caused fading.

Summary Statement
The project measured how different plastic and glass coverings affected the amount of fading when paper was exposed to sunlight.

Help Received
My mother helped with the idea and my father helped me with using Adobe Photoshop to measure the picture's brightness.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Tyler Q. Moon

Project Number
J1123

Project Title
Which Insulation Material Is Better for Homes and Buildings?

Abstract

Objectives/Goals
The objective of my project is to determine whether there are materials that can be more energy efficient when used as an insulation material for homes and buildings. I hypothesized that the fiberglass material would keep heat in the structure the longest.

Methods/Materials
Four structures, of the same size and shape, were constructed from foam board. Three structures were filled with an insulation material that was either R-11 fiberglass, recycled bubble wrap or recycled foam peanut shells. A fourth structure was left empty. A 100 watt light bulb provided the heat source that was applied to each model structure for 5 minutes. The change in temperature was recorded every 2 minutes to see how long it would take to cool down to its original temperature.

Results
Several trials were performned and the time, measured in minutes, it took for each structure to cool down to its original temperature was recorded. The bubble wrap took on average 98.0 minutes; the R-11 fiberglass 104.4 minutes, the foam peanut shells 100.8 minutes and the model with no insulation averaged 66.2 minutes. The results indicate all the materials tested could possibly be used as an alternative insulation material.

Conclusions/Discussion
The project results indicate that the R-11 fiberglass material kept the heat in the model structure the longest and was the best insulator of the materials tested. Therefore, it supported my hypothesis. The data also confirms that use of any type of insulation is better than none at all. In addition, common household materials could serve as potential alternative insulation materials.

Summary Statement
This project tested different materials to determine whether they can be more energy efficient when used as insulation materials for homes and buildings.

Help Received
My dad helped with cutting the foam boards and assembling the light sockets. My mom helped proof read documents. My science teacher provided guidance and support.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Victoria A. Neufeld

Project Number
J1124

Project Title
Lighten Up!

Abstract

Objectives/Goals
The objective of my project was to discover which bulb would shine farther through fog: xenon or halogen bulbs. This project could help save lives by reducing fog related car accidents. I have heard of many car accidents that involve fog and the driver not being able to see an oncoming vehicle. My experiment could help reduce the risk of car crashes on a foggy day or night. If more people chose halogen lights over xenon for fog lights (or xenon over halogen), there would probably be fewer crashes in the fog.

Methods/Materials
I will use a Chevy Suburban, one halogen fog light bulb, one xenon fog light bulb, a measuring tape, a foggy morning, a private airstrip in the country where there is no other lights to interfere with the results, safety glasses, gloves, two covers for headlights, one cover for a fog light, and a red bucket to simulate a traffic safety cone as a visual marker.

Results
After performing the first test (without fog), I found that with a halogen light you could see 194 feet. In the same test you could see only 173 feet with a xenon light. And in the second test (with fog), I found that you could see 170 feet with the halogen light and only168 feet with the xenon. In the third test (also with fog) you can see 240 feet with the halogen and only 207 feet with the xenon.

Conclusions/Discussion
My hypothesis was that you would be able to see farther in fog with the xenon light. After doing several tests, I found that my hypothesis was incorrect because the distances measured using a halogen bulb were consistently greater than those measured using a xenon bulb. Most of the project went well and worked like I had planned. However, there were some things that I would do differently. For example, while doing the experiment the fog would keep moving so I had to do all the steps very quickly so that the test results would be accurate. The next step would be to have a light meter to measure the amount of light that is being shone through the fog. Also, it would be ideal to perform the test in a controlled atmosphere so that each bulb could be evaluated in identical fog conditions.

Summary Statement
My project is about reducing fog-related car accidents and saving lives.

Help Received
Mother helped start car, drive car, take me to the library, and glue board; Grandfather Harold Kindsvater let me use his air strip.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Cameron A. Paskerian

Project Number
J1125

Project Title
Does Turning a Light Bulb On and Off Affect Its Lifespan?

Abstract

Objectives/Goals
Does turning a light bulb on and off every couple of seconds affect its life positively or negatively? My objective is to find out the answer to this question.

Methods/Materials
15 low life 75 watt light bulbs (all same brand), 3 a/c cords, 15 light bulb sockets, 5 "button flashers," 1 Electrical Timer.

Results
Constant On
Bulb No. Elapsed Hours On Hours Off Notes:
1 1724 1724 0 Went off around 8:30am on 4/02/06.
2 1598 1598 0 Went off around 4:41pm on 3/27/06.
3 1665 1665 0 Went off around 5:35pm on 3/31/06.
4 1727 1727 0 Went off around 11:30am on 4/02/06.
5 1406 1406 0 Went off around 4:30pm on 3/19/06.
Average 1748 1748 0

On 1 Hour, Off 1 Hour
Bulb No. Elapsed Hours On Hours Off Notes:
6 2065 1033 1033 Lightbulb still on as of 12:00 noon on 4/16/06.
7 2065 1033 1033 Lightbulb still on as of 12:00 noon on 4/16/06.
8 2065 1033 1033 Lightbulb still on as of 12:00 noon on 4/16/06.
9 2065 1033 1033 Lightbulb still on as of 12:00 noon on 4/16/06.
10 2065 1033 1033 Lightbulb still on as of 12:00 noon on 4/16/06.
Average: 2065 1033 1033

2 Second On/Off
Bulb No. Elapsed Hours On Hours Off Notes:
11 1714 1500 214 Went off around 6:00pm on 4/6/06
12 1627 1424 203 Went off around 3:30pm on 4/2/06.
13 1600 1400 200 Went off around 7:00am on 4/2/06.
14 964 844 121 Light bulb still on as off 11:30am 4/16/06

Summary Statement
My project is about finding the answer to the age old myth that turning a light bulb on and off does affect its life span.

Help Received
Dad helped in paying for electricity bill

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Lauren S. Pierce

Project Number
J1126

Project Title
Don't Let Your Memories Fade Away

Abstract

Objectives/Goals
Digital photography and home-based printing methods now allow anyone to produce photographs. This study examines how the photo printer used, the paper selected, and the image color printed impacts the fading of photographs when they are exposed to UV light in accelerated aging studies.

Methods/Materials
Create a simple digital test image that has three pure color stripes: red, green and blue. Print image using multiple home inkjet printers with their recommended photo paper and multi-purpose inkjet paper. Also, obtain prints from two professional processes. Stress all photographs in a UV chamber and measure their colors over multiple exposure times using a scanner and image processing software to quantitatively determine the degree of fading versus control images. Repeat a portion of experiment using glass photo covers as a means to protect the photographs.

Results
A wide range of fading potential exists in prints from today's home printers. Fade-resistance did not depend very much, however, on whether photo paper or cheaper multi-purpose inkjet paper was used. Professional prints were at both extremes of fade resistance. In addition, the color red was usually the least fade-resistant and the color blue was usually the most fade-resistant across the materials tested. Finally, covering photographs with glass slows the fading process almost completely relative to uncovered photographs.

Conclusions/Discussion
Given the fading tendency of today's photo prints, choosing printing methods carefully for lightfastness and/or covering prints with glass in a frame gives you the best chance of keeping your memories from fading away.

Summary Statement
This study examines how the photo printer used, the paper selected, and the image color printed impacts the fading of photographs when they are exposed to UV light in accelerated aging studies.

Help Received
My parents assisted me in many aspects of this project, though I was the boss when deciding exactly what experiments to do. My mom helped me to obtain all of the supplies and books that I needed. She worked with me to find many light, color, and fading references on the Internet. My dad helped me to understand

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)

Remington J. Rebeil

Project Number

J1127

Project Title

Is UVA and UVB Electromagnetic Radiation Blocked or Filtered Out by Automobile Windshields?

Abstract

Objectives/Goals

The purpose of this project is to investigate whether ultraviolet radiation (UVA and UVB) are blocked or filtered out by windshields of modern automobiles (2000-2006). These wave lengths are dangerous to humans because they can cause photo-aging damage and cancers.

Methods/Materials

Ultraviolet Light Meter- UV Hawk 1
Various Car Windshields
Clock
Compass

Twenty three vehicles were selected from nine various models of modern automobiles. These were from nine different manufactures and five different countries. These automobiles were selected for testing of UVA and UVB radiation through the windshields. A UV meter was employed to read solar-noon hour radiation over a period of one week. Five non-modern cars (1946-1958) were tested for comparison.

Results

Ultraviolet radiation was blocked and filtered out by all nine vehicle windshields in twenty-three tests. There was no UVA or UVB radiation coming through in any of the modern vehicles tested.

Conclusions/Discussion

Ultraviolet radiation was blocked and filtered out by all nine vehicle windshields in twenty-three tests total. (Model Years: 2000-2006) Modern automobiles were chosen because of their availability and new technology. Older vehicles from the 1940's and 1950's that were tested for comparison had UVA and UVB radiation that filtered through the windshields. It is reasonable to assume that all modern vehicles block out UVA and UVB radiation through the windshields and protects the passengers from dangerous UVA and UVB radiation.

Summary Statement

To determine if UVA and UVB radiation penetrates through modern automobile windshields.

Help Received

Grandfather helped to locate automobiles and drive to specific location; Mother helped with lettering board title.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Paige A. Robinson

Project Number
J1128

Project Title
Red! Red! Red! Colorful Plant Dyes

Abstract

Objectives/Goals
The purpose of this experiment was to determine which of three plant dyes would make the best red color on fabric. Up until about 150 years ago natural dyes were the only kinds of dyes used, so I was wondering what might have been used to make the color red. Would fabric type, afterbath, washing, or sun have an affect on the color?

Methods/Materials
1) Choose strawberries, beets, and tomatoes with the darkest red color and make dyes from each of them.
2) Choose three types of fabric (cotton, wool, polyester) and make four sets of fabric, each set with one piece of each type of fabric. One set is the control.
3) Dye one set of fabric with each of the three dye baths. Put the control in distilled water only. Observe color and intensity.
4) Soak each set (including control) in a vinegar afterbath. Observe color and intensity.
5) Wash each set (including control). Observe color and intensity.
6) Dry each piece of fabric in the sun. Observe color and intensity.
7) Compile the data and then draw conclusions.

Results
The strawberry dye solution was close to red in color, but the fabrics were dyed pink. The beet dye was very dark red, but the dyed fabric turned orange. The tomatoes made a light gold dye and dyed the fabric a gold color. Out of the three fabrics, the wool picked up the color the best, then the cotton. The polyester had only very pale coloring, with the most color on the polyester dyed with beets. The afterbath affected the color a lot. It took the color out of the fabric instead of helping the color attach. Washing and sun had little or no effect on color or intensity.

Conclusions/Discussion
Based on my experiment, neither strawberries, tomatoes, nor beets made a good red dye on any of the fabrics. The tomatoes made yellow, the strawberries made pink, and the beets made orange. My hypothesis was that strawberries would make the best red dye but, of the three, the beets on wool was closer to red than the others. Vinegar was not a good afterbath. These plant dyes may be better with an alkaline afterbath. Finally, polyester was not a good fabric choice for these plant dyes. The natural fabrics seem to work better with the natural dyes.

Summary Statement
My project was to determine which of three plant dyes would make the best red color on different fabrics.

Help Received
My mother helped with proofreading, formatting and scanning the photos.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Amanda M. Rodriguez

Project Number
J1129

Project Title
Determining the Crunchability, Floatability, and Stability of Breakfast Cereals

Abstract

Objectives/Goals
My goal for me and my project is for me to go as far as I can. The reason I choose this to be my goal is because I know I tried my hardest doing this project and so far my goal is doing fine.

Methods/Materials
For my science project I am testing the crunch ability, float ability, and stability of breakfast cereals. My test cereals are Cocoa Puffs and Kix . My tests are the crunch tests, the float tests, and the stability tests. For the crunch tests I would take each cereal from an unopened box and pour, drop by drop, drops of milk onto the cereal and determine how many drops it would take before the cereal collapsed .For the float tests I would also take one piece of cereal out of an unopened box and put it in a bowl of milk and time how long until the cereal would sink more then half way below the milk. For my final tests, the stability tests I would again take a piece of cereal out of an unopened cereal box and put plates on the cereal (each weighing a different amount of weight)and record how many pounds until cereal crushed.

The materials needed for this project were:Whole milk, Cocoa Puffs cereal, Kix cereal, Stopwatch, a Bowl, An Eyedropper, A Scale, A Spoon, and Tweezers.

Results
My hypotheses was that the Cocoa Puffs would be overall more stable because of the sugar. I thought the sugar in the cereal would give it more of a stability. In the crunch tests the overall average drops before the cereal collapsed was Kix , ten drops and Cocoa Puffs, nine drops. The overall average in the float tests was Kix, two minutes and thirty five seconds before sinking and Cocoa Puffs, four minutes and two seconds before sinking. In the final tests, the stability tests Kix had an overall average of three pounds before crushed and Cocoa Puffs had an average of five pounds before crushed. My results proved that Kix has a greater crunchability and that Cocoa Puffs has a greater stability and crunchability

Conclusions/Discussion
The results show that my hypotheses was correct and Cocoa puffs was more stable then Kix . One of my observations though was that the sugar in the Cocoa puffs was making the milk chocolate and this gives another reason why Cocoa Puffs is more stable. Some of my observations prove that although I have complete this science project it begins the start of another.

Summary Statement
I am determining whether Cocoa Puffs or Kix is more stable with three types of tests the crunch tests, the float tests, and the stability tests.

Help Received
Teacher helped typed; Teacher helped research

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Mackenzie K. Ruehl

Project Number
J1130

Project Title
Getting Away with Murder: A Study of Forensic Blood Evidence

Abstract

Objectives/Goals
The objective of this project was to determine which blood substitute would best match the spatter patterns and drop stain patterns of real blood, so that a blood substitute may be used in an active investigation. My first hypothesis was that the saline would match blood the closest, especially for the single drop tests. My second hypothesis was that paint would best match the blood in more life-like comparisons, such as the three drop test.

Methods/Materials
The four substances used were water, saline, model paint, and EDTA-preserved (dead) blood, the control variable. No live tissue was used in this project. Each substance was dropped four times from four different heights in one drop, two drop, and three drop successions.

Results
In comparison to blood main drop average diameters, paint diameters were smaller, while those of water and saline were larger than blood. The average spatter diameters of paint were smaller than blood, but the average diameters of water and saline spatters varied from smaller than to larger than average blood spatter diameters. In most cases for drop and spatter diameters, saline averages matched blood averages best.

Conclusions/Discussion
The results upheld my first hypothesis and disproved the second. Overall, saline would be the best blood substitute, although all had problems.

Summary Statement
The objective of this project was to determine which blood substitute would best match the spatter patterns and drop stain patterns of real blood, so that a blood substitute may be used in an active investigation.

Help Received
Dr. Terri Haddix, forensic expertise; Mr. Dolyniuk, supplies and common sense; Dad, insight.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Khaila G. San Juan

Project Number
J1131

Project Title
Effects of Different Fabrics Inhibiting the Passage of Moisture from the Environment

Abstract

Objectives/Goals
My objectives is to do my best in this project. I want to know on which fabric will do the best in precenting the passage of moisture. I also want to know if my hypothesis is correct or not.

Methods/Materials
The materials in this projectare : polyester fabric, cotton fabric, acetate fabric, sponges, small shovel, water , measuring cups,soil, triple beam balance, stop watch, pots. The method that I am doing in my project isto do the procedure ten times for every test variable.

Results
The results that i got when I was done with my project was that the wrapped actate fabric did the best of preventing the passage of moisture. The fabric that did the worse was cotton.Polyester was in between the average rate of acetates average and cottons average.

Conclusions/Discussion
After completing my project i found that my hypothesis was incorrect. My hypothesis stated thatcotton would do the best in preventing the passage of moisture.

Summary Statement
My project is about which clothing would do the best in preventing the passage of moisture on a foggy day.

Help Received
Mr. KeithBerry proof read my papers; Mother helped buy the materials; Father helped with my proceedure

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Ana C. Segovia

Project Number
J1132

Project Title
The Effect of Temperature on the Elasticity of Rubber

Abstract

Objectives/Goals
My project was attempting to discover how different temperature affects the elasticity of rubber. I believed that as temperature gets higher rubber is more elastic and as temperature gets lower rubber is less elastic.

Methods/Materials
My project requires:
-Four rubber balls of the same size but different types of rubber.
-Four rooms with different temperatures.
The four rubber balls were exposed to each temperature for five hours. As soon as the balls were at each temperature the heights of their bounces were measured for twenty five times.

Results
After the balls were exposed to the highest temperature, they had the highest bounces. The height of the balls' bounces decreased as the temperature decreased. After the balls were exposed to the lowest temperature, they had the lowest bounces.

Conclusions/Discussion
Temperature does affect the elasticity of rubber. The higher temperature is, the more elastic rubber becomes and the lower temperature is, the less elastic rubber becomes.

Summary Statement
Changes of the elasticity of rubber under different temperatures.

Help Received
Mrs. Kellie Marcarelli, science teacher, helped giving instructions and supplies needed. Mrs. Heather Nellys, English teacher, helped with the writing. Mr. and Mrs. Kerlick, guardians, helped correcting work.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Kristie M. Tagawa

Project Number
J1133

Project Title
The Hazards of Hard Water

Abstract

Objectives/Goals
My project involves the testing and research of hard and soft water and its cleaning effects on different objects and surfaces. I was interested in this project because the hard water in our house leaves behind visible residue on our showers, dishes and cars. I wanted to determine if the minerals in water affect how clean different surfaces will become. My hypothesis states: if soft water cleans more effectively than hard water, then objects washed in soft water will produce less water stains/residue than those same objects washed in hard water.

Methods/Materials
Firstly, I defined and determined the hardness of three types of water (deionized, hard and soft water). I tested several samples of materials (glassware, silverware, vinyl, ceramic tile and a car body panel) by spraying each sample with each of the three different types of water. Next, I collected data by measuring the amount of residue/stains that remained on the tested surfaces and I recorded and graphed the results of my experiment. I was then able to determine which type of water (hard or soft) cleaned most effectively. The deionized water served as the control.

Results
After analyzing the data, I recorded the results: the hard water left the most visible residue on all of the sample surfaces; the soft water left much fewer stains than the hard water. The deionized water produced the least amount of residue.

Conclusions/Discussion
I concluded that soft water cleans different surfaces and objects the best. Hard water contains many minerals such as calcium and magnesium which leave visible deposits behind. This supports my hypothesis that soft water cleans more effectively and leaves less residue behind than hard water.
If I were to re-conduct the experiment, I would have tested the different types of water on a larger sample of objects, such as clothing, skin, hair and even corrugated surfaces. This project can benefit society in a number of ways. The knowledge obtained could impact many businesses both positively or negatively. For example, car washes, cosmetic industries, restaurants, and even construction markets are all affected by the type of water they use. If consumers are not pleased with their products or services, companies may lose business and their profits could easily suffer. Ultimately, the minerals and contaminants in water can have a direct impact on a business, one's personal life and in the overall health of society.

Summary Statement
My project involves the testing and research of hard and soft water and its cleaning effects on different objects and surfaces.

Help Received
My parents purchased the supplies and test equiptment.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Carol Tran

Project Number
J1134

Project Title
Comparing Effectiveness of Titanium Dioxide with Oxybenzone in Protecting Serratia marcescens against UV Radiation

Abstract

Objectives/Goals
My objective was to use the Serratia marcescens bacteria to simulate a human body in a series of experiments that would determine whether the physical ingredient titanium dioxide in sunblocks or the chemical ingredient oxybenzone in sunscreens is more effective in protecting against ultraviolet radiation.

Methods/Materials
The sunblock and sunscreen tested had been carefully selected so that their only difference in active ingredients would distinctly be titanium dioxide or oxybenzone. Nutrient agar plates were streaked with a diluted Serratia marcescens bacteria solution and allowed to cultivate. Titanium dioxide sunblock and oxybenzone sunscreen were each spread onto separate plastic wrap sheets, which were placed over the bacteria as a protective covering from the ultraviolet radiation that the plates were to be exposed to. Two controls were also created: bacteria that would be exposed to UV radiation without any protection and bacteria that would not be exposed to any UV radiation. Ultraviolet radiation was induced using a germicidal lamp for specific time lengths throughout five trials. The Serratia marcescens were then observed, measured, and compared to identify the sun lotion that was more effective in protecting the bacteria from death.

Results
The titanium dioxide sunblock protected at least 10% more Serratia marcescens bacteria against ultraviolet radiation than the oxybenzone sunscreen. Bacteria growth of those exposed to the ultraviolet radiation without any protection decreased by approximately 50%, while the bacteria growth of those not exposed to the germicidal lamp increased by nearly 20% in most cases.

Conclusions/Discussion
Ultraviolet radiation exposure can result in extremely detrimental effects to living organisms unless sheltered with some form of effective protection. From my results, I can conclude that titanium dioxide is more effective in protecting against ultraviolet radiation than oxybenzone. Titanium dioxide is a physical ingredient that works by physically reflecting ultraviolet photons with its molecules' opacity rather than absorbing the photons as oxybenzone does. Its refractive index, resistance to discoloration under ultraviolet light, and insolubility enhances its stability and ability to protect human skin from the devastating effects of ultraviolet radiation overexposure.

Summary Statement
My project determined that in sun lotions, the physical ingredient titanium dioxide is more effective than the chemical ingredient oxybenzone in protecting against ultraviolet radiation.

Help Received
My mother helped me to cut and paste papers on to my display board.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Luke D. Van Houten

Project Number
J1135

Project Title
Effectiveness of Sunblocks in Reducing UVA Exposure: Sprays vs. Lotions

Abstract

Objectives/Goals
Last summer, my mom was severely burned after applying spray sunblock. That same day, my father, sister and I were not burned at all after using lotion sunblock. The purpose of this project was to compare the effectiveness of lotion and spray sunblocks in blocking UV rays that might cause sunburn and other forms of skin damage. I believed that the lotion sunblocks, Coppertone SPF 30 Lotion and Coppertone Waterbabies SPF 45 lotion would be more effective than spray sunblocks (Coppertone SPF 30 spray and Coppertone Waterbabies SPF 45 spray) at blocking UV rays.

Methods/Materials
I constructed a device from a box that had all of its top flaps removed. I inserted a paper towel roll for the purpose of viewing. I placed UVA detecting beads and a UVA/B detector inside the box. The UVA detecting beads emit colors when exposed to ultraviolet light at about 365 nm. I coated one side of a sheet of acrylic plastic with the sunblock being tested. Then I placed the acrylic with sunblock on the top of the box and took it outside. After the box was outside, I timed for one minute and recorded the results. I did this 32 times (8 trials for each sunblock).

Results
When I tested with the sunblock lotions, the color-changing beads never turned their brightest shades, and only two colors of beads showed any color at all (the blue and purple beads). When I tested with the spray sunblock, the blue and purple beads turned bright blue and purple. Orange beads also changed color. Even some pink beads began to show color. Unfortunately, the UVA/UVB detector, although not inexpensive, was not high quality enough, not sensitive enough, to give many readings when either spray or lotions were used. I also tested with just the acrylic plastic (no sunblock) as a control. When I tested the controls, the bead colors exhibited included blue, purple, pink, yellow and orange. I timed the beads# response from when I unveiled them to the sun to the point when they reached their full colors. In the control trials the beads took only approximately 5 seconds to reach their full colors.

Conclusions/Discussion
Based upon the results of my tests, the sunblock sprays and lotions were both able to block UVA rays. However, the sunblock lotions appeared to be much more effective in blocking UVA rays than the sunblock sprays. I would recommend sunblock lotions be used to prevent sun damage and not sunblock sprays.

Summary Statement
This project tests the effectiveness of sunblock lotions versus sunblock sprays in blocking UVA rays.

Help Received
I would like to thank my family for their wonderful assistance and support. I would also like to thank my science teacher for her ideas and suggestions. Lastly, I would like to thank the Mintz family for allowing me to borrow their UV detector for my experiments.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Jacquelynne D. Vaughan

Project Number
J1136

Project Title
Where Did the Sound Go? A Study in Sound Absorption

Abstract

Objectives/Goals
The objective of this experiment is to study what materials make the best sound absorbers. It is hypothesized that out of all the materials being tested, fiberglass will absorb the most sound because of its soft composition and porous surface.

Methods/Materials
In each test of the experiment, the interior of an L-shaped tunnel was lined with a different material. An instrument tuner was placed at the closed end of the tunnel, generating a note. The sound was recorded by an MP3 Player at the open end of the tunnel. All sound files were analyzed on a computer, using three different software audio meters. The materials tested included carpet, fiberglass, cardboard, terry cloth towels, open-cell foam, and wood.

Results
The results indicated that the fiberglass absorbed the most sound, followed by terry cloth towels, open-cell foam, carpet, cardboard, and wood. The results did support the original hypothesis.

Conclusions/Discussion
It is shown that soft and porous materials do absorb sound better than hard and smooth materials. In the fiberglass's case, it most likely reflects much of the sound inside itself, therefore allowing the sound to die out as it loses energy. This would happen because fiberglass is made of many tiny fibers of glass which, when seen at their level, are hard and reflective. Sound would reflect into the mass of fibers and bounce around inside of it until it dissipated. Other absorbent materials probably act in a similar way.

Summary Statement
The purpose of this project is to find out what kinds of materials are best at absorbing sound.

Help Received
My father helped build the tunnel and set up the software used.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Lakshmi D. Vijanderan

Project Number
J1137

Project Title
Can You Feel the Heat in Your Feet?

Abstract

Objectives/Goals
My goal for this project was to find which sock material best insulates your feet.

Methods/Materials
Materials: different sock materials (cotton, wool, polyester, nylon, acrylic), 1 dozen water bottles, centigrade thermometer (Celsius), corks, water, and clock.
Methods: I heated the water bottles up to body temperature (37.0 degrees celsius), placed the different sock materials over each bottle, and observed how the temperature of each bottle went down over 1 hour after the socks were put on. Then I repeated same procedure for all the sock materials.

Results
The water temperature in the bottles without socks(my control) dropped from 37 degrees celsius to an average of 31.3 degrees celsius in one hour.
The water temperature in the bottles with cotton socks dropped from 37 degrees to an average of 31.9 degrees celsius.
The water temperature in the bottles with polyester socks dropped from 37 degrees to an average of 32.6 degrees celsius.
The water temperature in the bottles with wool socks dropped from 37 degrees to an average of 33.7 degrees celsius.
The water temperature in the bottles with acrylic socks dropped from 37 degrees to an average of 33.0 degrees celsius.
The water temperature in the bottles with nylon socks dropped from 37 degrees to an average of 32.7 degrees celsius.

Conclusions/Discussion
I found that wool best insulates your feet because the temperature of the water in the bottles with wool dropped the least. Acrylic ranked second. Polyester and nylon ranked third and had about the same results. Cotton insulated the least. My control bottles (no socks) lost the least amount of heat.

Summary Statement
Which sock material best insulates your feet.

Help Received
Mrs. Mary Beth Hodge(teacher) helped advise

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Kaitlin Wilcox

Project Number
J1138

Project Title
Fishing for Relief: A Remedy for Ichthyosis

Abstract

Objectives/Goals
Ichthyosis is a human skin disorder which causes unusual dryness, discomfort, cracking and occasional bleeding. Various remedies and lotions can be used to alleviate the symptoms of Ichthyosis. The objective of this project was to determine which lotion was the most effective at keeping the moisture within gelatin, which acted as simulated skin.

Methods/Materials
The materials included 10 tablespoons of each of six different lotions, 10 tablespoons of petroleum jelly, 40 Petri dishes, and 3 boxes of Jell-o brand gelatin. Into each Petri dish, 50mL of gelatin was cast and chilled. Two tablespoons of each of the lotions and the petroleum jelly were applied separately in a thin layer on top of the gelatin in each dish. As the control, five dishes of gelatin had no lotion or petroleum jelly applied to them. The dishes were weighed after 1 hour, 2 hours, 3 hours, 4 hours, 8 hours, 12 hours, 24 hours, and every 24 hours thereafter, for 14 days. The amount of weight lost over time for each dish was attributed to water loss. The dish which lost the least amount of water would be considered the best at retaining moisture in the gelatin, or simulated skin.

Results
Eucerin Plus proved to be the most effective lotion with its samples losing the smallest percent of weight, 4.4%, after two weeks. Vaseline Intensive Care samples lost the largest percent of weight, 47.8%, after two weeks. The control dishes lost slightly more than 70% of their weight.

Conclusions/Discussion
Of the six moisturizers tested, Eucerin Plus lost the smallest amount of weight after two weeks. Eucerin Plus had an ingredient in it that differed from the others called alpha-hydroxy acids. I believe that the alpha-hydroxy acids were responsible for the superior water retention in the gelatin and therefore would be the most effective lotion to use in order to relieve the symptoms of dryness associated with Ichthyosis.

Summary Statement
The project compares the effectiveness of various lotions on retaining moisture in gelatin (simulated skin).

Help Received
Mother helped with Excel chart formatting; Mr. Kim (Science teacher) oversaw project production.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Christopher M. Williams

Project Number
J1139

Project Title
Which Battery Brand Best Meets the Accuracy Challenge?

Abstract

Objectives/Goals
My robotic team discovered that the accuracy of the robot's performance decreased as it repeated its task on the challenge course. My objective was to determine if one particular brand of battery would assist the robot in performing at a consistent rate.

Methods/Materials
I built one Lego robot and programmed it to complete a test run that constisted of moving up a straight course with a 10 degree slope making three stops occuring at .5, .6, and 3.4 second intervals. I marked and measured the distance at Stop 1, Stop 2, and Stop 3 on a sheet of paper that ran along side the course. Testing three brands of batteries, I used each brand in the robot for a total of 30 runs. At Stop 1 of the first battery brand, I found the difference in distance between each of the 30 runs and calculated an average. I did this for Stop 2 and Stop 3. After totaling those averages per battery brand, I compared all three battery brands to each other. This allowed me to find the brand that varied the least and would be the most effective battery to use.

Results
The most consistent brand of battery was Kirkland with an average variance of 3.653". Duracell followed at 3.937" and then Energizer at 4.308".

Conclusions/Discussion
Batteries do not all provide power at a consistent rate. This variance creates a problem when the robot must be accurate in stopping at a precise point on its robotic course. The results of this experiment suggest that I should use Kirkland batteries in my future robotic challenges.

Summary Statement
During a robotic challenge, the brand of battery being used might affect the accuracy of the stops the robot makes on its course.

Help Received
My mother typed part of the project, recorded data as I measured, and assisted in board layout. Mr. Hodges and Mrs. Nelson, science teachers at the intermediate and high schools, critiqued my project before this competition.

CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Andrew L. Zellman

Project Number
J1140

Project Title
A Study of Performance Fabrics: Staying Warm Wet or Dry

Abstract

Objectives/Goals

I would like to determine which fabric, commonly used in outdoor performance clothing, is the best insulator that will keep me the warmest while I am camping and hiking. Since it is often cold and raining when I go camping, my project tests the fabrics in both dry and wet conditions.

I evaluated seven fabrics, two wools (worsted & knit) and five specialty polyester fabrics made by Malden Mills. I hope this experiment will be of benefit to me and my fellow campers in selecting the best clothing for cold and rainy environments.

Methods/Materials

Use the Boxcar software to launch the HOBO data logger; setting the reading interval at 15 min. and the start times. Wrap each jar with an 18cmx36cm performance fabric. Heat ten liters of water to 50°C, pour 900 mL of water into each jar. Put on lids and place sensor through the lid. Put the jars on the insulating pad in the refrigerator. Plug the temperature sensors into the Hobo data logger. Turn on fan. After four hours, unplug the sensors from the Hobo data logger and plug the data logger into the computer and download data to Boxcar software. Repeat the Dry Trial experiment for a total of four replicates. For the Wet Trial, add 30mL of 20°C water to each fabric before placing jar in refrigerator. Perform a total of four replicates. Export all data to Excel to create data tables and charts.

Results

Thermal Pro was the best insulator in the dry trial of the seven performance fabrics tested. Following the Thermal Pro, the three Polartec Classics and the wool knit fabrics performed about the same. In the lowest tier, the worsted wool and Power Shield performed about the same as the control.

In the Wet Trial, wool knit was the best performer closely followed by the Polartec Classic 300. Both of these easily outperformed the other five fabrics.

Conclusions/Discussion

Polartec Thermal Pro was clearly the best at insulating in the dry experiment. My first surprise was how well the wool knit performed compared to the four Polartec fabrics. In the wet trial, the wool knit surprised me again. It came in first over-all. Polartec Classic 300 placed 2nd followed by Thermal Pro. Thus, I learned that in cold and dry weather, I will be happiest in my Thermal Pro jacket. But, if it is cold and rainy, I will go out wearing a wool knit (and a rain coat). I may have found the key to being both a warm & happy camper.

Summary Statement

I evaluated seven performance fabrics to determine their relative insulating capabilities under dry and wet conditions.

Help Received

My teacher, Amy Talbot, helped organize my project. Malden Mills provide the Polartec fabrics. My mother helped with the board. My grandmother loaned me the jars. My dad loaned me the data logger and showed me how to create graphs and tables in Excel.