CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Peter John L. Abanto

Project Number
J1301

Project Title
Which Material Can Insulate the Most Sound?

Abstract

Objectives/Goals
Objective: The experiment's purpose was to figure out what of the four materials (cotton, styrofoam, acoustic foam, and cardboard) is the best sound insulator.

Methods/Materials
Materials and Methods: The experiment contained 100 trials for each material, including the control (no material). Boxes were padded with 5cm thick of each material and a cell phone was placed inside the boxes as the sound source. The phone inside was called 100x per material and control. The amount of decibels that escaped the box were measured by a decibel reader.

Results
Results: Acoustic foam insulated the most sound with an average of 19 decibels blocked. The remaining materials, from least to greatest decibels insulated, were cardboard, cotton, and secondly styrofoam. The means of sound insulated was that cardboard insulated 13dB, cotton insulated 16dB, and styrofoam insulated 18dB from the control. The percent of decibels insulated from the control was 22% for acoustic foam, 21% for styrofoam, 18% for cotton, and 15% for cardboard.

Conclusions/Discussion
Discussion: From the experiment, acoustic foam proved to be the most effective sound insulator out of the four materials. The fact that the acoustic foam was made of foam, had a corrugated pattern, and was porous , reduced the sound waves' volume. Sound insulation is important in everyday uses, like building houses, and using it in special rooms (band, restaurant, and theatre houses).

Summary Statement
This project was conducted to see which material (styrofoam, cardboard, acoustic foam, and cotton) would be the most effective sound insulator.

Help Received
Cousins and brother helped with the reports, uncle cutting the materials, teacher let me borrow a decibel reader, brother helped in suggestions of the project

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Trevor Bianchi; Andrew Grogin

Project Number

J1302

Project Title

How Does the Temperature of a Golf Ball Affect the Distance It Travels When Struck?

Abstract

Objectives/Goals

Our objective was to determine whether the temperature of a golf ball affects its distance when struck. Our hypothesis was that a heated ball will travel further than will a colder ball, because a warmer ball becomes more elastic when heated, causing it to rebound further off an object when struck.

Methods/Materials

To determine how the temperature of a golf ball affects the distance when struck, we set up a backdrop with centimeter increments. We cooled one dozen golf balls to 5 degrees celsius (41 degrees fahrenheit), heated one dozen golf balls to 37.7 degrees celsius (100 degrees fahrenheit), and left a control group of one dozen golf balls at room temperature. We then dropped each set of golf balls from a height of 2.5 meters from a ladder onto a cement slab and recorded how high the golf balls bounced using a video camera. We then analyzed the data to determine how the temperature of agolf ball affects its distance when struck.

Results

Our graph showed that the warm golf balls bounced 216 centimeters on average when dropped from 2.5 meters, the room temerature golf balls bounced 200.25 centimeters on average, and the cold golf balls bounced 174.4 centimeters on average when dropped from 2.5 meters. We concluded from this experiment that a warmer golf ball will bounce higher, causing it to travel more distance when struck and a colder golf ball will bounce lower, causing it to travel less distance when struck. Our hypothesis seems to be correct, because we thought that the warmer golf balls would bounce higher.

Conclusions/Discussion

We believe we got the results we got because the colder an object becomes, the less elastic it is. The greater elasticity that an object may obtain when it gets hot causes the ball to compress more, causing it to bounce higher and rebound more. We discovered that the warmer a golf ball is, the further it will travel when struck. We think that this is very useful information to any golfer because weather varies and temperature can change, and if golfers know that when when it is cold, the ball won't travel as far, they can make a decision to change clubs. This can benefit golfers to know this fact because they can improve their game by increasing their knowledge of their game, thus, improving their score. If a golfer has a certain distance to the hole, this information is crucial to create a smart and skillful shot.

Summary Statement

How does the temperature of a golf ball affect the distance it travels when struck?

Help Received

None

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jenna Brandt

Project Number
J1303

Project Title
Better Balloons: Creating Balloons with Eco-Friendly Materials to Reduce the Harm of Latex and Mylar to Aquatic Habitats

Abstract

Objectives/Goals
The objective was to construct balloons that biodegrade in water faster than Latex or Mylar balloons to reduce the harmful impact to marine and freshwater habitats.

Methods/Materials
Research was conducted online to find seven alternative materials which meet ASTM D6400, ASTM D6954-04 and/or EN13432 standards for biodegradability. These materials, along with Latex and Mylar, were tested for four months to see how well they biodegraded in sea and pond water. Balloons were made by cutting two circular pieces of each material and ironing the edges. They were tested to see if they held helium, and whether and how well they floated. The materials tested were: Bag to Nature (made from a "blend of organic biopolymers which degrade completely and are fully biodegradable and compostable"), BioBag (a corn-based product, made from "starches derived from plants, vegetable oils, and compostable polymers"), BioTuf (made from recycled plastic and is 100% compostable), Cello Bags (made from "clear, 100% compostable cellophane, a cellulose product derived from wood fibers"), Natural Value (recycled plastic which "returns the organic carbon back to the natural bio-cycle"), NaturBags (made of "biodegradable polymers, natural polymers, organic and inorganic materials which are reactively blended"), and PrideGreen (made of recycled plastic and "degrades, then biodegrades, on land or at sea").

Results
Cello Bags biodegraded the best in both sea and pond water. All materials except Mylar and Natural Value showed some biodegradation. Natural Value held helium and had the longest elapsed time suspended in air, 170 minutes. PrideGreen held helium and floated for the second longest time, 101 minutes. Biobag and NaturBags floated for only a few minutes. BioTuf, Bag to Nature and Cello Bags did not float.

Conclusions/Discussion
PrideGreen was the most successful alternative material overall. It held helium for 101 minutes, but when tested in a larger size was able to float for much longer. It is made from recycled materials and showed some biodegradation. Surprisingly, it could be tied and then untied, making it reusable, a capability neither Latex nor Mylar balloons have. Cello Bags was by far the best at biodegrading, but did not float. Cello Bags could replace the Mylar balloons which are attached to sticks and placed in potted plants. These materials show promise for new, earth-friendly balloon options. Better Balloons!

Summary Statement
The purpose of this experiment was to construct balloons that can provide earth-friendly alternatives to Latex and Mylar and reduce harm to marine and freshwater habitats.

Help Received
My parents supervised me when I was using the iron.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Christopher E. Chan

Project Number
J1304

Project Title
Best Shields against Electromagnetic Radiation

Abstract

Objectives/Goals
The objective of this experiment is to measure how different objects shield against electromagnetic radiation emitted by cell phone towers, high tension wires, electrical poles, and radio towers.

Methods/Materials
Five walls of the same size and shape were constructed from Douglas Fir wood, each insulated with different materials to comply with the Los Angeles 1-2 Family Residential Building Code and materials that could block radiation. A High Frequency Electromagnetic Field (EMF) meter was used to measure the amount of dBm's (decibels per milliwatt) one inch from the center of the walls. The measurements were repeated five times behind five walls and once without walls at ten and fifty feet from eight poles (two electrical poles, two radio towers, two high tension wires, and two cell phone towers).

Results
The following poles are listed in order from highest to lowest average amount of electromagnetic radiation that was emitted (in dBm): cell phone towers (-27.35;-28.34), high tension wires (-41.57;-41.16), electrical poles (-49.52;-47.39), and radio towers (-46.72;-46.75).

The following walls are listed from average best to worst shield against electromagnetic radiation (in dBm): galvanized sheet metal (-43.28;-43.75), EMF shielding foil (-42.44;-43.74), grounded wire mesh (-42.04;-42.63), aluminum foil (-41.41;-42.12), and standard wall with R13 insulation (-40.68;-42.01).

Conclusions/Discussion
The galvanized sheet metal was the best shield against electromagnetic radiation. This proves that simple, inexpensive modifications to walls can provide protection to people who are exposed to poles that emit electromagnetic radiation.

Summary Statement
Lining standard walls with additional material increases the amount of protection against electromagnetic radiation emitted by eight different poles.

Help Received
I appreciate my father's help withsafely constructing the five walls and driving me to the testing sites.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Janel M. Cuevas

Project Number
J1305

Project Title
Oven Evolution

Abstract

Objectives/Goals
The experiment's objective is to find a more environmentally friendly household oven. To achieve that, the experiment will test four different ovens, three with different reflective materials, and a control oven that is all black. It is predicted that the oven with the aluminum reflective material will work more efficiently on heating up and heating up the meat.

Methods/Materials
The experiment uses many tools such as three different specialized thermometers, recycled pots holding the meat, environmentally friendly reflective materials, recycled boxes, and beef franks.

Results
The result of the testing were unexpected, and the hypothesis failed. The testing came in two parts; "Part One" testing done before Regional Screening, and "Part Two" testing conducted between Regional Screening and City Fair. "Part One" results were that the soda can oven works more efficiently for heat control, while the Mylar was the oven that worked more efficiently with meat. During "Part Two" of testing, the results shifted, and it was shown that the soda can oven worked more efficiently for both heating up the oven, and cooking the meat product.

Conclusions/Discussion
The experiment proves that you can use any recycled house hold object such as Soda Cans to make an everyday energy-efficient household oven. Doing this more often proves that we have the capability of using resources as recyclable materials to create a common tool.

Summary Statement
Finding an energy efficient household oven.

Help Received
University of California San Diego Sustainabiltiy Center; Kristin Hansen (UCSD Sustainability Program

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Maxwell O. Dawson

Project Number
J1306

Project Title
Insulation Innovation: Putting Phase Change Materials to the Test

Abstract

Objectives/Goals
The inspiration to do this project came to me because my mother is always cold, and I wondered if there was a way to amend that. The purpose of this project was to see how PCMs can compare to conventional insulation, and if PCMs could replace the insulation we use every day. A phase change material (PCM) is a material that absorbs and releases large amounts of heat at its melting point. My hypothesis was that a double layer of PCM would insulate more effectively than a single layer. I also hypothesized that a liquid PCM with a low melting temperature around a solid PCM with a higher melting point would not be efficient at insulating an object.

Methods/Materials
For my experiment, I used three clear plastic boxes of concentric size. I used two sets, but the experiment could be done with one. I used about 0.5 kg of three microencapsulated PCMs with melting temperatures of 6 C, 24 C, and 37 C. I used two digital thermometers with probes, silicone, a drill and 0.635 cm drill bit, and safety goggles. I used a notepad to record results during the experiments. I placed a thermometer probe inside the inner box, through the holes in the tops of the boxes. After filling each box with the appropriate PCM, I filled the inner box with water. I recorded data every five minutes for one hour.

Results
I recorded a total of 192 readings from 16 different experiments. I performed eight experiments at each ambient temperature. In the -18 C environment, the PCM 37 around the PCM 24 insulated the water most effectively. In the 55 C environment, the double layer of PCM 24 insulated the water most efficiently.

Conclusions/Discussion
In general, my hypotheses were supported by my results. PCM 37 around PCM 24 resulted in the least temperature change with exposure to -18 C. I also discovered that a double layer of PCM insulated more effectively than a single layer. I believe more tests should be performed to confirm my results. From packaging to clothing to electronics to building materials, PCMs have many applications that have yet to be explored.

Summary Statement
I tested a new material called a PCM and its properties.

Help Received
Dawn Mantz at Microtek Labs donated PCMs; Father supervised; Mother purchased supplies; Science teacher guided me.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Chloe C. Ding

Project Number
J1307

Project Title
Cost-efficient Fire Fuels

Abstract

Objectives/Goals
The objective is to find out the most cost efficient fire fuel.

Methods/Materials
Five burning materials (pine, oak, charcoal briquettes, lump charcoal, fire logs) were split into separate groups of $1.25 for each trial. A thermometer probe was hanging over the fire with the main unit on a chair nearby. Another thermometer was placed 10 meters away from the fire. The material was burned in a fire pit and the temperatures from the thermometers were recorded every five minutes to see how much the temperature changed. The length of time that the material burned was also recorded.

Results
The average burning time of charcoal briquettes, fire logs, lump charcoal, pine, and oak were 168.33, 166.67, 136.67, 131.67, and 120.00 minutes, respectively. The average temperature increase of pine, oak, charcoal briquettes, fire logs, and lump charcoal were 10.22, 9.52, 9.47, 8.96, and 6.79 degrees Celsius, respectively. For this experiment, the sum of the temperature increases of all the time points was used to represent the total heat each material gave out. The total amount of heat produced by the charcoal briquettes, fire logs, pine, oak, and lump charcoal were 359.85, 322.57, 286.07, 266.65, and 190.23, respectively.

Conclusions/Discussion
jk.\\The hypothesis of this project was that oak would give at least 8% more heat than any of the other options, but pine had the highest average temperature increase which was 7.35% more than the next highest average. The charcoal briquettes had the highest total heat and produced 11.56% more heat than the second highest, the fire logs. Though charcoal briquettes did have the longest average burning time, it was only 1% longer than the fire logs, as opposed to the predicted 5% in the second half of the hypothesis. Based on these results, charcoal briquettes are the most efficient choice. They have the longest burning time and the highest total heat output and their average temperature increase is only 0.75°C lower than the average temperature increase of pine.

Summary Statement
This experiment was conducted in order to find the most cost-efficient fire fuel based on the burning time and temperature.

Help Received
My mom saw me through the entire project and gave me plenty of good advice

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Sarah K. Douglas

Project Number
J1308

Project Title
Can't Touch This: A Study of Latent Fingerprint Detection

Abstract

Objectives/Goals
My objective was to determine how the latent fingerprint revealing technique of dusting would be altered by the powder applied to the print, and whether these prints revealed through the dusting technique would be more or less legible than when revealed through the vacuum metal deposition method. I also tested whether these methods would work better on porous or non-porous surfaces.

Methods/Materials
Six subjects each applied their fingerprints four times to six different surfaces ranging from porous to non-porous. The prints were revealed through one version of the metal deposition technique and three versions of the dusting technique, the latter method using three different types of powder. Once visible, the prints were compared to the subject's ink prints, the control, and were then rated according to how many ridge characteristics were visible and whether the print could be correctly matched to the subject's ink one.

Results
The vacuum metal deposition technique was less effective than all three versions of the dusting method. As I predicted, porous surfaces were hard to find prints on, but it was relatively easy to reveal and retrieve prints from non-porous surfaces, such as glass and aluminum foil.

Conclusions/Discussion
I realized that dusting, an older method of latent fingerprint detection, was more effective than the new, more expensive method of vacuum metal deposition. This information is beneficial to those who work in the crime scene industry, as many are on a tight budget and will now know not to invest in the newer method of vacuum metal deposition when the older method, dusting, still works much better.

Summary Statement
I investigated various forms of latent fingerprint detection methods on a variety of different porous and non-porous surfaces.

Help Received
Mother helped cut pages for my board; Used vacuum chamber at UCSB under the supervision of Nancy Eisenmenger.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Julia R. Freeman

Project Number
J1309

Project Title
UV or Not UV: How Does the Type and Color of a Material Affect Its Ability to Block UV Radiation?

Abstract

Objectives/Goals
My objective was to determine how the type and color of a fabric affects how much UV radiation can get through it.

Methods/Materials
I cut and tested 2#x2# swatches from each of 64 fabrics, namely, eight different colors (red, orange, yellow, green, blue, purple, black, and white) of each of eight different fabrics (all available at JoAnne#s Fabrics: Costume Satin (100% Polyester); Country Classics (100% Cotton); Cozy Flannel (100% Cotton); Dance/Swim Fabric (87% Nylon 13% Spandex); Kona Cotton (100% Cotton); Party Taffeta (100% Acetate); Quilter#s Only Solids (100% Cotton); and Symphony Broadcloth (65% Polyester 35% Cotton)) . I attached the swatches to a poster board in a way that allowed #UV Fastcheck Strips# to be inserted behind a single layer of cloth. After exposing the board to sunlight for 3 different time intervals, I compared the Strips to a #UV Fastcheck Chart# (Strips and Chart are available from uvprocess.com) to determine the amount of UV permitted through the fabric. I repeated this process five times and calculated averages of the data found.

Results
UV Average in mJ per color (all fabrics combined) at each time interval (5 min, 30 min, 60 min): Red (5.63, 25.35, 37.25); Orange (11.63, 39.5, 51.56); Yellow (21.13, 66.63, 115.29); Green (7.38, 30.31, 57.69); Blue (9.81, 53.81, 92.38); Purple (12.81, 58.88, 102.88); Black (1.75, 14, 24.38); and White (22.25, 71.94, 117.06).
UV Average in mJ per fabric (all colors combined) at each time interval (5 min, 30 min, 60 min): Dance (2.75, 12.81, 19.38); Symph (19.5, 79.56, 116.63); Kona (5.25, 20, 30.54); Quilters (9.63, 47.25, 74.44); Taffeta (30.5, 114.6, 207.69); Flannel (0.75, 4.75, 9.75); Country (17.88, 61.81, 95.88); and Satin (6.13, 19.63, 44.19).

Conclusions/Discussion
I found that within each fabric type, the colors black and red blocked UV radiation the best, and that the next best colors were orange and green. I also found that when the results for each color were combined on a per fabric basis, the Cozy Flannel and Dance/Swim fabrics blocked UV radiation the best, and that the next best fabrics were Kona Cotton and Costume Satin. These results supported my hypothesis in part, and helped me obtain my objective. Knowing which fabrics and colors block UV best helps people to make better choices of UV protective clothing.

Summary Statement
My goal was to determine which fabrics and which colors of fabrics block UV radiation best.

Help Received
My mom helped me get all the materials I needed, and she helped check my work.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Brian A. Friedenberg

Project Number
J1310

Project Title
The Amazing Power of OLEDs

Abstract

Objectives/Goals
The goal of this study was to see how the thickness of the emissive layer affects the amount of light output of an Organic Light Emitting Diode (OLED), and to see how the chemical used as the Hole Transport Layer (HTL) affects the light output.

Methods/Materials
Glass coated with a common anode called ITO, was cleansed in water and isopropanol. The 4 drops of a common HTL called PEDOT:PSS was pipetted onto the cleansed glass, while the glass was on the spin coater. The glass was spun at 1290 rpm. The glass was dried with a hot plate and then an emissive layer called Red Diamond 620s was spun coated on, and then dried. The cathode template was stuck on, and then a common cathode called Gallium Indium Eutectic was pipetted on. The cathode cover was stuck on, and then a little bit of HTL and emissive layer was taken off using acetonitrile. The power supply was attached to the anode and the cathode and the power supply was turned on. Measurements of photoresistance were taken using a multimeter hooked up to a light dependent resistor. Measurements were taken every 30 seconds for 10 minutes.

Results
When the spin speed of the emissive layer was increased from 1290 rpm to 2448 rpm there was a 76% decrease in light output. When the HTL was changed from Low Conductivity PEDOT:PSS to High Conductivity PEDOT:PSS there was a 12.4% decrease in light output. One of the devices made with the Low Conductivity PEDOT:PSS as the HTL did not turn on at 6V, the voltage used to turn on the other OLEDs. None of the devices made without an HTL turned on.

Conclusions/Discussion
1290 rpm is a better candidate for spin speed when spin coating the emissive layer because it had a 76% higher light output than the devices with emissive layers spun at 2448 rpm. The High Conductivity PEDOT:PSS is a better candidate as an HTL because more devices worked for the High Conductivity PEDOT:PSS compared to the Low Conductivity PEDOT:PSS, even though the High Conductivity PEDOT:PSS had a 12.4% lower light output than the Low Conductivity PEDOT:PSS.

Summary Statement
OLED devices were made by varying the spin speed when spin coating the emissive layer, also various chemicals were used for the Hole Transport Layer, and the effect on light output was measured.

Help Received
Stephen Clemmet # CEO of Polymertronics, provided OLED components and advice on OLEDs. Bay View Optics provided ITO coated glass and PET substrates. Dad helped with editing and was the Adult Hazards Supervisor. Mom helped with backboard and editing.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Rachel P. Hallmark

Project Number
J1311

Project Title
Exploring Rust Prevention

Abstract

Objectives/Goals
I tested to see what household substances would be the best at preventing rust.

My hypothesis is that that the oil and cornstarch mixture will prevent rust the best because, according to my research, oil does not mix with water and the cornstarch will make the oil thicker causing it to stick to the steel better than oil alone.

Research indicates that corrosion of steel via rust is very costly to our societies and can endanger lives. New ways of preventing rust can possibly can both money and lives.

Methods/Materials
I explored multiple substances as barriers to rust on 30 5cm long 6.35mm diameter steel rods. I cleaned and labeled each rod and tested the following four substances: vegetable oil, a vegetable oil and cornstarch mixture, sunscreen and melted candle wax. Six trials for each condition, and a control, were tested. For six days I sprayed the pieces of steel with water in the morning and evening. After six days, the amount of rust created was measured by asking three family members to estimate what percentage of the steel below the 3cm mark had rust.

Results
My results showed the oil and cornstarch mixture was the best at preventing rust vs. the other conditions.

The median percentage of steel covered with rust for the control condition (no additional coating) was 71%, the median for the oil and corstarch mixture condition was 1%, the median for the wax condition was 9%, the medion for the oil was 14%, and the median for the sunscreen was 38%.

Conclusions/Discussion
There are multiple household substances which can be applied to steel to prevent rust, but a combination of substances (such as oil and cornstarch)w as the most effective. Exploring ways to prevent rust through combining low cost substances could be effective at both preventing rust in real world applications and saving money through improved longevity of things made from steel.

Summary Statement
I tested to see what household substances prevented rust the best.

Help Received
My father, mother and sister assisted by estimating the percentage of rust on each rod of steel. My father cut the steel rods for me. My mother melted the wax for me. .

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jessie M. Houng

Project Number
J1312

Project Title
An Equal Degree

Abstract

Objectives/Goals
The objective of my project is to determine which of the four metals tested in the experiment,(Copper, Aluminum, Stainless Steel, or Carbon Steel) would conduct heat best. As you can see, these metals are inexpensive, as

Methods/Materials
The four metals used were Copper, Aluminum, Carbon Steel, and Stainless Steel bars of equal dimensions. A bottomless water-bottle cap was sealed with silicon glue onto the end of each metal. Small slits were made into all four cups using a utility knife. Each metal bar was able to fit perfectly through the slits horizontally. When a support was placed under the bars and leveled with each of the slits, water was poured into the cap. The disposable cups were filled to the top with ice and the timer began. Over a ten minute span at one minute intervals, change in temperature of the water was measured and recorded with a surface thermometer. The average and direct change in temperature per metal was recorded and compared.

Results
Copper's performance in the three trials tested astounded me. It(averaged)decreased the water's temperature by 23°F over the 10 minute span. Aluminum's performance also greatly surprised me. Instead of doing poorly like I had expected, it had an average decrement of 20.1#°F. Carbon Steel proved well also. It had an average decrement of 8.3°F, not bad compared to Stainless Steel. Speaking of Stainless Steel, it came up last with an average decrement of only a 2.5°F change over the 10 minute interval.

Conclusions/Discussion
Copper was, overall, the best conductor of the four metals. That proved that at least one of my hypotheses is correct. On the other hand, Aluminum's performance proved my second hypothesis incorrect. It's performance was just a tad worse than Copper's. I had expected its performance to turn out poorly because of its porous structure and that people bought Aluminum foil because it was indeed cheap. Finally, Stainless Steel and Carbon Steels' performance also proved my hypothesis wrong. I had expected the results to be too close to make out. However, the Carbon Steel's temperature decrements were much greater and much steadier than that of the Stainless Steel.

Summary Statement
This project was conducted to find out which common metal would conduct/dissipate heat most efficiently.

Help Received
Uncle helped cut metals to equal dimensions; Mother helped lay out board; Father helped word report by giving fragments on what is expected of the project; teacher assigned project in the first place.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Charlie N. Hunt

Project Number
J1313

Project Title
The Insulative Qualities of Home Roof Types

Abstract

Objectives/Goals
The objective of this experiment is to measure the insulaltive qualities of home roof types and foundations relative to maintaining constant interior temperatures in homes.

Methods/Materials
Six model houses, of identical size and shape: 20 inches wide, 21 inches tall, and 22 inches deep, with 3 different roof types: Living roof (sod), solar roof (reflective aluminum sheeting), and standard composite shingle roof. For each roof type we tested flat foundation on soil against 6-inch deep basement. I put a thermometer in each of the 6 houses and recorded temperature inside the house every 2 hours.

Results
Living roofs had the best insulative qualities, and kept the average temperature between 1 and 2 degrees cooler than the other roof types. Solar proved to have the second most effective insulative qualities. However, the difference between solar and composite shingle was only .45 degrees. That was a much smaller differential than between the living roof and second place aluminum reflective sheeting.

Conclusions/Discussion
My conclusion is that the living roofs are the most effective insulative roofing material. Basements contribute insulative qualities, but to a substantially lesser degree than the differential between roofing types.

Summary Statement
This project measured insulaltive qualities of home roof types, and foundations relative to maintaining constant interior temperatures in homes.

Help Received
I received help from a friend with the correct tools to build the houses.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Rami Lieberman

Project Number
J1314

Project Title
Biomimetics and the Lotus Effect

Abstract

Objectives/Goals

Many living organisms have microstructures and nanostructures that allow them to have sophisticated effects in order to create structural colors, hydrophobic properties, adhesion properties, etc.

The objective was to identify which of those structures are only due to the textures created by these organisms in order to be able to copy them and then be able to mass produce them with embossing or casting techniques onto films in order to have new novel technologies and materials such as self cleaning displays (cellular phone displays, TV displays, glass panes, windshields, etc)

Methods/Materials

Procedure:
In order to copy the lotus leaf structures we used a UV curable lacquer and a room temperature curable silicon. The experiments needed for the lacquer and silicon are as follows:
UV curable lacquer: With a UV light the lacquer was cured on top of the leaf structures and then peeled from it.
Silicon: At room temperature the silicon lacquer was cured on top of the leaf structures and then peeled from it.
The experiments and testing consisted of 50 trials in total.

Materials:
1.Live Lotus plant 2.Dried Lotus leafs 3.Motion Picture F/X Company (silicon) 4.Radcure (lacquer) 5.UV light 6.Dropper 7.Funnells 8.Plastic cups 9.Weight Scale 10.Scissors 11.Tape 12.Microscope 13.Gloves 14.UV light protective goggles 15.Long Sleeve shirt 16.Acitate sheets

Results

1.- That the ideal mix for the lacquer is 40% dilution in order to obtain the best replication.
2.- After twenty minutes of curing the replication quality remains the same.
3.-The more pressure the better the replication.
4.- The micro and nano structures can be replicated and mass produced in films
5.- The mass produced films keep the same properties as the original micro or nano structures

Conclusions/Discussion

Conclusions:

Summary Statement

Identifying and copying nanostructures of living organisms in order to mass produce them onto new novel materials and applications such as; military, medical, industrial, commercial ones, etc.

Help Received

My mother helped me organizing everything; My dad helped me with ideas and some of his equipment; Mrs. Rines my advisor helped me fixing all sorts of things

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Alyssa R. LoGalbo

Project Number
J1315

Project Title
Testing the Radiation Shielding Potential of Residential Walls

Abstract

Objectives/Goals
The purpose of my science fair project is to determine the radiation shielding potential of residential walls; how well residential walls protect from gamma radiation.

Methods/Materials
Using a radiation source (Tc-99m), a survey meter (Ludlum model 3-98), and a home-made caliper, I measured the attenuation and thickness of various walls. I took a second measurement at each location without the wall. I calculated the transmission ratio factor, percent change and HVL (Half Value Layer) for each wall and analyzed the results to see how well the walls shielded the radiation.

Results
Some residential walls blocked greater than 50% of the radiation and had relatively small Half Value Layers (10-20 centimeters thick). The walls with standard 2x4 wood construction performed the best of residential walls tested.

Conclusions/Discussion
I found that walls with the most common type of construction - 2x4's with dry wall - shielded greater than 50% of radiation projected on them. This was a better than expected result and leads me to conclude that residential walls of this nature have a fairly high shielding potential against gamma radiation.

Summary Statement
This project determined how well the walls in our homes protect us from gamma radiation.

Help Received
Mother helped set up board, Dr. LoGalbo acquired & supervised the handling of radiation source, Dr. Weidlch helped with HVL fomula

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Madison A. Marks-Noble

Project Number
J1316

Project Title
A Green Solution to Reducing Cooling Loads on a Building, A Two-Year Project

Abstract

Objectives/Goals
My goal was to determine the effectiveness of passively conditioning a building in the San Joaquin Valley of California.

Methods/Materials
I built two scale model roofs using the following materials: normal wood constructing materials (plywood, galvanized sheet metal, asphalt shingles, and 2x4s), nails, and z-purlins. I also used two sensored thermometers and an infrared heat gun. Roof's orientation was northern exposure. Temperatures were measured daily (or 2x daily) at the following locations: roof, roof deck, and attic space of each roof. The duration of the test was 1 year.

Results
I found the temperature of the attic space in the engineered air channel system (EACS) was around 10-20 degrees C lower than the composition roof. Generally, these results were the same throughout the duration of my testing.

Conclusions/Discussion
My results showed that I discovered that natural convection generally reduced the attic space by 10-20 degrees C depending on the season.

Summary Statement
This project explores the use of natural convection to passively reduce temperatures in buildings.

Help Received
Father helped with construction and advised on testing; Engineer advised on content of project board.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Tovah H. Popilsky

Project Number
J1317

Project Title
What's Hot and What's Not

Abstract

Objectives/Goals
The goal of my project was to learn what everyday material is the best thermal insulator. My hypothesis was that the hay would insulate the best because hay has good climate control.

Methods/Materials
First, I built six uniform boxes out of pine wood and placed a polycarbonate insert inside of each box. Then, I filled each box, between the inner wall of the wooden box and the insert, with its designated insulator. Then each box was heatd up to 100 degrees fahrenheit with a hairdryer and a stopwatch was started. Once the thermometer read 70 degrees fahrenheit, the time was recorded then converted to seconds. This was preformed for five trials.

Results
The results proved that the Aluminum Cans insulated the best. The insulators ranked in this order: Aluminum Cans, Hay, Fiberglas, No Insulation, Shredded Paper, then Wood Chips.

Conclusions/Discussion
By conducting my experiment, I learned that Aluminum Cans was the best thermal insulator from the materials I tested. I also learned that my hypothesis that Hay would insulate the best, was invalid. There were many ways I could have improved my project in a few ways. First, I could of tested eco-friendly insulators. I also could have figured out the average cost of each material.

Summary Statement
In my project, different materials were tested to determine which one was the best thermal insulator.

Help Received
Mother helped construct boxes.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Renee L. Serota

Project Number
J1318

Project Title
Operation: Burn It

Abstract

Objectives/Goals
To determine the effect of wood composition on burning rate. Determining which woods burn faster, and why.My hypothesis was if I test my selected five woods, the softer and less dense woods will be the fastest to burn.

Methods/Materials
Woods chosen : Redwood, walnut, pine, oak, and fir. Each test used the same 5 woods. I performed three tests, in the first I burned 1 piece of each wood10"by2"by1" in a fireplace using equal amounts of kindling and newspaper, for one hour, recording the percentage of blackened every ten minutes until completely burned. In the second test I used the same size woods in one fire,comparing the original mass to what was left after 2 minute increments for each piece of wood. The third test I used much smaller pieces-5"by 1/4by1/4", burning them individually with flame applied to one end of the stick.

Results
My experiment dissproved my original hypothesis. In two of my tests it was walnut, which is a dense wood, that burned the quickest.

Conclusions/Discussion
I realized that there were other factors beside density that determine burn rate. I looked up chemical components of the wood, and saw that walnut contains phenol that may have helped it to burn faster, however, oak also contains phenol, and was the slowest burning of the woods. Because all three tests did not show the same results I conclude that there is no one factor for determining burn rate. The density, water content, and chemical composition of wood are variables in determining burn rate.

Summary Statement
This is an exploration of the effect of wood composition on burning rate comparing five types of wood.

Help Received
Father provided wood samples cut to size, Mother supervised burning of woods.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Paulina R. Shearer

Project Number
J1319

Project Title
Visualizing the Effect of Various Materials on the Magnetic Field

Abstract

Objectives/Goals
The project objective was to determine how ferrous and nonferrous materials affect the magnetic field, if at all. In addition, I wanted to capture a visualization of this effect.

Methods/Materials
The materials utilized were various ferrous and nonferrous materials, two large magnets, one bottle of iron filings, and a custom-built Plexiglas, cardboard, wood, and paper box. I added iron filings to the box, positioned a magnet underneath, and placed some material covering over the magnet. I then activated a pager motor I had attached to the bottom of the box in order to vibrate the paper so that the iron filings would align with the magnetic field. I gathered quantitative results - photographs of the resulting field for each material - and converted them into a table.

Results
My data did not support my hypothesis. Both ferrous and nonferrous materials affected the magnetic field. In fact, I saw something untirely unexpected. The thickness of the material obstructing the magnet seemed to determine the effect on the magnetic field. These results were determined by closely examining the photographs of my data.

Conclusions/Discussion
My hypothesis was that ferrous materials would affect the magnetic field more the nonferrous materials. However, when I performed my experiment, the resulting data did not support my hypothesis. I found that both ferrous and nonferrous materials affected the magnetic field. I also found that the thickness of the materials used in my experiment seemed to have the most influence over the results. For example, cast iron blocked out all the magnetic field lines for both magnets. Thin plastic, however, had little to no effect whatsoever on the magnetic field. Yet thick plastic seemed to have the same effect has cast iron. To further this investigation, I would focus specifically on testing material thickness.

Summary Statement
My project is about determining how ferrous and nonferrous materials affect the magnetic field, if at all, and if I can see the extent of this effect.

Help Received
I received help from my father with understanding circuitry, creating my poster, and building my box (power tools use, spray paining, prototyping box ideas).

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Kevin A. Tavangari

Project Number
J1320

Project Title
String-Cup Telephones

Abstract

Objectives/Goals
The goal of my project was to determine the best combination of string and cup materials and thread or wire length used in creating a String-Cup Telephone, also known as a Tin Can Telephone, would result in the greatest output volume.

Methods/Materials
Aluminum cans, plastic cups, and paper cups were three conventional cup materials I used in the project. I tested 5 and 10 meter lengths of steel floral wire and 100% cotton thread as the string materials. To perform my experiment, I used a computer installed with a software that generated different frequency tones which was connected to an speaker as the output for the different tones, at 196 Hz and 392 Hz. I placed one end of the constructed String-Cup Telephone (there was a total of 12 possible combinations) one centimeter away from the speaker, secured to the ground. The opposite cup of the telephone contained a microphone placed 3.5 centimeters inside the cup, which was connected to another computer installed with a software that recorded sound using the external microphone and plotted the volume levels in Decibels, which I later converted to Sound Pressure Level (SPL), which is the deviation of the sound pressure from the atmospheric pressure. Each test measured ten seconds of data for each of the 12 combinations, and for each low and high frequency, which were all tested three times. The highest Decibel level throughout the ten second recording was documented and converted to Pascals.

Results
The 5-meter length of cotton thread combined with an aluminum can created the greatest low-pitched output volume, at an average .1867 Pascals, or Newtons per meters squared. The 10-meter length of cotton thread combined with an aluminum can created the greatest high-pitched output volume, at an average .2018 Pa.

Conclusions/Discussion
The experiment data suggests that on average, cotton thread combined with an aluminum can generates the greatest output volume. My hypothesis stated that an aluminum can combined with 5 meters of steel wire would create the greatest volume. The hypothesis was partially incorrect. Essentially, aluminum cans were the most effective, and plastic cups the least. 5 meters of cotton thread combined with a plastic cup with a high frequency tone had the overall lowest output volume of all, and the opposite with 10 meters of cotton thread combined with an aluminum can transmitting a high frequency tone.

Summary Statement
The Testing Of Which Combination Of String And Cup Materials And String Length Will Create The Greatest Output Volume In A String-Cup Telephone.

Help Received
Sister helped play tones across the room.

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Jack A. Vecchio

Project Number
J1321

Project Title
Science: Kindling for the Mind

Abstract

Objectives/Goals
The objective of this experiment is to see if the structures of different wood samples cause them to burn differently. And mainly to see which wood produces or gives off the most heat when burning.

Methods/Materials
The method of this project was to test the wood samples in a Perkin Elmer TG/DTA. A simple but effective Pyris program was used to run the tests. This experiment is designed to test the rate in which the sample burns and how much heat the sample gives off. The materials needed are wood samples such as Adler, Balsa, Birch, Cherry, Eucalyptus, Oak, Pine, Poplar, Red Oak, Redwood, Spruce, and Walnut.

Results
The Eucalyptus sample started to burn at the lowest temperature, but the Redwood sample burned for the longest and produced the most heat. The sample that burned the fastest was Pine. The results were very clear and helped to discover which wood sample produced the most heat. It was also a clear difference between how the softwoods burned and how the hardwoods burned.

Conclusions/Discussion
Some clear conclusions are that the original hypothesis that Hardwoods will produce the most heat is false. Redwoods are softwoods that produced the most heat. The second hypothesis that softwoods will burn at the fastest rate was true. This is because Softwoods have very low densities so there is less wood to burn.

The reason Redwoods and Eucalyptuses were tested in more depth is because when they were tested they produced to exothermic peaks, in other words they had two burn stages. It was discovered that this occurs when testing the non-knot region of the wood. It is unknown why this occurs when testing the non-knot region. The knot region is where there is different material to make branches.

Summary Statement
The project examined a variety of woods to see if the structure of wood affects how it burns.

Help Received
Used TG/DTA at UCSD under the supervision of Dr. Kenneth Vecchio

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Helena R. Washburn

Project Number
J1322

Project Title
Comparing High and Low Quality Exterior Paints Combustion and Burn Rate of Wooden Structures

Abstract

Objectives/Goals
The purpose of my project was to determine if the time it took for a wooden structure to catch fire and burn changed based on the price of the paint used. I wanted to know if paying more money for higher quality paint meant getting a safer paint or if the lower priced paint would have more fire resistance.

Methods/Materials
I used Valspar paint at $14.99 a quart and Olympic at $10.99 a quart. I used 30 identical wooden bird houses; 10 will be unpainted for the control, 10 will be painted with Valspar and 10 with Olympic paint.I attached a bird house to a metal stand using a wire and then placed an oil lamp directly beneath with a 3 inch space between the lamp and house. I lit the oil lamp then started a stop watch to time combustion and burn rate. After the house caught fire I replaced the oil lamp with a bucket of water for the duration of the test.

Results
The average combustion time for the control test was 2 minutes with the average burn time 3 minutes 32 seconds. The average combustion time for Valspar was 5 minutes 15 seconds with the average burn time of 3 minutes 22 seconds. The average combustion time for Olympic was 4 minutes 32 seconds with the average burn rate of 2 minutes 23 seconds. Burn time was determined by the fire self extinguishing or burning the rope at the top of house then dropping to water bucket below.

Conclusions/Discussion
After testing I found that the Valspar paint had the longest average combustion rate proving higher fire resistance, however, the average Vlaspar burn rate was also the longest. The houses painted with the Valspar paint fully engulfed in flames after ignition and suffered greater damage than the houses painted with the Olympic paint. The Olympic houses did not burst into flames and the flames did not travel as fast and they often extinguished themselves after a couple minutes. So the higher quality paint initially offered more fire resistance but once ignited it burned faster and did more damage. I feel more testing needs to be done to determine if paying more money for higher quality means getting a safer paint.

Summary Statement
Does paying more money for higher quality paint means getting a safer paint?

Help Received
Mother supervised burning of wooden structures and took photos

CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Brandon C. Gribas

Project Number
J1399

Project Title
What Insulation Material Is the Most Efficient?

Abstract

Objectives/Goals
The objective is to determine which insulation material is the most efficient using fiberglass, foam, wood shavings, llama wool and cotton. My hypothesis was that llama wool would be the most efficient insulator, and the water would stay the warmest using this as the insulation material.

Methods/Materials
Six identical plastic baby wipe containers,six identical small baby food jars, hot water, fiberglass, cotton, urethane foam, llama wool, and wood shavings insulation, clock watch or timer, and thermometers were used. Hot water was poured into the jars. The temperature of the water was measured to make sure that the water was 130 degrees at the beginning of the experiment. Each jar was put into a container surrounded by the insulation material. Then the lids were closed. The boxes were opened after 30 and 60 minutes to measure the temperature of the water. This experiment was repeated a second time and results were recorded on a chart.

Results
The first test showed that both fiberglass and foam were the most efficient with the water temperature being 101 degrees F. after 60 minutes. The second test showed that fiberglass was the most efficient with the water temperature being 102 degrees F. after 60 minutes, but only one degree F. higher than foam and cotton. The control jar of water was the lowest showing that any of the insulating materials was better than none.

Conclusions/Discussion
My hypothesis that llama wool would be the most efficient insulator proved incorrect. Fiberglass and foam proved to be the most effective insulation material. Hopefully, in the future, a more cost effective and environmentally friendly insulation will be found.

Summary Statement
My project is about finding an environmentally friendly, cost effective and efficient insulation material.

Help Received
My mom and dad supplied the materials, my dad took and developed pictures, my mom and nanny helped with the project chart and typing.