



CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s) Sameer Ahmed	Project Number J2101
Project Title Guess What's Cooking?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Objective: My objective was to test different types of metal cooking pots to determine which one would leach the most amounts of metal in a 25% citric acid solution boiled for 30 minutes.</p> <p>Goal: To be able to determine which cooking pot leached the most amount of metals into the citric acid solution.</p> <p>Tested: Cast iron, aluminum, stainless steel, and nonstick pots.</p> <p>Methods/Materials Methods: 1.) Make citric acid solution; 2.) Boil 200 mL of the solution in each pot for 30 minutes; 3.) Place boiled solution samples into test tubes and add chemical indicators; 4.) Place test tubes with chemical indicators into the spectrophotometer; 5.) Compare results</p> <p>Materials: 2-4 quart aluminum cooking pots; 2-4 quart stainless steel cooking pots; 2-4 quart cast iron cooking pots; 2-4 quart nonstick pots; Spectronic 20 Spectrophotometer; Spectrophotometer vials; Test tubes; 4- Test tube racks; 2 lbs- Citric acid; 3 liters- Deionized water; Lab coat; Paper towels; 8 Hotplates; 1-Magnetic mixer; 2- 4000 mL glass flasks; 1- 2 liter glass beaker; 1- 250 mL glass beaker.</p> <p>1- Scale; 1- Scale tray; 1- Spoon; 8 Timers; 1- Safety goggles; 1- Face splatter shield; Latex gloves; 2- Heat resistant gloves; 4 drops of 6 molar of HNO₃; 5 mL of 1 molar of KSCN; 2 ml of Na₂CO₃; 5 mL of a 0.1 molar solution of Na₂S.</p> <p>Results All of the cooking pots showed traces of leaching. Cast iron leached the most Aluminum leached the second most Nonstick leached the third most Stainless Steel leached the least</p> <p>Conclusions/Discussion Through using chemical indicators and a spectrophotometer, I was able to conclude that cast iron leached the most.</p>	
Summary Statement I tested different types of metal cooking pots to determine which one would leach the most amounts of metal in a 25% citric acid solution boiled for 30 minutes using chemical indicators and a spectrophotometer.	
Help Received Used lab equipment at Cochise College, Arizona under the supervision of Mrs. Tasneem Ashraf; My Science and English teachers helped proofread my board. My parents helped me build support systems and attaching all needed items to my board.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Grace Brock; Gabriella Donato	Project Number J2102
Project Title The Story of My (Aspirin's) Life: Changes in the Composition of Aspirin over Time	
Abstract Objectives/Goals The purpose of this project was to determine the percent decomposition of samples of aspirin that had passed their expiration date. Aspirin's active ingredient is acetylsalicylic acid, which decomposes into salicylic and acetic acid over time. The amount of acetylsalicylic acid can be found using back titration. We used this method to test a control sample (not expired) and then four samples that had passed expiration. Our hypothesis was that the older samples would show a greater percent decomposition (less acetylsalicylic acid). Methods/Materials We titrated aspirin samples with sodium hydroxide, using phenolphthalein as an indicator. Then we performed a back titration by adding excess sodium hydroxide, heating, and titrating back to colorless with HCl. We calculated the number of moles of base needed for each titration and used the difference to find the percent decomposition. We used a new bottle of aspirin (expiration date June 2015) as the control. We obtained four more bottles with enough aspirin for testing, with expiration dates 4, 17, 19, and 33 months before our experiment date, for comparison. We tested four samples from each bottle and found the average percent acid and average percent decomposition in each sample. Results We found that the older samples did show a greater percent decomposition, and that this trend was mostly linear. The average percent decomposition for the control sample was 5.4, vs. 7.5, 9.8, 9.4, and 13.4 for the older samples (in chronological order). Conclusions/Discussion Our data does support our hypothesis that older samples show greater percent decomposition and higher acidity. The expiration date did seem to be a good indicator that samples had less than 10% decomposition. Samples very close to the expiration date (within 4 months) are probably still safe to use, but the samples from 17 months past and older all showed more than 100% acid and should be avoided. However, we had a lot of error, some inherent in the procedure and some due to our technique.	
Summary Statement We used titration to determine how much acetylsalicylic acid had decomposed in samples of aspirin at various dates past expiration.	
Help Received Science teacher supplied equipment, supervised titrations, and gave feedback.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Ahmad S. Eissa	Project Number J2103
Project Title ThINK Before You Print!	
Objectives/Goals This project was designed to find out which of the most commonly used font styles would save the most ink, and thus save companies, government, schools, and individuals a substantial amount of money spent each year on very expensive ink cartridges.	
Abstract Methods/Materials A new cartridge was placed inside the printer. The letters ETAIO, the most commonly used letters in the English alphabet, were printed in pre-set margins. The alphabets were printed repeatedly on several sheets of paper until the first signs of fading occurred. This indicated that the ink cartridge was emptying out. A wait time of twenty four hours was given before another cartridge was used. After this process was performed repeatedly over different time spans, with multiple font styles, the amount of lines that were printed were recorded.	
Results Times New Roman, Century Gothic, and Arial were tested to find which one would prove to be most economic. All 45 tests indicated that Times New Roman proved to save the most ink by printing over 400 lines more than Century Gothic or Arial. The results throughout this project were very steady and did not change drastically.	
Conclusions/Discussion After the experiment was conducted, the hypothesis was proved wrong. Times New Roman was in fact the most ink-saving font. It would be interesting to repeat this experiment with several other font styles and different content to confirm whether or not Times New Roman would still hold the number one spot in ink-saving fonts.	
Summary Statement My project is about finding the font that saves ink and thus is most economical.	
Help Received Mother helped purchase material.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Evan I. Evers	Project Number J2104
Project Title Detecting Radiation in Everyday Objects	
Abstract Objectives/Goals My objective was to test to see if the public should be concerned about radiation levels in everyday household objects. Methods/Materials A lead-lined radiation-shielding box was constructed and placed in an empty room. Various small household objects of identical weight were placed in the box one by one, and their radiation levels were measured over 60 seconds. Radiation levels were tested with a Geiger counter using a pancake wand on a boom stand positioned over a hole in the top of the box. Results were recorded and graphed. Results Half of the objects had the same level of radioactivity as the control, while the other half rose above that number, with the Apple iPhone testing with the highest result, followed by bentonite clay and Epsom salt. Conclusions/Discussion I believe that my results should ease public concerns of dangerous radioactivity in household objects. Even though some of the objects that were tested were more radioactive than our control, they were only marginally so. Next steps that I would like to try would include testing a range of mobile phones currently on the market, to see how they measure against the iPhone 5S, and I would also like to test a broader range of foods, since the strawberry and cheese samples also tested at elevated levels.	
Summary Statement My project tested to see if the public should be concerned about radiation levels in everyday household objects.	
Help Received Mother helped retype report as dictated by student. Parents rented Geiger counter.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Paige A. Fontes	Project Number J2105
Project Title Burn Baby Burn: Which Wax Will Burn the Longest?	
Abstract Objectives/Goals My project was to determine whether Beeswax, Paraffin Wax, or Soy Wax would burn longer as a votive candle. I believed that Soy Wax would burn longer as a votive candle because it is a natural, non-animal product. Methods/Materials Ninety votive candles were made with exactly 65 grams of wax each. Thirty votive candles were made of Beeswax, thirty made of Paraffin Wax and thirty made of Soy Wax. All candles were numbered and placed on a cookie sheet. Candles were then lit and a timer started. As the candles burned out, the time was noted by the candle's number in the log book. Observations of smell, soot, and cleanliness were also noted. Results Soy Wax votive candles burned an average time of 25:21:56 (1521 total minutes). Paraffin Wax votive candles burned an average time of 16:04:13 (964 total minutes). Beeswax votive candles burned an average time of 1:02:30 (62 total minutes). Evidence of outliers in Paraffin Wax data and Beeswax data was observed. In recalculating the data after removing outliers, the results were: Paraffin Wax votive candles burned an average time of 19:38:26 (1178 total minutes) and Beeswax votive candles burned an average time of 0:40:57 (41 total minutes). Conclusions/Discussion My conclusion is that Soy Wax, being a natural, non-animal oil, burned longer than the other waxes. I also observed that Soy Wax seemed to burn cleaner and clean up was easier. This information is useful in the decision making process of buying candles.	
Summary Statement Which wax will burn the longest: Beeswax, Paraffin Wax, or Soy Wax	
Help Received Mother supervised the use of the fire with the candles. Father helped assemble project board.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Christian R. Gilbert	Project Number J2106
Project Title What Happens to the Sound Output When Increasing the Amount of Air Pressure Blown through a Train Horn?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project was to determine if how loud a train horn sounds is a direct function of the amount of air pressure applied. I believe that increasing psi(pounds per square inch) to a train horn increases the decibel sound output in a linear fashion up to a certain point.</p> <p>Methods/Materials My project was to determine if how loud a train horn sounds is a direct function of the amount of air pressure applied. I believe that increasing psi(pounds per square inch) to a train horn increases the decibel sound output in a linear fashion up to a certain point.</p> <p>Results My project was to determine if how loud a train horn sounds is a direct function of the amount of air pressure applied. I believe that increasing psi(pounds per square inch) to a train horn increases the decibel sound output in a linear fashion up to a certain point.</p> <p>Conclusions/Discussion My project was to determine if how loud a train horn sounds is a direct function of the amount of air pressure applied. I believe that increasing psi(pounds per square inch) to a train horn increases the decibel sound output in a linear fashion up to a certain point.</p>	
Summary Statement I changed the psi going into a train horn to see if it would change the noise output, this could save many people.	
Help Received My dad held the dB meter.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Ashley M. McCullough	Project Number J2107
Project Title Did You Know Your House Has "Phantoms"? Not Ghosts, but Energy Phantoms?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my project was to find out if the appliances and electronic devices in our home use enough energy when plugged in but turned off to be a concern when trying to cut our energy consumption. I also wanted to find ways to cut that consumption if possible.</p> <p>Methods/Materials Materials: Kill A Watt meter, paper and pencil, power strip, 15 various appliances or electronic devices Method: I will remove each device and plug them into the Kill A Watt meter, turn them off, then plug the meter in and read if there is any energy usage. I will record the watts used by any of the items and create a cost analysis for various tier rates after computing the annual Kilowatt usage.</p> <p>Results The results showed, indeed, many household devices or electronics do use energy when turned off because of remote controls, timers, lights, clocks, using enough energy to cost the average household more than \$100 per year. Even cell phone chargers plugged in but not charging a phone use energy.</p> <p>Conclusions/Discussion I feel that this topic is important enough that I want to educate my friends and family about how much energy can be used from phantom loads. Turning off devices isn't enough and unplugging them, while this will work to save the energy, is not always possible and is time consuming. For example, a coffee maker with a timer set for morning. Turning off multiple devices quickly can occur by using power strips but if you need some devices to remain using that minimal load, I found that there are energy conscious power strips that can help with this consumption. More and more households are adding more of these kinds of devices so I think it's important that we educate everyone about this power usage.</p>	
Summary Statement My project is about phantom loads, energy use while devices are turned off, and how costly this can be.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Austin McCullough; Ian Odermatt	Project Number J2108
Project Title Is a Higher Priced Soccer Ball Worth the Money?	
Abstract Objectives/Goals Our project is to determine whether a more expensive soccer ball travels further and is more consistent than a less expensive soccer ball. We think the more expensive soccer ball will travel further and be more consistent than the lower priced soccer ball. Methods/Materials A kicking device made out of wood and metal pipes is constructed to control the velocity of the kick. Use four different balls of different prices, two balls being very inexpensive, a medium priced ball, and I highly expensive ball. Test the various distances of the balls by having the pendulum kick each ball six times. Then, find the average of each ball. Results The highest priced soccer ball traveled further and was more consistent the the lower priced soccer balls, while the lowest priced soccer ball was the very inconsistent and traveled the shortest distance. Conclusions/Discussion In conclusion, higher priced soccer balls travel further and are more consistent then lower priced soccer balls due to less drag and better build quality.	
Summary Statement Our project is about the performance of soccer balls based on cost.	
Help Received No help.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Ojas Nain	Project Number J2109
Project Title Got Hurt? Make a Cold Pack at Home!	
Abstract Objectives/Goals The objective is to determine whether an instant cold pack can be made using household chemicals, that is as effective as commercially available instant cold packs. Methods/Materials Baking Soda, Ammonium Nitrate, Scott's weed and feed Fertilizer and Morton Salt Substitute (100g in each trial) were mixed with water (100ml) in a Ziploc bag to produce an endothermic chemical reaction. Three trials were conducted. The solution temperature was measured over duration of 15 minutes at one minute interval to determine whether solution temperature stays below or close to 32°F for it to be used as an effective instant cold pack. Finally, the results were compared with a commercially available instant cold pack ("Equate Instant Cold Pack") to compare the performance by performing the same trial. Results Only Ammonium Nitrate solution in a Ziploc bag demonstrated an endothermic chemical reaction, strong enough to cause the temperature to drop below freezing temperature of water (32°F) to an average of 21°F over the three trials. Other household compounds considered in this experiment, did not demonstrate sufficient temperature decrease to be considered for an instant cold pack. Due to lack of insulation in the Ziploc bag, the solution temperature rose above 32°F within four minutes to render it ineffective. Commercial instant cold pack held the temperature below 32°F up to 12 minutes from the time of activation. Conclusions/Discussion An instant cold pack could be made at home by mixing Ammonium Nitrate and water. However Ziploc bags did not provide sufficient insulation to hold the temperature below freezing for the duration of more than 4 minutes in the experiment. An effective cold pack should keep the temperature around or below 32°F for almost 15 minutes. This research can be expanded to include cost effective insulated bags instead of Ziploc bags. It also should be of interest if chemical reaction could be controlled using a slow release method of Ammonium Nitrate while creating the solution.	
Summary Statement Making an instant cold pack at home using household chemicals that exhibit an endothermic chemical reaction when mixed with water.	
Help Received My mother and father helped me in decorating the display board and typing the report. My teacher helped in selecting the project and provided me with guidelines to arrange display board and to write report and journal.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Amanda T. Roberts	Project Number J2110
Project Title Is Do-It-Yourself Detergent As Good at Cleaning Laundry As a Store Bought Brand?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to determine if Do-It-Yourself Detergent (DIYD) could remove stains from white 100% cotton fabric as well as a store brought brand of detergent (Kirkland Signature Ultra HE detergent (Kirkland)). I also wanted to determine if longer pretreatment times with OxiClean could further remove stains.</p> <p>Methods/Materials Do-It-Yourself Detergent (DIYD) and Economy DIYD (EDIYD) were created from Dawn dishwashing detergent, Arm & Hammer Super Washing Soda (sodium carbonate, Na₂CO₃) and Borax (sodium borate decahydrate, Na₂B₄O₇*10H₂O). I used varying concentrations of each of these ingredients in dose ranging trials to determine the optimal dose of each ingredient. I created a Stain Intensity Index (SII) to determine the ability of different detergent concentrations to remove stains from white cotton fabric after laundering. The final DIYD and EDIYD solutions were compared to Kirkland Signature Ultra HE detergent (Kirkland) for stain removal using SII ratings on white cotton fabric. Grass, mustard, dirt and butter were the stains that were measured for removal from the white cotton fabric.</p> <p>Results All treatments including no detergent removed butter from fabric swatches. DIYD removed grass and dirt as well as Kirkland and DIYD removed mustard significantly better than Kirkland (P<0.001). The cost of DIYD was 25.26% of the cost of Kirkland. EDIYD was created and compared to Kirkland and had similar ability to remove grass, mustard and dirt stains as Kirkland, but was only 12.57% of the price of Kirkland detergent. Pretreatment with OxiClean for 1 hour, 1 day and 2 days and then washing with DIYD had significantly greater stain removal than DIYD alone.</p> <p>Conclusions/Discussion For effective stain removal and reduced cost, EDIYD had good results and OxiClean pretreatment caused even greater stain removal. If someone has allergies to commercial laundry detergents, EDIYD is proven to be as effective as Kirkland in cleaning at a cost of only \$6 per year. As well, EDIYD is environmentally friendly as Borax and washing soda boxes are recyclable and the water to make EDIYD came out of a faucet from my house. Compared to some commercial detergents, less fuel is consumed as large liquid plastic containers don't have to be transported by truck and you don't have as many large plastic bottles to recycle or throw away.</p>	
Summary Statement I compared the stain removal ability of Do-It-Yourself Detergent to Kirkland Ultra HE detergent and I also tested the ability of different durations of OxiClean pretreatment to further remove stains.	
Help Received My mother bought materials for the project and helped me glue down items on the posterboard. My father taught me how to use Excel to create graphs and do statistics.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Thomas M. Rodrigue	Project Number J2111
Project Title Did You Catch That?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Human and computer interactions are becoming increasingly common, and as a student very interested in robotics and technology, I decided to test children ages eleven to thirteen to try to determine how well the speech recognition software, #Siri#, might work for complete sentences versus isolated words, and whether accuracy might differ for certain types of words.</p> <p>Methods/Materials In order to conduct this study, I needed an iPhone, a decibel meter, a video recorder, and forty participants ages 11 to 13. Participants were asked to give ten one sentence commands to the voice recognition software, then read eight words starting with unvoiced sounds, and finally read eight words beginning with voiced sounds. I hypothesized that the accuracy of the software would be very high in the commands portion of the test. I believed that the accuracy rate would be much lower when the system was asked to transcribe isolated words. Furthermore, I predicted that the words starting with voiced sounds would be interpreted more accurately than those starting with unvoiced sounds. Voiced sounds are ones that vibrate the vocal chords significantly, while unvoiced sounds are ones that do not vibrate the vocal chords significantly.</p> <p>Results Analysis of the data showed that the voice recognition software understood 92% of the commands portion of the test across all participants. There was a dramatically lower accuracy for words spoken in isolation. Words beginning with voiced sounds were interpreted correctly 48% of the time, while words beginning with unvoiced sounds were interpreted correctly only 41% of the time.</p> <p>Conclusions/Discussion According to my results, the voice recognition software showed much greater accuracy in deciphering complete sentences than identifying isolated words. When isolated words were presented, this project also revealed a significant difference between the recognition of voiced versus unvoiced sounds.</p>	
Summary Statement I designed a project to test speech recognition software accuracy, "Siri", for complete sentences versus isolated words.	
Help Received First, I would like to thank the participants for your help in my project, without you I would not be able to conduct my experiment. I would also like to thank my science teacher for being so interesting and and always being willing to help me. Finally, I would like to thank my parents for always helping me when I	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Troy C. Romana	Project Number J2112
Project Title Tennis Shock Absorbers: Bad Vibes?	
Abstract Objectives/Goals Objective/Goals: Tennis players worldwide use tennis shock absorbers. They believe that a reduction in racket vibrations help them play better. But do the shock absorbers actually absorb the vibrations? This experiment has tested multiple racquets and absorbers in order to see if the absorbers reduce vibrations significantly. Methods/Materials Methods/Materials: The experiments used 3 different tennis racquets and shock absorbers, a tennis ball machine, and a program called Praat. Each shock absorber was made of different materials. In order to test the vibration, the sounds of the balls impact of the racquet were recorded and run through Praat to get their frequency readings. Each racquet was tested once without the shock absorber, and three times with. There#s a repetition of 25 balls per absorber. Results Results: There were a total of 300 measurements, and 100 per racquet. When the racquets were tested without a shock absorber, the sound intensity had ranged from 3500 Hz to 3900 Hz Shock absorber #1 had dropped the intensity by about 100 Hz # 150 Hz, Shock absorber #2 had dropped it from 175 Hz to 250 Hz, and shock absorber #3 had the intensity drop approximately 200 Hz to 325 Hz Conclusions/Discussion Conclusions/discussions: Based off this data I can conclude that the Commercial shock absorbers could not absorb any significant amount of vibrations, and that the original hypothesis was incorrect. The hypothesis had predicted 60% drop in vibration, but the data has shown there to be a 14% drop in vibration. This was not a lot of vibrations, and it shows that the absorbers may not be useful to the player. i can also conclude that rubber is the best material of the three to dampen vibrations with. Also, it is possible the racquet could affect the absorbers usefulness.	
Summary Statement It is about whether or nor tennis shock absorbers work.	
Help Received Mom helped with report; Dad helped with testing; ;Bob Sandler for loaning a ball machine	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Aaron A. Rothman	Project Number J2113
Project Title Can Green Clean? A Comparison of Name Brand and Environmentally Safe Detergents	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective was to find out if a specific brand of environmentally safe detergent provided greater stain removal properties than major brands of detergent.</p> <p>Methods/Materials The main materials used were six detergents, three environmentally safe detergents (Seventh Generation, All Free and Clear and Method) and three name brand detergents (Tide, Gain and Arm & Hammer with Oxi-Clean). I chose four stains (grass, juice/peach, ink and lipstick) and applied each stain on a 100% cotton test cloth. I used three sample tests per detergent for a total of eighteen tests. To determine the results, I examined each completed sample under a microscope and counted the number of remaining stained fibers per stain.</p> <p>Results The environmentally safe detergent Seventh Generation, was superior over the other five detergents (Tide, Gain, Arm & Hammer with Oxi-Clean, All Free and Clear and Method) because it left the least amount of stained fibers on the cotton sample swatch. In my data, Seventh Generation left only 29 total stained fibers. My prediction was that Arm & Hammer with Oxi-Clean would provide the best stain removal properties because the added Oxi-Clean booster would give more cleaning power but I was incorrect.</p> <p>Conclusions/Discussion I learned that some environmentally safe detergents can clean as well as or better than name brand detergents for the same price. Also, I learned certain stains are difficult to clean no matter what detergent. Detergents contain a lot of chemicals that can be potentially harmful to the environment. Some factors that could have affected my results are: the types of detergents chosen, the types of stains chosen, the type of fabric chosen for the sample. I think this experient may open people's minds to using an environmentally safe detergent and not be so brand conscious.</p>	
Summary Statement My project compares name brand detergents to environmentally safe detergents to see which one performs best.	
Help Received My mom helped purchase the supplies, my teacher Mrs. Jill Rivero helped with testing ideas, Koren Takata and Heidi Herrera reviewed my project and gave me feedback.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Adrian M. Schroeck	Project Number J2114
Project Title The Best Firewood	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project was to find the best firewood in terms of most heat with the least smoke at a good price. It is important because more and more people in our community are using indoor and outdoor fireplaces and stoves that burn firewood. This leads to dangerous levels of air pollution which can cause many health and environmental problems. I tested the heat of firewood and the duration of the heat to analyze which wood burns best. I measured the height of the flame and the smoke level at different time periods to make sure the least amount of pollution is put in the air. I then correlated my findings to the prices of the firewood. Based on my results people can then change their choice of firewood and there will be less pollution.</p> <p>Methods/Materials I burned wood samples cut to size - 16" long x 3" wide x 3" high - with a moisture content lower than 20% of Cedar, Madrone, Oak, Fir, Eucalyptus, and leaf litter of the same volume as the wood. For each sample I measured the height of the flame, the heat of the fire, and the smoke opacity every two minutes for two hours or until the temperature reached 100 degrees Fahrenheit.</p> <p>Results My data show that the best woods to burn are Madrone and Oak because they produce the most heat with the least smoke at the best price.. The most comfortable height of the flame came from Madrone. The cost of the woods were very important because Fir and Cedar cost the same, but Cedar makes about twice as much heat and twice as much smoke. Another thing I found was that Fir, which is the most commonly bought wood, is not the best wood and has medium levels of smoke. The worst things to burn are leaf litter and Eucalyptus.</p> <p>Conclusions/Discussion I would advise for people who have wood burning fireplaces and stoves to use only 20% or less moisture wood, mostly Oak and Madrone. Take the wood out after the fire begins to smolder because after smoldering, the fire will produce more smoke. And also, just because Fir is thought to be cheaper and easier to burn, it is not. You can get triple the heat and half the smoke by paying 15% to 25% more money for Oak or Madrone.</p>	
Summary Statement Which fire wood is the best in making the most heat for the longest time with the least smoke and the flame in a three feet range for the least price.	
Help Received Scotts Valley Fire Department provided Laser Thermometer; Opacity Chart provided by Monterey Bay Unified Air Pollution Control District; Mother helped record data during experiment and helped typing. Father helped set up the experiment and with mounting information on display board.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Isabella A. Sills	Project Number J2115
Project Title Can 3D Printing Replace Major Retailers?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to evaluate the effectiveness of 3D printing and the potential impact of how we acquire goods.</p> <p>Methods/Materials Eleven various items ranging from a door stop to an iPhone case were selected and printed on a 3D printer. Source files for 3D printed items were found online and available for free download.</p> <p>The amount of 3D printer filament and power consumed to print each object was measured. To account for the purchase price of the 3D printer, a depreciated cost was determined for each part based upon the idea of printing on average 20 items per month over the expected printer life span of 5 years.</p> <p>Per part costs were then calculated based on the per part measured costs and a portion of the cost of the 3D printer.</p> <p>Results 3D printed parts of differing sizes affected the measured values. The calculated per part 3D printing costs ranged from \$0.55 to \$5.76 while the comparable retail products ranged from \$2.12 to \$22.50. The overall cost for all 3D printed items amounted to only \$16.80 while the comparable store bought items would have amounted to \$131.27.</p> <p>Conclusions/Discussion The findings showed that it can be significantly more cost effective to 3D print most items rather than purchasing them from a store. Overall, the costs of the 3D printed items were consistent and much lower. Additionally, I had the ability to easily manipulate various characteristics of the printed items. I could easily change the color, size, or even create items not even available from a retailer.</p> <p>The study showed that 3D printing can significantly disrupt the retail environment. The creation of items at home has the potential to impact manufacturers, distributors, and retailers.</p>	
Summary Statement Is it more cost effective to 3D print goods versus buying them at the store, and if so what potential impact will this cause for retailers?	
Help Received My father showed me how to setup the 3D printer and use the software.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Sara O. Vargas	Project Number J2116
Project Title The Cell Phone Microscope	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my science project was to find out whether the cell phone microscope that I created functions better than a simple microscope. Both of these microscopes have a magnification of 100x.</p> <p>Methods/Materials The materials that I used were 25 different specimens, a camera cell phone, the cell phone microscope appliance, and a simple microscope. The way that I tested this was by taking various pictures of my specimens through both microscopes and creating a chart to rate what picture of the sample has better quality.</p> <p>Results The results when I rated each sample was that they work almost identically. The cell phone microscope that I created was a tad bit better due to picture clarity, the widescreen angle, and the realistic colors shown in the picture.</p> <p>Conclusions/Discussion In conclusion, both microscopes, the simple 100x and the cell phone microscope worked about the same. Plus, the cell phone microscope is much more efficient because it can fit in your pocket, it is fast to focus and zoom, and it costs much less money to build in only a few minutes if you have the right tools. I plan to improve this device and patent it to make it my own. I also plan in the future to create an app to help you use the device more efficiently by recognizing what specimen you are testing. I believe this product could be used in third-world countries to detect viruses and examine the patient as quickly as possible, once the product is improved and finalized, of course. Another idea that I have with this product is to use it in schools for students who have difficulty understanding science. This could help them immensely by having a familiar product like a cell phone in their hands instead of working with very expensive and complicated equipment.</p>	
Summary Statement My project is about a cell phone microscope and comparing it to a simple microscope to see how well it achieves its function.	
Help Received My mother and father have helped me immensely by buying the materials for me and supporting me on my creative ideas along the way.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Sherry Y. Xu	Project Number J2117
Project Title Light It Up: The Energy Efficiency of Light Bulbs	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objectives of my project was to compare the energy efficiencies of incandescent, compact fluorescent (CFL), and name brand and generic LED light bulbs. I hypothesized that LEDs would be the most efficient, and out of name brand LEDs and generic LEDs, the name brand LEDs would be 10% more efficient than the generic LEDs.</p> <p>Methods/Materials A transmitting end (light bulb, Kill-A-Watt electricity meter, light dimmer) and a receiving end (3-volt series DC circuitry with a fixed resistor and light sensor variable resistor, whose resistance responds inverse linearly to the amount of light illuminated) were placed on opposite ends of a table. By measuring power consumption (watts), resistance (ohms), and voltage (volts) of the fixed resistor, and total voltage (volts), and using Ohm's Law, relative energy efficiency was calculated. Three trials were conducted for each of the four light bulbs.</p> <p>Results When comparing the incandescent light bulb, CFL, and LED, the LED was the most energy efficient; when not dimmed, the energy efficiency of the LED was 5.1 times as that of the incandescent light bulb, while the CFL was only 3.75 times. When comparing name brand LED and generic LED, the name brand LED and generic LED had the same energy efficiency when not dimmed.</p> <p>Conclusions/Discussion My first hypothesis was proven true: LEDs are the most energy efficient type of light bulb at all dimness levels. My second hypothesis was proven false: name brand LEDs and generic LEDs have very similar energy efficiencies at all dimness levels. Therefore, when looking to purchase an LED light bulb for energy efficiency purposes, one should consider purchasing a generic LED for similar energy efficiency to a name brand LED, while at almost half the price.</p>	
Summary Statement By developing an original procedure, I calculated (and then compared) the relative energy efficiency of different kinds of light bulbs at minimal cost.	
Help Received Father explained Ohm's Law and taught PivotTable in Excel	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Rishi Shah	Project Number J2199
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Project Title
Wall Plug Efficiencies of Luminescent LEDs and Incandescent Lights

Abstract

Objectives/Goals
The objective of my experiment was to determine and compare Wall Plug Efficiencies (WPE) of white, red, yellow, green, and blue LED and Incandescent lights. My hypothesis was based on Planck-Einstein relationship: $E = hf = hc/v$ where h = Planck's Constant, c =speed of light, v =wavelength. White light will be most efficient because white light is comprised of all the primary colors. Wavelengths increase from blue, green, yellow to red, therefore, efficiencies will decrease from blue, green, yellow, to red.

Methods/Materials
Input power was determined by measuring voltage across the light (the input current was kept constant using a 350mA constant current driver - 3023 BuckPuck). Output power was determined by measuring voltage across a 10kilo ohm resistor that was connected across ground and output voltage terminal of TSL14S Light-to-Voltage Converter. The control was the light itself. The independent variable was the color. The dependent variable was the voltage across: resistor, LED and incandescent light.

Results
My WPE results for LED lights are: White was the most efficient, then blue, red, green, and yellow the least. WPE results for incandescent lights: Yellow was the most, then red, blue, white, and green the least. Relative WPE (LED WPE/Incandescent WPE) results: White highest, then blue, red, green, and yellow the least.

Conclusions/Discussion
For LEDs, the results show that my hypothesis should be: (1) Accepted for white and blue lights. (2) Accepted for green and yellow in so far as green is more efficient compared to yellow. (3) Rejected for red light, since red is shown to be more efficient than green and yellow. For incandescent lights, my hypothesis should be rejected since yellow and red had higher efficiencies than white and blue. For maximum efficiency and savings LED lights should be used: White first, then blue, red, green and yellow last. If I were to continue with this experiment, I would compare the overall cost/savings of different colors of LEDs.

Summary Statement
My project was to determine and compare Wall Plug Efficiencies of white, red, yellow, green, blue LED and Incandescent lights.

Help Received
My mom helped me get all the components, materials, supplies needed for the project, put the display board together, and proofreading the report.