



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Yarely Alvarez Nolasco; Dulce Ruiz Hernandez	Project Number J2001
Project Title Scented vs. Unscented Candles	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective is to see if scent has any affect on how long a candle will last.</p> <p>Methods We compared the mass lost after burning for three hours of three sets of three candles all of the same size and from the same maker. Three candles were vanilla scented, three a light linen scent, and three unscented candles.</p> <p>Results The vanilla candles lost an average of 7.2 grams of mass after burning three hours, the unscented candles lost an average of 14.4 grams, and the linen scented lost an average of 21 grams.</p> <p>Conclusions It was not conclusive that scent has an impact on mass lost during candle burning. One scent lost the most mass, while the other scent lost the least amount of mass as compared to the unscented candles.</p>	
Summary Statement It was found that scent does not always affect the candle burn rate.	
Help Received We designed the experiment, but my science teacher helped us gather supplies.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Joedina Crocker	Project Number J2002
Project Title Using Water Saturation to Affect Kernels' Popping Ability	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective on the experiment was to increase the yield of popped popcorn by saturating the kernels prior to popping.</p> <p>Methods A Presto hot air popper was used during the experiment. Great Value yellow popcorn was used during the entire experiment, and tap water was utilized to saturate the popcorn kernels. Lastly, a plastic container was used to soak the popcorn.</p> <p>Results 5 batches of popcorn kernels were popped without soaking (the controlled group), yielding an average of 333 kernels that popped, and 5 batches were soaked (the test group) with the hope of increasing the amount of kernels popped. In the end, the soaked popcorn did not yield a significant increased average.</p> <p>Conclusions Apparently, soaking the popcorn kernels didn't significantly change the amount of popcorn popped. With a 95% confidence, if this experiment was to be repeated, the averages would fall within the upper and lower confidence levels shown within the error bars on the graph.</p>	
Summary Statement The point of the experiment was to investigate whether increasing the amount of time that the kernels soaked would result in an increased amount of kernels popped.	
Help Received Mr. Lewis helped with purchasing the materials needed for the experiment. Mrs. Gutcher helped with teaching the statistics.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Cameron Do; Christopher Do	Project Number J2003
Project Title Tackling Concussions: Testing the Effectiveness of Headgear to Reduce Displacement	
<p style="text-align: center;">Abstract</p> <p>Objectives My brother and I play competitive level sports, including soccer. A key move in soccer for passing and scoring is to head the ball, which causes concern about potential concussions. Wearing headgear is recommended to help protect the brain, especially for younger players. The goal of this project was to test whether protective headgear is effective in minimizing the acceleration of the brain caused by soccer heading. We hypothesized that headgear would significantly reduce the G-force of impacts and that various types of headgear would provide similar levels of protection.</p> <p>Methods We performed 88 trials and analyzed over 500 data values measuring the G-force of simulated soccer headings with and without protective headgear. To simulate a human head and shoulders, we attached a plastic skull to a spring, placed the spring through a hole in a paint bucket lid, and zip-tied the apparatus to a 5-pound weight inside the bucket. We encased an accelerometer in a plastic bag filled with ultrasound gel and placed the bag into the skull. To simulate a soccer heading, we set a pitching machine to throw balls at the experimental head at 17 meters/second at a distance of 13 meters. We ran simulations using Rock Solid headgear, Storelli Exoshield headgear, Full 90 headgear, and no headgear (the control). We tested the impact of the ball to the front, back, left and right sides of the head, and analyzed the G-force data collected from the accelerometer.</p> <p>Results Based on the results of this project, protective headgear appears to reduce the G-force of an impact by as much as 59% compared to using no headgear. Rock Solid headgear seemed to be slightly more effective than Storelli Exoshield for impacts from the back, left and right sides, reducing the G-force by 59%, 47% and 18% respectively. However, Storelli was the most protective for frontal impacts, with an average 51% reduction to G-force. Full 90 was the least effective of the headgears tested.</p> <p>Conclusions Although protective headgear might reduce the force of impact to the skull, it does not eliminate the risk of concussion. As such, improving education about concussion management, encouraging neck strengthening exercises, and minimizing high risk impacts may be the best way to reduce concussions in sports. An option in soccer would be to ban heading altogether. But that might lead to a whole new headache for soccer players and fans.</p>	
Summary Statement This project investigates the effectiveness of various types of protective headgear in reducing the G-force of impacts from soccer ball headings.	
Help Received We would like to thank our parents for supervising us while we conducted our project. We would also like to thank our science teacher for guiding us in our project.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Ayush Doshi	Project Number J2004
Project Title Comparison of Heart Rate Measurement Accuracy across Multiple Devices	
<p style="text-align: center;">Abstract</p> <p>Objectives The study objective was to determine the accuracy of various heart rate measurement devices such as blood pressure cuffs, wrist meters, and wearables compared to the two-finger pulse check.</p> <p>Methods Measurements using popular wearables such as the Apple iWatch (Gen. 1), Samsung Galaxy Gear S3 watch, and Fitbit Alta HR, along with the Samsung Galaxy Note 8 smartphone, an arm cuff and wrist cuff blood pressure meters were all used in the comparison. The study involved taking measurements at rest and after exercise for all subjects.</p> <p>Results None of the devices performed very consistently in measuring heart rate compared to the two-finger pulse check. The Fitbit Alta HR had the lowest percent difference against the two-finger pulse check in the at rest measurement, while the Galaxy Note 8 smartphone had the closest measurement in the after exercise measurement.</p> <p>Conclusions In summary, while these devices are useful to get a quick measurement of heart rate, they should not be relied upon to make decisions critical to health and well-being.</p>	
Summary Statement I compared various off-the-shelf heart rate measurement devices and found that none performed consistently when compared to the two-finger pulse check.	
Help Received I came up with the idea and designed the experiments myself. I received help on understanding percent difference from my Dad.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Brady Elliott	Project Number J2005
Project Title Fire in Your Sole: Reducing the Thermal Conductivity Found from Outdoor Sports Surfaces	
<p style="text-align: center;">Abstract</p> <p>Objectives Since I have been playing competitive soccer I wanted to find a cure to the constant injuries presented by the heat on artificial turf. The goals of my project were not to fix the astroturf itself, but it was to fix what goes inside of your cleat. After doing numerous tests to see which product is the most effective, I found that the manufactured products worked the best. Later I sent these results to the owner of Blusol and he will be using my data on the patent of Blusol.</p> <p>Methods To complete my project, I used placed a bag of sand (since sand acts as the turf heating up) in a crockpot and gradually heated up the sand to 170 degrees Fahrenheit with the cleat with the insole inside of it. Next, I graphed the temperature of the sand and the temperature inside of the cleat to see which product had the most effective against the conduction presented by outdoor sports surfaces.</p> <p>Results After testing and graphing the thermal conductivity found between a cleat and a surface, I have found that the more reflective insoles are ineffective, whereas the more insulated inserts have shown the best results. In addition, the control and the engine shield had vastly different outcomes. For example, the control kept the cleat cool by 40 degrees, while the engine shield saved the cleat by 59 degrees. Also, there were two distinct groups shown on the graph due to the fact that the control, Mylar Blanket, and aluminium foil had the worst end results. Whereas, the Cleat Shield, Blusol inserts, and engine shield had the most beneficial results regarding the protection upon thermal conductivity. As we can see, the more insulated inserts have shown the best results and the more reflective inserts have had the worst outcomes, creating two distinct groups of thermal protection.</p> <p>Conclusions The three best inserts where the Blusol, Cleat Shield, and Engine Shield inserts; whereas the three ineffective inserts were the manufactured inserts or control, aluminium foil, and the mylar space blankets. This shows that the more reflective products have the worst results as the more insulated products had the best results. After performing numerous tests on the effectiveness of 5 different products have received many great opportunities. For example, I got the chance to sit down with the owner of Blusol and reflect on the data. In result, My name will be included in the patent of Blusol Heatshields.</p>	
Summary Statement To solve the problem of the extreme thermal conduction found on artificial turf, and I wanted to test which shoe insole would be the most effective in solving this problem.	
Help Received I have gotten the opportunity to work with the owner of Blusol since we reflected on my data throughout the process.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Norah Ferguson	Project Number J2006
Project Title Toilet Paper Absorbency	
Abstract Objectives The objective of my experiment was to find out the most absorbent and most economical toilet paper brand. This indirectly illustrates the factuality of advertisements. Methods The materials you need to conduct this experiment are an eye dropper, colored water, four brands of toilet paper and a timer. To find the absorbency of the toilet paper I used an eye dropper to drop 1 ml of the colored water onto the rolled up toilet paper. I waited 25 seconds before unrolling the toilet paper. I then counted the number of markings, the least amount of markings is the most absorbent because it can catch the most liquid before it can drain through. In this experiment I also wanted to find the most economical toilet paper brand, being the combination of cheapest and most absorbent. I gave the most absorbent brand 4 Points , the second most absorbent 3 Points etc. I did the same for cost, by first calculating the cost per foot of paper, then giving the cheapest cost per foot 4 Points etc. The total score will be the rank of most economical from high to low. Results Kirkland Signature was my control, it averaged 9 ? layers that the liquid passed through. It costs 0.44 cents per foot. Value corner had a mean of 11 layers absorbed, it was the least absorbent of all of the brands. Angel Soft had an average absorbency of 8 ? and the cost per foot was 0.93 cents. Lastly, Charmin Ultra Soft had the most expensive cost per foot at 1.71 cents and had an average absorbency of 9 layers absorbed. Conclusions I found out that the most absorbent toilet paper brand is Angel Soft and the most economical brand is a tie between Kirkland Signature and Angel Soft. This retains to my objective because I did find the most cost-efficient and the most absorbent toilet paper brand. Through this experiment, I have learned that advertisements can not always be trusted, and may want to mislead you in order for you to buy their product.	
Summary Statement I measured the absorbance and cost efficiency of 4 brands of toilet paper and found Angel Soft was the most absorbent and tied with Kirkland for best cost efficiency.	
Help Received I designed and conducted the experiment by myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Karen Garcia	Project Number J2007
Project Title What Type of Salt Brands with Different Qualities Have the Presence of Microplastics?	
<p style="text-align: center;">Abstract</p> <p>Objectives My intent was to notice if microplastic particles are present in sea salts of different qualities.</p> <p>Methods Gathered salts of different price points. Dissolved 50 grams of each salt in 500 milliliters of water. Vacuum filtration system, filtering the mixture through a pink dyed membrane and examined the filtered product with a microscope.</p> <p>Results On my first trial, the highest priced salt, Morton sea salt costs 43 cents per ounce and had the highest amount of microplastics and anthropogenic particles. The cheapest salt, 365 sea salt costs 6 cents per ounce and had the lowest amount of microplastics and anthropogenic particles.</p> <p>Conclusions I hypothesized that the most expensive salt will have the least amount of microplastics in the membrane filter because the salt with the higher price will most likely be processed in a way to filter microplastics. Based on results, I concluded that sea salts of any quality or price point have a presence of microplastics.</p>	
Summary Statement I found the presence of microplastics in sea and Pink Himalayan salts, while discovering potential ways to filter microplastics.	
Help Received My science teachers assisted me with the methods of the vacuum filtration system.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Kayla Goodwin	Project Number J2008
Project Title How Do Various Types of Table Tennis Balls Differ in Bounce Height?	
Abstract Objectives The objective is to measure how various types and brands of professional table tennis balls differ in bounce height. Methods Different types and brands of table tennis balls, camera, ball dropper, and measuring backboard. I dropped each type of five times using the ball dropper and recorded with slow motion video. By watching the video I determine the bounce height. Results I recorded the bounce heights of each type of ball by watching the videos. I calculated the average and the median bounce height for each type of ball. Conclusions The types of balls that are played more often in international competition bounce lower, than some of other 40+mm plastic balls. The new plastic balls were similar in bounce height as the 40mm celluloid balls.	
Summary Statement My project is important because table tennis players can use this ball bounce height information to adjust their playing style in competitions.	
Help Received I designed and built the ball dropper myself. My dad helped with the slow motion camera, and my teacher helped review my research report.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Cornelius Harmon	Project Number J2009
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Project Title Oil in a Day's Work: The Power of Pistons in Heat and Lubricity
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<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study is to measure the efficacy of various 10w30 motor oils to reduce heat caused by friction. Using a wooden test stand, aluminum cans, electric motor, pistons, eye dropper, and temperature probes. Tests were performed to measure the ability of various motor oils to lubricate and cool an engine during metal interactions over a 10 minute period. A controlled volume of various brands of motor oils was placed in aluminum cans. The temperature increase of the aluminum cans, when exposed to heat, was recorded at multiple intervals. Repeated trials were run to calculate an average temperature increase. The difference between Castrol oil and the other motor oil temperatures were statistically significant. To within the accuracy of the measurements, the presence of Castor motor oil significantly reduced friction to lubricate and cool the engine. However, the difference between the other brands of motor oils was not statistically significant. As measured by the ability to control heat, I found that there is a significant difference between generic and the Castrol brand motor oil. This experiment continues my broader study of minimizing energy loss in internal combustion engines.</p> <p>Methods A test stand that was required for this experiment. A test stand was created to decrease the variability within the test. Each of the four cylinders was filled with its designated oil. Each cylinder was also outfitted with a digital temperature probe. This engine, however was not constructed like an ordinary one. The crankshaft and piston assembly were above the block because each cylinder needs to contain different oil types and they need to be isolated from each other. In addition, the engine block was made from material that does not transfer heat well, an isolator. Wood, an insulator, was chosen for the material to build the engine block.</p> <p>Results 1) Wooden test stand (4) 2 diameter aluminum cans (4) 6 x 8 aluminum sheet (1) Electric motor (drill) (4) Pistons (1) Timer (4) Temperature probes (1) Quart of Mobil One motor oil (1) Quart of Pennzoil motor oil</p>

Summary Statement The objective of this study is to measure the efficacy of various 10w30 motor oils to reduce heat caused by friction.

Help Received I would like to acknowledge my dad for his assistance with constructing the test stand.



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) David Heinrichs	Project Number J2010
Project Title Does Limiting Direct Sunlight with Different Types of Shade Materials Make an Air Conditioner Work More Efficiently?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of my study is to determine if shading can increase the efficiency of an air conditioner.</p> <p>Methods Temperature sensors, PVC frame, heat lamps, and various shade materials. I followed a process of repeatedly heating the air conditioner, and then testing its ability to cool. I recorded the temperature changes inside the house from the air intake to the vent and outside between the heat lamps and underneath the shade materials.</p> <p>Results Different materials were compared to see if they would increase the efficiency of an air conditioner by providing shade and a lower operating temperature. The performance of the air conditioner showed that the temperature inside the house cooled faster when using shade coverings compared to the control which had no shading. I also found that there were differences in the cooling factors between the types of shade materials used.</p> <p>Conclusions I found that reducing the amount of solar rays that hit an air conditioner will make it run more efficiently. Through my repeated tests, I found that thicker materials are more effective in reducing heat transfer to the air conditioner. This insulating characteristic resulted in the cooler working more efficiently.</p>	
Summary Statement I created a shade structure that reduces the amount of sun rays that hit an air conditioner making it run more efficiently.	
Help Received I designed and built both the shade structure and the solar simulator. I received minimal set-up help with heavy material from family members.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Brady Hickman	Project Number J2011
Project Title What Brand Is a Hit?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study is to determine which brand of baseballs will travel a further distance when hit off of a tee with the exact same bat velocity.</p> <p>Methods Seven different brands of baseballs, baseball tee, tape measure, flags to mark distance, screwdriver to dig hole for flag stem, homemade "regulator" built with my dad to create a swing that would produce the exact same bat velocity for each swing, long bolts to secure "regulator" to ground, and hammer. After the experiment, each baseball was cut in half with band saw. Measured the distance of ten different hits for each brand of baseball.</p> <p>Results The Pronine baseball traveled an average of almost exactly 83 feet. The second place, Spalding, and third place, Rawlings, brands were hit 1 ½ to 7 inches shorter on average. The remaining brands (Diamond, Champro, Wilson, Dick s Sporting) traveled 1 to 5 feet shorter than Pronine. After conducting all seventy hits and calculating their average distance hit and standard deviations, each ball was cut in half to examine its composition. Although each ball was sold locally as an official league baseball, their compositions were different. Pronine went the farthest and was the only baseball with a core mostly made of rubber. Dick s Sporting Goods brand only traveled an average of approximately 77 feet and came in last place. This baseball s core was made from cork. The remaining brands were made consistently of string, rubber and cork. Five feet can be the distance separating a home run from an out!</p> <p>Conclusions Pronine baseballs were very consistent in the 80-foot range by hitting 80 feet or further seven times out of ten. Spalding, Rawlings, Diamond baseballs also were hit consistently over 80 feet, yet not as far as Pronine. Pronine traveled the furthest at 92 3 . Pronine, Spalding, Rawlings, and Diamond are very consistent at hitting the baseball 80 feet or further. Champro, Wilson and Dick s Sporting were not very consistent. If you desire a very consistent baseball, then you should consider using Pronine. If you are playing at a small baseball field, then you might think Wilson or Dick s Sporting Goods baseballs would benefit your situation best. Knowing the average distance a baseball is hit will allow a consumer to make an educated purchase. My hypothesis was incorrect, yet I gained knowledge about different brands of baseballs.</p>	
Summary Statement I discovered that the brand of baseball and its unique composition determines the average distance it can be hit.	
Help Received My dad and I researched a design and built a "regulator" using wood, Lazy Susan hardware, bat, and clamps to create a consistent "swing." My grandpa and I cut each baseball in half. My mom taught me how to calculate standard deviation.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Hunaina Hirji	Project Number J2012
Project Title The Effects of Metal Pipes on Potable Water Quality	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of the experiment was to determine the extent of metal contamination in drinking water when using metal pipes. The question was: What is the effect on drinking water when using metal pipes? I hypothesized that the amount of metal in drinking water does increase to a significant level upon standing in metal pipes over time. The experiment consisted of three types of pipes: Black Steel, Brass, and Copper. I filled each pipe with one of each water types: distilled water, garden hose water (hard water), unfiltered soft tap water, and filtered soft tap water. I tested the waters in each pipe using 2 types of heavy metal testing kit every two days for 12 consecutive days in total. I made observations over the testing period and recorded the results. On completion of the experiment, I observed that black steel is not a safe pipe to use for any water transportation. Brass pipes can still do harm, due to the increase in pH and alkalinity, and that Copper pipes appear to be the safest pipes to use for drinking water transportation as it did not leech significant amount of metal, compared to black steel and brass. It also maintained healthy levels of pH and alkalinity. My hypothesis was proven correct. The concentration of metal does go up within days of the water sitting in them and hence water should be drained from pipes after not being run for long periods of time.</p> <p>Methods 2 Copper pipes and caps, 2 Black Steel pipes and caps, 2 Brass pipes and caps, Distilled water, Garden hose water (Hard Water), Unfiltered, Soft Tap Water, Filtered, Soft Tap Water, and 2 types of heavy metal testing kit. Each pipe had water poured into it and testing with both kits was done every 2 days for 12 days.</p> <p>Results From my experiment, I found that copper pipes are the safest material to store and transport our drinking water. Brass pipes are still usable but the pH and Alkalinity changes which can eventually hurt one's health. Black steel pipes should not be used for water at all, due to the dangerous change in metal content.</p> <p>Conclusions The concentration of metal does go up within days of the water sitting in the metal pipes and hence water should be drained from pipes after not being run for long periods of time. Selection of the right materials to transport water has a dramatic impact on drinking water. Pipes that leech harmful materials such as lead or iron can be fatal for a human, such as what we see occurring in Flint, Michigan with lead water pipes. According to fondriest.com the EPA had revealed that one-fifth of all Americans have already been exposed to water that was potentially unsafe at least once over the past ten years. So utilizing high quality and safe piping like copper is important.</p>	
Summary Statement Analysis of the effects of metal pipes on potable water quality.	
Help Received I carried out the research and experiment by myself. Financial support was done by my school and parents. My teachers reviewed my project and helped analyze my results. Orange County Water District helped me understand how water is transported and the Chief Operations Officer at CWE Environmental	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Marea Ito	Project Number J2013
Project Title Save the pHish	
<p style="text-align: center;">Abstract</p> <p>Objectives Approximately seventy percent of the world is covered with water and with our pollution crisis it is very important to help keep the water clean. Keeping our water safe is crucial for all living organisms. There are many harmful factors that affect the pH of a body of water. Harmful pH levels in water will not only harm fish, but also other living organisms. For my experiment, I tested the pH levels of different types of waters to determine which ones are the safest for several types of living organisms. The purpose of my experiment was to ensure that waters we encounter everyday are safe for all living organisms.</p> <p>Methods I gathered 10 different types of water to test the pH levels and I used a digital pH tester.</p> <p>Results My hypothesis was incorrect. My hypothesis stated if I test the pH levels of different types of water, then the Fiji bottled water will be the safest for living organisms. I discovered that the Arrowhead bottled water would be the safest with a pH level of 6.99. The Arrowhead water was the closest to 7 which is the most neutral pH level that all living organisms can live from.</p> <p>Conclusions I discovered that the Arrowhead bottled water would be the safest with a pH level of 6.99. The Arrowhead water was the closest to 7 which is the most neutral pH level that all living organisms can live from. The Fiji bottled water got the second closest to 7 with a pH level of 6.96. I thought the Fiji water was going to be the safest and most pure because when I researched the different types of water, the Fiji website was very fancy and had the most believable marketing! Fiji created a picture of their water coming from volcanic rock and purified clouds . I also discovered that the Brita water filter does change the pH level of the Hollister tap water slightly. Before filtering the Hollister tap water, it had a pH level of 7.69 and after filtering, it had a pH level of 7.44. Fortunately, the Brita filter did bring the pH level down to be closer to neutral so it made the water safer. All of the different types of water did stay in the range for all types of living organisms except the Aquafina bottled water. The Aquafina water had the lowest level with a 5.4 which means it is acidic. Having too much acidic water can be unhealthy for you because if you have too much acid in your body it could affect your kidneys and lungs which, in turn, could be life-threatening. In conclusion, running this experiment helped me to realize that our water is a precious resource that needs constant attention. It affects living organisms of all kinds and can really change the way we live.</p>	
Summary Statement Our water is a precious resource that needs constant attention, affects living organisms of all kinds, and can really change the way we live.	
Help Received I completed the project on my own.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Elizabeth Kearns	Project Number J2014
Project Title Chalk Talk: Determining the Best Liquid Chalk Product	
<p style="text-align: center;">Abstract</p> <p>Objectives As a gymnast, I use chalk to absorb the perspiration on my hands and feet before performing skills. For my science experiment, I asked the question Which liquid chalk product is best for improving grip? Research on the effectiveness of liquid chalk over powdered chalk shows that liquid chalk is more effective. In my project, I wanted to determine the best liquid chalk product on the market.</p> <p>Methods My science fair procedure had two parts. First, I tested which chalk product had the highest viscosity with a qualitative test. I scored the liquid chalk brands on a scale of more watery = 1 and more glue stick-like = 10. To prevent bias, I tested the liquid chinks in a random order with the names of the brands covered. The highest scoring liquid chalk had the highest viscosity. The second part of my experiment was quantitative. A total of seven (7) gymnasts participated in this study. I tested how long each gymnast could hang on the bar without using chalk on their hands (the control). Then I tested how long each gymnast could hang on the bar with each type of chalk. I tested the hang times using a stopwatch. In between tests I washed the bar and thoroughly washed the gymnasts hands. I used six different types of chalk products including Hand Armor, ZUMWAX Beastly Chalk Gorilla Addition, SPORTSMEDIQ Pro Grade Liquid Chalk, Liquid Chalk (Camp USA), Black Widow Liquid Chalk, and Liquid Grip. I tested seven female gymnasts of similar abilities, including myself.</p> <p>Results All gymnasts' hang times were improved by using liquid chalk. The average control hang time without chalk was 35.67 seconds. Liquid chalk brand Camp USA improved the average hang time to 71.23 seconds. Camp USA's product was the only product made from silicon dioxide. All the other products used magnesium carbonate.</p> <p>Conclusions Surprisingly, liquid chalk made by Camp USA does not include the three popular ingredients in most liquid chalk brands: magnesium carbonate, alcohol, nor resin. Camp USA is made up of water and silicon dioxide. Silicon dioxide is capable of withstanding very high temperatures, which is an important property for a chalk product due to the friction created during gymnastic routines. The results of my experiment are relevant to gymnasts, coaches and other athletes such as rock climbers, baseball players, and CrossFit competitors who use chalk to improve grip. The results may also cause scientists to look more closely at the applicability of silicon dioxide over magnesium carbonate.</p>	
Summary Statement I determined that a liquid chalk product made from silicon dioxide improved grip more than products made from magnesium carbonate.	
Help Received During this project, I received help from my science teacher regarding organization and classification. I also received help from my mom overseeing the gymnasts when I measured hang times at a playground. Last, my babysitter helped with timing the gymnasts' hang time.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Nicholas Kellar	Project Number J2015
Project Title Rammed Earth: Packing Construction's Future	
<p style="text-align: center;">Abstract</p> <p>Objectives Rammed earth is a material made from soil and its contents. It is nearly free and available virtually anywhere with soil. The question is if it is viable enough to use it in place of clay brick. The rammed earth made in this experiment will be more viable than the clay brick in terms of cost, strength, and availability. This project is important since the population is rising so that a cheap but effective building material is crucial to keeping people housed.</p> <p>Methods Essentially, this experiment compared the independent variable of the viability of the clay brick compared to the dependent variable, the viability of the rammed earth. The controlled variables are the mix of the rammed earth and the amount of pressure used to pack it. Units of measurement used are the strength of the material (Mohs Hardness Scale) and the price of each material (USD). First, experiment made to the rammed earth using a mold and a mix of materials. The experiment measured the clay content in the soil, which was around 50%. Based off of that, the amount of sand and gravel needed to balance out the soil were calculated. The ratio would have to be 2:1:1 to have a correct mix. The amount of cement (5%) was then added to the mix. The mixture was packed and dried. The economic testing was done by first finding the inflation rates of the ingredients each material and multiplying that exponentially to the price of the materials. This showed the cheapness of rammed earth comparative to clay brick. A strength test was done using the Mohs Hardness Scale. With the mix created in the experiment, the rammed earth was less strong than the clay brick.</p> <p>Results The experiment overall does support the hypothesis, as rammed earth is superior to clay brick often, but both materials are usable (just rammed earth is better for many parts of the world. The experiment collected information that noted how rammed earth could be constructed anywhere where soil is, whereas red bricks are fired in factories and shipped to a location).</p> <p>Conclusions Rammed earth can be used as a material everywhere. Rammed earth, while the mix in this experiment was proven to be less strong than the clay brick, in actual use would be far stronger. People all over the world could benefit from rammed earth, and construction costs for the world would drop as it would be used more.</p>	
Summary Statement I tested the overall viability of the building material rammed earth in terms of economics, strength, and overall availability.	
Help Received Other than supervision from my father with power tools, the entire experiment was composed and designed by myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Angela King	Project Number J2016
Project Title Helpful or Hurtful? Seeking the Most Effective Methods and Materials for Minimizing Electromagnetic Fields (EMF)	
<p style="text-align: center;">Abstract</p> <p>Objectives Determining whether Electromagnetic Field defenders are helpful or hurtful (assuming the studies claiming Electromagnetic Fields are unsound are correct). Many people don't know about EMFs. Most cell phone companies say that one solution is hokey, and to not bother at all. That is throwing the baby out with the bath water. I'm going to figure out the most effective method and/or material for minimizing EMF exposure, (assuming the health studies claiming excessive EMFs are unsafe are correct). My hypothesis: The Belly Armor* brand of EMF Shields will be the most efficient in blocking EMFs because they are the most prestigious company.</p> <p>Methods Super Builds Super Structs Pinklets for iPhone stand, rubber jar-opener so the phone won't slip, iPhone 8+, tin foil, SafeSleeve Anti Radiation Cell Phone Case, Pure Goods Quantum Pendant Japanese Technology Amulet, Lvfeier Cloth (Headband, scarf, Hijab, etc.), Ener-Tech Anti-Radiation (Sticker), Brink Alara Radiation Protection Case (originally Pong), and finally, a EMF Detector- Cornet ED88Tplus, for measuring the average frequency over a minute in different situations.</p> <p>Results Even though the Lvfeier Cloth had the lowest readings of the claimed defenders, I uncovered the fact that most of the radiation you receive is based on distance.</p> <p>Conclusions I originally thought that the Belly Armor* brand of EMF Shields would be the most efficient in blocking EMFs because they are the most prestigious company. I discovered that the Lvfeier Cloth worked the best. I also uncovered the fact that most of the radiation you receive is based on distance from the EMF source. I highly recommend 1. Limiting use on devices 2. Getting an Analog Meter 3. When you get a call, go somewhere private and turn it on speaker, and hold the phone away from your body- best to not hold it at all. (Assuming the health studies claiming excessive EMFs are unsafe are correct.)</p>	
Summary Statement I measured the reductions of EMF exposure using different methods and materials and discovered that increasing distance from the EMF source has the greatest impact.	
Help Received I designed, built, and tested my experiment, and my mother purchased the products.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Gabriel Konja	Project Number J2017
Project Title Baseball Bat Performance Testing	
Abstract Objectives The objective of the my project is to test which bat hits the ball the furthest. Methods Used 4 types of bats: 1. aluminum 2. composite 3 wood 4corked A tee with a ball on it A Skilz baseball training device which I taped the bats to Results The ball went the least distance with the corked bat. The bat that outperformed all the others was the Aluminum bat. The Wood bat hit the ball a close second to the aluminum bat. Conclusions The results show that the most expensive bat does not necessarily hit the ball the furthest Kids want the most expensive composite bat, but performance wise the Aluminum and wood had better results.	
Summary Statement Which type of bat hits the ball the furthest	
Help Received I did some research online. My dad helped me build the device to secure the bats.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Ethan Kwan	Project Number J2018
Project Title Now That's a Lot of Damage! Which Premium Tape Has the Greatest Tensile Strength?	
<p style="text-align: center;">Abstract</p> <p>Objectives There are a lot of premium tapes out there. There is 3M Duct Tape, Flex Tape, Gorilla Tape and so much more. But which one is strong enough to fix your everyday problems? My hypothesis was that Flex Tape would be the strongest premium tape. The goal of my experiment was to determine which premium tape has the highest tensile strength.</p> <p>Methods The materials I used in my experiment included weights (130 pounds), 6 different types of premium tape, a pulley system (Universal weight set), ruler, scissors, and a stopwatch. I conducted my experiment at my local fire station because it had a Universal weight set, which for my experiment functioned as a pulley system. The first step of the experiment was to test each premium tape using the same width and length of tape to remove any variables involving the size of the tape. I used 2 inches wide by 8 inches long pieces of tape. Next, I attached one end of the tape to a hook which was attached to the pulley system and I attached the other end of the tape to the weight set bar or hand pull. Lastly, I pulled down on the weight to create tension for 10 seconds using a stopwatch to keep track of the time. I started my experiment with 5-pound weights and increased the weight by 5 pounds until the tape broke.</p> <p>Results During all three cycles of my test my results where exactly the same. This showed that the tapes perform consistently. Since the weight set I used was a Universal weight set I believe I provided consistent tension to help determine the tensile strength of each tape. In my experiment the common trend was that most of the tape stretched and most of them failed at or below 100 pounds. The only tapes that were able to resist tension over 100 pounds were the 10X Fiber Fix and the Gorilla Tape.</p> <p>Conclusions After completing my experiment, my data did not support my hypothesis. After testing the tensile strength of each tape three separate times, the results were clear. Flex Tape was not the strongest premium tape. The most remarkable tape was 10X Fiber Fix. 10X Fiber Fix barely stretched and did not break at 130 pounds, which was the maximum weight I had during the experiment.</p> <p>The implications of my results help the consumer select a premium tape that will help them fix everyday objects. By extending the life of objects can also preserve the environment by reducing waste.</p>	
Summary Statement In completing my experiment, I was able to determine which of the premium tapes I tested had the highest tensile strength.	
Help Received Mrs. Dowdy is my science teacher and was my advisor throughout the experiment. My Father also helped me pull down on the weights to create tension when they became too heavy.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Laurel Manion	Project Number J2019
Project Title Cookie Cooking	
<p style="text-align: center;">Abstract</p> <p>Objectives My experiment was designed to use the same cookie dough and alter the cookie dough only by temperature for a period of time to see the effects it had on taste and texture.</p> <p>Methods I used the same recipe for all the cookie dough, so I ended up tripling the recipe (dependent variable). Then I put the cookie dough balls either in the refrigerator or the freezer for either 5 hours or 24 hours (independent variables). The control variables were the oven temperature, bake time, and the baking sheet. Then I performed the experiment by baking cookies at the different intervals. All that was left was for my taste testers to eat the cookies.</p> <p>Results My testers overall picked Batch C as the BEST cookie, which was the cookie that was frozen for 5 hours. The next best cookie was Batch E which was frozen for 24 hours. These cookies had the best taste and texture to my taste testers.</p> <p>Conclusions My conclusion was that, YES the temperature of the cookie dough does make a difference in the way the cookie is baked. My results proved that cookie dough that is frozen tasted better than dough that was not. I found that when the cookie dough had time to combine in the colder temperature the molecules of the ingredients were able to be absorbed better which produced a better tasting cookie.</p>	
Summary Statement Temperature of cookie dough can effect the taste and texture of a basic chocolate chip cookie.	
Help Received I give credit to my mom, Linda Manion for helping me with making the cookie dough.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Sholeh Mozaffari	Project Number J2020
Project Title Same Chemical Process, Different Types of Hair	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study was to show how dyeing hair permanently alters the texture and color of hair.</p> <p>Methods Bleach, 6rr red-colored dye, and two different levels of developer, 20 and 40, were all tested on three different types of hair swatches, Caucasian, Asian, and African American. A total of 24 tests were run, 8 on each swatch of hair. Both the dye and bleach were mixed with either 20 or 40 volume developer. Once applied to the different types of hair, the swatches were wrapped in foil and processed for 40 minutes, but were checked on at the 20, 30, and 40 minute mark.</p> <p>Results When looking at the texture of the hair swatches, I based my observations on a scale of 1-5, 1 being no change in texture (silky smooth) and 5 being an extremely noticeable change (extremely dry). In all of these tests the African American hair swatches had the most change (Color- 20 volume- level 3 & 40 volume- level 4, Bleach- 20 volume- level 4 & 40 volume level 5), the Caucasian samples had a moderate change (Color- 20 volume- level 2 & 40 volume- level 3, Bleach- 20 volume- level 3 & 40 volume- level 4), and the Asian swatches had the least amount of change (Color- 20 volume- level 1 & 40 volume- level 2, Bleach- 20 volume- level 2 & 40 volume- level 3).</p> <p>The changes in color when looking at dye were based on a 1-5 scale, 1 being no change (the original color) and 5 being an extremely noticeable change (the desired shade of red). When testing with 20 volume developer and dye the Caucasian hair samples had the most change in color (20 volume- level 2) while the Asian and African American samples both had the same level of change (20 volume- level 1). The 40 volume developer and dye results showed that the Caucasian hair had the most change (40 volume- level 4), the Asian sample had a moderate change (40 volume- level 3), and the African American swatch had the least amount of change (40 volume- level 2). The outcome of bleach tests and the change in color was also not what I expected. The changes in color when looking at bleach were examined on a 1-5 scale, 1 being a barely noticeable change from the natural haircolor and 5 being an extreme change from the natural haircolor. The results were the Asian sample had the most amount of change (20 volume- level 4 & 40 volume- level 5), the African American hair had a moderate change (20 volume- level 3 & 40 volume- level 4), and the Caucasian swatch had the least amount of change (20 volume- level 2 & 40 volume- level 3). I observed the color change becoming more extreme the further down the hair swatch towards the ends 1of</p>	
Summary Statement My experiment is testing what happens when the same chemical process is used on different types of hair.	
Help Received I came up with the idea for my experiment and my mom helped me understand how to make it into a science fair project. My teachers, Mrs. Humkey, Ms. Ringstad, and Mrs. Meza were my mentors throughout the process and helped me compile all of the parts and pieces of a science fair project.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Aarohi Patel	Project Number J2021
Project Title Medicines in Mailboxes: Melting Microorganisms	
<p style="text-align: center;">Abstract</p> <p>Objectives Ordering things online has become an instinct for our generation and mail ordered medications are no exception. When medicine is ordered in the mail especially in the summer the package starts heating up immediately. Living in Bakersfield, triple-digit summers and frequent heat waves make this is a drastic problem. The objective of this project is to build an efficient, economical, and environmentally friendly solution that keeps medicine at the ideal temperature in a mailbox or outside the house.</p> <p>Methods</p> <ol style="list-style-type: none">1) Collect the thermally insulating materials: fiberglass, air, cloth polyester, foam polyester, cotton, cardboard, and styrofoam.2) Create an insulated box by sticking a layer of the thermally insulating material on the sides3) Designate the control box and fill it with brown packaging paper4) Insert the thermometers into the middle of the control and insulated material5) Place the boxes outside6) Leave the boxes outside for 30 minutes7) Check the temperature inside the boxes, record, and repeat <p>Results After a 70-day trial for all the groups, the experimental results showed that fiberglass was the best thermal insulator. Fiberglass stopped the heat transfer from occurring better than any other thermal insulator. Cotton was the second best insulator according to my rating system and the air was the worst.</p> <p>Conclusions The performance of the fiberglass insulation was more effective than other insulators that I tested. This means that fiberglass insulation can provide a reasonable solution that keeps medicine at the ideal temperature when in a mailbox or a hot environment places like Bakersfield. I analyzed and studied temperatures during the summer in Bakersfield and a few other cities. I noticed that there were only a few days during the summer where the outside temperature was ideal for the medicine to be kept in a mailbox or outside. I also studied Bakersfield s hourly temperature during the summer for 2018 from 12 p.m. to 4 p.m. and found out that it was not suitable for the medicine to be kept in mailboxes. I learned that when you place medicine in the heat, the medicine will lose its efficacy and the proteins will degenerate.</p>	
Summary Statement I tested different insulating materials to build an insulated shipping box that keeps medicine at the ideal temperature when in a mailbox or a hot environment.	
Help Received My sister helped me buy all the materials.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Allison Phillips; Sophie Staker	Project Number J2022
Project Title That's the Way the Cookie Crumbles: Does the Type of Fat Used in Baking Affect How Crumbly a Cookie Is?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this study was to determine whether different fats affect how crumbly chocolate chip cookies are.</p> <p>Methods Chose a recipe for chocolate chip cookies. Selected four different fats: butter, margarine, canola oil, and grape-seed oil. Baked the cookies, and weighed each one. Broke the cookies in half, and dusted away the excess crumbs. Weighed the cookies after breaking. Determined the amount of weight lost.</p> <p>Results Unsaturated fats (such as canola oil and grape-seed oil) lost less weight than saturated fats (margarine and butter). Grape-seed oil lost the least amount of weight, and margarine lost the most weight. The end weight loss was relatively close.</p> <p>Conclusions Fats with a lower concentration of fatty acids hold together better than fats with a higher concentration of fatty acids. When applied to baking, this means that cookies baked with unsaturated fats will not be as crumbly as those baked with saturated fats. This might help bakers and businesses that package cookies know which fat will hold together the best, so that the cookies aren't as likely to fall apart.</p>	
Summary Statement We baked cookies to discover whether the type of fat used will affect how crumbly the cookies are.	
Help Received Our science teacher clarified how we should format the graphs and tables, and provided the scale used to weigh the cookies.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Mason Prevost; Jack Zdanowski	Project Number J2023
Project Title Waterproofing ECOR: Comparing Effectiveness of Low VOC Paint and Sealants	
<p style="text-align: center;">Abstract</p> <p>Objectives There are great concerns regarding pollution due to the burning of agricultural wastes. ECOR helps utilize these potential polluting materials. ECOR is a sustainable building material sourced only from recycled paper products, agricultural fiber wastes, and forest waste. ECOR converts waste fibers using only water and heat, and is a completely nontoxic product. ECOR has tremendous strength as a panel material. ECOR has met some challenges with waterproofing, due to very limited choices of eco-friendly sealants. The purpose of this project was to test various eco-friendly sealants for their effectiveness as moisture barriers for ECOR products.</p> <p>Methods In our project we tested many samples of three types of ECOR products in two trials. One variation was made entirely from old recycled milk cartons, another from recycled office paper, and the last was made from recycled cardboard, milk cartons, office paper, and other recyclables. The samples were cut into smaller pieces and tested with SafeCoat, ECO Advance or Benjamin Moore Natura paints. We compared the strengths of samples with sealants applied to the control samples which had no sealants.</p> <p>Results The strength of the ECOR ranged from 0.90 kg to 68.03 kg. Benjamin Moore Natura Paints was the most effective sealant. Compared to the water exposed ECOR, the Benjamin Moore Natura sealed ECOR on average had a 31.00kg greater strength and reduced the water intake by an average of 25%. The other two sealants, SafeCoat and ECO Advance, were much less effective compared to Benjamin Moore Natura Paints. On average the strength when compared to the control was 13.31kg greater for SafeCoat and 13.45kg greater for ECO Advance.</p> <p>Conclusions Based on our results, water exposed ECOR performance improved due to the sealants. Benjamin Moore Natura Paints was the most effective while still maintaining the eco-friendly claims that ECOR wanted to keep secure. The ECOR controls, after being placed in water, swelled, gained weight, and were reduced in strength dramatically. For ECOR to be used for outdoor buildings a sealant should be applied as a moisture barrier. We also recommend further testing be performed on this new, sustainable product.</p>	
Summary Statement Our project tested various eco-friendly commercial sealants for their effectiveness as moisture barriers for ECOR products.	
Help Received We would like to thank Joe Stapley, an executive at ECOR, for aiding us in our research and informing us about the limitations of ECOR. And we would like to thank our parents for supervising our testing and buying our test supplies.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Matthew Silcott	Project Number J2024
Project Title Cold Feet? What Type of Socks Can Keep Your Feet the Warmest in Cold Weather?	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this project was to determine which sock fabric, Merino Wool, Nylon, Acrylic, Spandex or Cotton worked best for keeping the feet warmest during cold weather.</p> <p>Methods The experiment involved wrapping different fabrics around glass jars and pouring hot water at 205 degrees into jars. I would check temperature every 2 minutes using a scientific thermometer. Experiments were done 3 times for each fabric totaling 15 tests.</p> <p>Results The results showed that Cotton worked best for keeping in the heat.</p> <p>Conclusions This did not support my hypothesis that Merino Wool would be the best. The experiment testing of the sock products for quality and/or effectiveness could be used by anyone who does outside activities in the cold.</p>	
Summary Statement The purpose of my project was to determine which sock fabric keeps feet the warmest in cold weather, a useful research for homeless, hikers, workers and/or climbers.	
Help Received The project was done with the help of my science teacher guiding me through the process of the science fair, my mother for letting me stay up late to write and type all my info and finally my father and step mom for the use of the printer and computer.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Lauren Trinh	Project Number J2025
Project Title Hands Down: The Best Moisturizer	
<p style="text-align: center;">Abstract</p> <p>Objectives We apply lotions and moisturizers on a daily basis, but do we know which moisturizers work the best and why? The objective of my experiment is to determine which of the three common moisturizers, Aveeno, Eucerin, or Vaseline, would hydrate your skin the longest. My hypothesis is that Eucerin will work the best because it contains mineral oil, which helps prevent evaporation of moisture from your skin.</p> <p>Methods Four petri dishes of gelatin, which acts as a skin model were prepared. The first dish, which was the control dish, did not contain any lotion. Each of the other three dishes contained a different moisturizer that was applied on top of the gelatin. Each day the dishes were observed for textural changes and weighted to see how much water and moisture have evaporated. This was done for six days and the trial was repeated two more times. The amount of water loss was recorded and the percentage of water evaporation was calculated.</p> <p>Results Eucerin outperformed the other two moisturizers. On average, Eucerin only lost about 10% of its body weight. Aveeno lost about 16%, Vaseline lost about 34%, and the control lost about 66% of its body weight. This moisture lost represents how well each product was able to block the moisture in one's skin from evaporating.</p> <p>Conclusions This experiment indicates that if one were to apply either Eucerin, Aveeno, or Vaseline, as a moisturizer, Eucerin would most likely hydrate one's skin longest. Mineral oil, the main ingredient in Eucerin, acts as a tough protective barrier that prevents the moisture in your skin from evaporating. A consumer looking to purchase a long lasting moisturizer may consider buying Eucerin or any products that contain mineral oil as its main ingredient.</p>	
Summary Statement Of the three moisturizes that were tested, Aveeno, Eucerin, and Vaseline, Eucerin was best at keeping skin hydrated.	
Help Received My parents provided all the necessary supplies. I conducted the experiment in my kitchen.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Malia Walker	Project Number J2026
Project Title Heat Conductivity: A Study of Baking Sheets	
<p style="text-align: center;">Abstract</p> <p>Objectives My purpose for this experiment was to examine how and why the heat conductivity in different baking sheets affects the outcome of baking.</p> <p>Methods I made biscuits and two different chocolate chip cookie recipes on 8 different baking sheets: Non-stick, Aluminum, Stainless Steel, Insulated, Aluminized Steel, Copper, Ceramic, and glass. The variables I controlled were the temperature (375 degrees Fahrenheit for cookies, 350 Fahrenheit for biscuits), size of baked good (one-ounce scoop for cookies, biscuits were 2.04 ounces), time baked (10 minutes for cookies, 13 for biscuits), and the number on the sheet (four for cookies, two for biscuits).</p> <p>Results My results showed that baked goods on sheets with a higher conductivity are over baked, while ones with lower conductivity are underbaked. Specifically, non-stick produced the darkest baked goods, glass resulted in the lightest baked goods, and aluminized steel resulted in the most golden baked goods.</p> <p>Conclusions Knowing the heat conductivity of baking sheets is important in a real-life situation because you need to be aware of what sheets you are baking with to achieve consistently well-baked goods.</p>	
Summary Statement I showed that the heat conductivity of different baking sheets affects baked goods.	
Help Received None. I completed the experiment and project on my own.	