



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Emilee H. Bass	Project Number J2001
Project Title To Rust, or Not to Rust?	
Abstract Objectives/Goals The goal of this experiment was to see which acid mixture or chemical would prevent the most rust. Methods/Materials For this experiment I used 24 finishing nails, 261 grams of Prep and Primer, Krylon Rust Preventative Spray Paint, 54 grams of Baking Soda, 54 grams of water, 195 grams of Boiled Linseed oil, 48 grams of melted Coconut oil, 40 grams of Fish oil, Wd-40 Aerosol, eight small bowls, one spoon, 24 test tubes, a weight scale, saran wrap, tape, a sharpie, scissors, a ruler, a box, 450 milliliters of hot water, and 24 plastic knives. I put a nail in each test tube. 21 test tubes had nails with a product on it and the other three were the control nails. I let the nails rust for 21 days. Results In the end Prep and Primer prevented the most rust with zero rust on any of the nails and Baking Soda with Water prevented the least amount of rust with an average of 7.3 millimeters of rust. Conclusions/Discussion In the end my hypothesis was correct. Prep and Primer did prevent the most rust. The information I have learned from this experiment is that you can't always trust what a company tells you.	
Summary Statement It is about what will prevent the most rust.	
Help Received Faith Bass helped me buy the materials for my project and Nathan Sargent proof read my notebook.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Quentin C. Bertrand	Project Number J2002
Project Title Particulate Matter Emission from Air Fresheners: A Quantitative Study	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Indoor pollution may be ten times higher than outdoor pollution and air fresheners may be contributing to particulate matter pollution. Air fresheners are omnipresent in many households. They come in two broad categories: instant action and continuous action. Instant action air fresheners include atomizers, spray bottles and aerosols. Continuous action air fresheners include plug-ins, scented candles and fragrance gels. I focused on aerosol air fresheners, scented candles and plug-in oils. The goal of this study was to link increased indoor air pollution to the use of air fresheners and to quantify the amount of particulate matter introduced by each type of air freshener.</p> <p>Methods/Materials I purchased nine different air fresheners. I researched their Material Safety Data Sheets and their list of ingredients. The instrument used to detect the particles was a Particle Counter, which I borrowed. This instrument uses the principle of light scattering to count and discriminate particles by their size. Fine particles are smaller than 2.5 micrometers (PM2.5) while coarse particles are between 2.5 and 10 micrometers (PM10-2.5). Control experiments were conducted to determine the amount of PM naturally present in the room before each trial. Each experiment was repeated multiple times, for a total of 27 trials and 54 tests.</p> <p>Results The instant action aerosols emitted the highest levels of particulates with Glade being the highest emitter of offending particulates. The candles were the second highest emitters. Even though low numbers of particles were emitted during the burning cycle, extinguishing the flame by blowing the candle out generated very high levels of elemental carbon and particulate matter. Plug-in air fresheners emitted the fewest numbers of particles due to their mechanism for releasing fragrance.</p> <p>Conclusions/Discussion Candles and plug-ins are designed to run for extended periods of time, and deliver a subtle, yet noticeable, fragrance in the room. Air freshener aerosols are meant to provide high levels of fragrance in the room instantly to eliminate foul odors. Air pollutants have been ranked in the top five environmental risks to public health. According to my results using any type of synthetic air fresheners significantly increases the level of indoor particulates.</p>	
Summary Statement I tested and compared the numbers of fine and coarse particles emitted by a variety of commonly used household air fresheners.	
Help Received I borrowed the particulate counter from the University of San Diego.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Grace V. Billingsley	Project Number J2003
Project Title Poison through the Roof	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project was to determine if different roofing materials would affect the quality of water runoff and/or the amount of trace elements contained in the water.</p> <p>Methods/Materials To conduct the experiment, a wooden stand was hand-built and measured to the correct roofing pitch. The four roofing materials; slate, clay, composite, and metal, were cut into squares of 2 ft by 2 ft. Each roofing material was clamped to the stand and 2 gallons of water was poured over the roofing material. The runoff was collected and tested with a number of test strips for different trace elements. The test was repeated three times for each material, and the results for each kind of roofing were averaged. The averages were then compared to each other and the baseline test (tap water) to determine which roofing material had the least change, on average, from the tap water's trace element levels. The roofing material with the lowest average deviation from the baseline was determined the best roofing material for water purity.</p> <p>Results The slate roofing came out with an average deviation of 71.52 points per million in comparison to the baseline test. It contained abnormally high levels of dissolved solids (>500 Points per million.) Clay roofing had an average deviation of 60.79 points per million as compared to the baseline. It also had abnormally high levels of dissolved solids (>400 points per million) Composite roofing came in with a deviation of 59.65 points per million as compared to the baseline, and metal roofing came in first as the roofing material with the least deviation, at 35.8 points per million.</p> <p>Conclusions/Discussion This project aimed to inform people of the effects that roofing materials could have on the quality of water and its renew-ability. The results communicated that metal roofing is healthiest for the environment in terms of reusing water runoff. It will hopefully affect the choices of many property owners to help keep water renewable and make sure that no valuable water is wasted. The environment will benefit from the findings of this project; it will help to aid in the campaign to save water and effectively use resources without waste.</p>	
Summary Statement This project intends to determine the effect of roofing materials on the environment as well as on the reusing and renew-ability of water runoff.	
Help Received Daniel Kasza provided information about composite and slate roofing tiles.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Jensen L. Boyt	Project Number J2004
Project Title Testing D3O: Impact Padding Effectiveness in Football Helmet Technology	
Abstract Objectives/Goals After playing tackle football for the past three years in a Schutt brand helmet, I noticed I had less concussions in the 2015 season. D3O, a non-newtonian padding made from silly putty technology, was the difference in the padding. I wanted to test the effectiveness to see if the foam, air, or D3O padding really made a difference in shock impact, and therefore less injury to a player's head. Methods/Materials I used a ten foot ladder, pool broom, leather dog leash, and heavy duty clip to make a pulley release to drop the helmet from 8 feet to a laminate floor. In doing this, I wanted to simulate helmet to helmet impact at the back of the head, where most trauma occurs. I put an egg in a plastic bag and placed it in the helmet. I released the clip to drop helmets. I recorded results each time. Results The egg had no breaks or cracks 100% of the time when dropped from 8 feet with the Schutt helmet containing D3O padding. The egg broke most of the time with the other two types of padding, protecting 0% with the air padding and 25% with the foam padding. Conclusions/Discussion D3O padding is more expensive than foam and air padding. It is well worth the cost to protect football players from life long head trauma such as chronic trauma encephalopathy (CTE). I plan on advocating for football player safety equipment, so players can have a productive life even after their gaming careers are long over. I would also like to see this padding used in kidney and heart protection for sports' uniforms.	
Summary Statement I demonstrated that D3O is effective padding for football helmets in head trauma protection.	
Help Received I designed, built, and performed the experiments myself, and my mom recorded video and took pictures.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Patrick Choe; Hannah Kimura; Eric Lee	Project Number J2005
Project Title How Fast Does a Tennis Ball Lose Its Bounce?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Tennis, an elegant sport enjoyed by many people, is played with a ball and a racquet. Having two tennis players on our team, we were interested in doing a project that had tennis in it. So we came up with a question: How fast does a tennis ball lose its bounce? The majority of people that play tennis do not care about how their tennis equipment performs after a long period of use. But, in reality, it is important to know that tennis balls do lose their bounce over time, and it affects the way you play. You can get an injury called tennis elbow from playing tennis for a long time with dead balls.</p> <p>Methods/Materials We played many games with the test balls (new balls from a can). After every five games, we dropped the ball from three feet and measured the rebound with a yardstick and slow-motion video.</p> <p>Results A ball is considered dead if the rebound ratio is less than 53%. We observed that a new tennis ball has a rebound ratio of less than 53% after ten games.</p> <p>Conclusions/Discussion In the beginning, we thought that the ball would become dead after 30 games. We concluded that the ball became dead after 10 games. During additional research, we discovered that balls are changed after nine games in professional tennis tournaments. Although our hypothesis was proven wrong, our experiment supports this rule in professional tennis.</p>	
Summary Statement We measured the bounce of a new tennis ball at intervals during 50 games and discovered that it becomes dead after about 10 games.	
Help Received We designed and conducted the experiment on our own. We wrote the report on our own, but had a little help from a parent to make the charts.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Caroline L. Daniher	Project Number J2006
Project Title How an Alum Flocculant Improves the Efficiency of a Ceramic Filter to Purify Water	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Imagine there was a natural disaster affecting your water source, or you lived in an area where clean water was questionable. What would you do? One thing you can do is filter your own water, but this may take a long time especially if the water is extremely turbid. I am asking whether using a flocculant improves the efficiency of a porous ceramic filter to purify turbid water. I am also looking at whether a flocculant improves the water quality after filtration. Completing this experiment will hopefully prove that a flocculant can improve the efficiency of a porous ceramic filter to purify water and the quality of filtered water.</p> <p>Methods/Materials I used ceramic filters, alum, dirt, water, and a nephelometer. First, I made all the turbid waters with different amounts of dirt. Then, I flocculated half of them using a 10% alum ($KAl(SO_4)_2 \cdot 12H_2O$) solution. Finally, I filtered both the flocculated and non-flocculated waters in porous ceramic filters. I recorded the amount of water filtered at timed intervals. Turbidity of the water was measured before and after filtration with a nephelometer.</p> <p>Results My results show how much more efficient the porous ceramic filters were in filtering the flocculated waters compared to the non-flocculated waters. By flocculating the water, the filtration rates improved between 45% and 238%. For example, the 800g of dirt water sample filtered at a rate of 0.89 ml/minute and after flocculation it filtered at 3.03 ml/minute. This is a 238% increase. The more turbid the water was, the more effective the flocculant improved filtration rates. The nephelometer measurements showed that flocculation improved the water quality both before and after filtration. The Nephelometric Turbidity Units (NTU) were about the same as drinking water after filtration.</p> <p>Conclusions/Discussion This was a useful study on the flocculant alum. Since alum is a positively charged compound, it bound easily with the negatively charged suspended particles in the water. This caused the dirt particles to have a larger diameter and settle at the bottom. The flocculated water could then filter more quickly through the ceramic filter resulting in higher filtration rates. Flocculation also led to improved quality (lower NTU) before and after filtration. In conclusion, alum is very useful as a pretreatment before water filtration.</p>	
Summary Statement I used an alum flocculant as a pretreatment to purify water and this resulted in faster filtration rates through the ceramic filter and improved water quality.	
Help Received My mom purchased the materials and taught me how to use a drill. My dad helped me make the graphs. A neighbor lent me the nephelometer and taught me how to use it.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Morrigin K.A. Fedinick-Emmons	Project Number J2007
Project Title Liar, Liar, Fabric on Fire!	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to determine whether natural or synthetic fabrics were more fire resistive.</p> <p>Methods/Materials Propane torch, burn pan and controlled lab environment. Fifty samples of fabric: twenty five natural and twenty five synthetic. Each sample was burned for one minute and thirty seconds or until self extinguished. Fabric masses were obtained pre and post burn. Fire resistiveness determined by burn percentage.</p> <p>Results Natural fabric, hemp was the most fire resistive. With synthetic fabric, polyester was the most fire resistive. Both findings, along with all other findings, confirm my hypothesis that natural fabrics are more fire resistive than synthetic fabrics.</p> <p>Conclusions/Discussion Based on experimental results, one can conclude that natural fabrics tested are more fire resistive than synthetic fabrics. A persons removal of synthetic fabrics could potentially lower the risk of injury, property damage, or death in the event of a house fire.</p>	
Summary Statement This project explored the fire resistance of natural and synthetic fabrics.	
Help Received Local Battalion Chief helped me better understand topic, Family friend helped edit, Humboldt State University and Dr. Kane	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Claire Fung	Project Number J2008
Project Title Hidden Danger: Investigating Compliance to Lead Standards for Retail Jewelry	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My mother owns a shop that sells jewelry. I often visit her there, and notice that some of the items are labeled lead-free. Lead in jewelry is especially hazardous because young children sometimes chew on jewelry and may even swallow small pieces. I decided to investigate whether local stores and small wholesale jewelry vendors complied with the government standards. I hypothesized that larger brand-name retailers might follow regulations more strictly due to their reputations.</p> <p>Methods/Materials I tested 52 pieces of jewelry from ten different suppliers: six large brand name stores (Walmart, Target, Claire's, TJ Maxx, Marshall's, and Dollar Tree) and four small wholesale vendors (Anna Beauty, Beauty Accessories, June, and Girly Jewelry). I documented my results through lead leaching. I used the Lead Inspector lead-detecting solution to evaluate my results.</p> <p>Results According to my findings, 35% of the samples tested contained > 50 ppm leachable lead, which exceeds the 40 ppm government compliance warning level for children's jewelry. None of these samples were labeled with the requires content warning. Approximately 37% of the jewelry from the large brand name stores; including Walmart, Claire's, Marshall's, and Dollar Tree, exceeded 50 ppm leachable lead. Jewelry from Target and TJ Maxx did not contain high levels of lead. Approximately 27% of the jewelry from wholesale vendors (Anna Beauty, Beauty Accesories, June, and Girly Jewelry) contained > 50 ppm leachable lead.</p> <p>Conclusions/Discussion I found 57% of samples from Claire's and 75% of jewelry samples from Dollar Tree contained > 50 ppm leachable lead, which violates state standards for children's jewelry. These results are especially alarming because Claire's, in particular, is a very popular jewelry store for children and adolescents, who are more susceptible to lead exposure than adults. Even more important, one of the jewelry samples from a wholesale vendor that tested over 50 ppm leachable lead level was labeled lead free!</p>	
Summary Statement My project tested the lead content in jewelry from retail and wholesale stores.	
Help Received I conducted the testing and leaching of the jewelry samples independently. My parents helped supply the jewelry samples used in order to test lead levels using the process of leaching.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Zuoheng He	Project Number J2009
Project Title Please Turn Down the Volume	
Abstract Objectives/Goals The purpose of this project is to test and perceive which kind of material is the most effective at soundproofing, also, it has an objective of learning and understanding the principles of soundproofing. Methods/Materials Cardboard box, Bluetooth speaker, Laptop, Phone, Drywall panels, Fiberglass insulation, Insulating foam panels, Audio sound level meter, ruler. Uses audio level meter to measure decibels blocked from a sound source from both insides and outsides of a insulation chamber. Results After four trials with two sets of procedures, when the testing is done from both outside and inside, fiberglass insulation decreased on average the most decibels with 4.75 and 5.225; while insulated foam decreased on average mediocre amount of decibels with 0.45 and 5.75; and drywall decreased the least amount of decibels on average with 2.9 on both testings. Conclusions/Discussion According to the project's data collection, when the testing is done from both outside and inside, fiberglass insulation decreased on average the most decibels while insulated foam decreased on average mediocre amount of decibels and drywall decreased the least amount of decibels on average. The benefits of this project to society are mainly to save the money and time of the citizens when they decide to purchase any kind of insulation for soundproofing management.	
Summary Statement Measured by a audio level meter, I perceived that fiberglass insulation is the most effective soundproofing material.	
Help Received The insulation chamber is designed and made by myself. Meanwhile, I also designed the two sets of testing methods.	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Nina N. Isaka	Project Number J2010
Project Title The Science behind Cleaning	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Millions of people today, perhaps also you, are being tricked and put into danger when using commercial grease-cleaning products such as Formula 409, Goo Gone, and many others. These cleaners contain hidden toxins such as sodium hydroxide or 2-butoxyethanol which disrupt the endocrine, can cause severe liver and kidney damage, and can cause pulmonary edema and severe burns when in contact. Not only do these commercial cleaning products negatively affect humans, but they also affect the environment. These chemicals are drained into waterways and sewage which can kill fish, birds, and plants. Spray cleaners also pollute the air. Knowing this, I sought to find a healthy, natural, convenient, and efficient cleaner to replace the hazardous commercial cleaners in stores today.</p> <p>Methods/Materials The key materials that were needed were the cleaners, a lux meter, a flashlight, plastic trays or lids, swabs, and vegetable shortening. In the procedure I dipped a swab into the solution of a cleaner and wiped it in circular motions to remove the colored vegetable oil (represented the organic soil). I did this with each cleaner in every tray and used a lux meter with range 20,000 lux and a flashlight to determine my results.</p> <p>Results In the end the results from best to last were in this order: Formula 409, Mr. Clean, coffee, water, baking soda and vinegar, then nothing.</p> <p>Conclusions/Discussion My hypothesis, that out of the chosen group of cleaning products, was somewhat supported, for coffee was not as effective as the commercial cleaners but was extremely close behind. Coffee was much easier to work with, because it had a nice aroma and did not irritate the eyes or throat. In conclusion, coffee can definitely be a substitute for commercial cleaners. Also, by replacing commercial cleaning products with natural cleaners, the benefits are quite immediate. One, natural cleaners have good aromas and have proven to be effective. Two, the environment benefits, for less waste will be produced, and chemicals will not be drained into soil or water, sparing the lives of many plants and animals. Three, natural cleaners are cheaper and more convenient, because they can be found in one's pantry and are very abundant. Lastly, the people living in your home will benefit from decreased amounts of harmful chemicals in the air and ground. If natural cleaners replaced all commercial cleaners, the risks created from cleaning will cease.</p>	
Summary Statement By switching to use natural products, cleaning will be environmentally friendly, economical, aromatic, safe, and readily available.	
Help Received None. I built, designed, and performed the experiments by myself.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Aamina Thasneem Khaleel	Project Number J2011
Project Title Investigating Harmful Artificial Food Coloring in Candies Using Agarose Gel Electrophoresis	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project is to find out which candy (M&Ms or Nerds) has excessive amounts of artificial food colorings. My hypothesis is M&Ms uses excessive amounts of artificial colorings than Nerds. I also extended my project by comparing European candies with American candies because European candies contain natural food colorings (e.g. E100, E120, and E133). My project is to raise awareness about the artificial colorings in candies. From my research, I found out that artificial colorings are derived from coal, tar, and petroleum. M&Ms have artificial colors like Yellow 5, Yellow 6, and Red 40.</p> <p>Methods/Materials Neo Sci Biotechnology Lab Kit, Nerds, M&Ms, Skittles, and Smarties were used for my project. Compared M&Ms with Nerds candies to find out which candies has more artificial coloring. Agarose gel was poured into gel-casting tray, after 20 minutes the wells were formed. Gel-casting tray was placed into electrophoresis chamber and then poured 10x TBE running buffer into the chamber. Dissolve the candies and dispense the dyes into the wells in the chamber using pipette and the micropipette tips. Power supply was used for heating. During the heating process, bubbles of hydrogen gas would evolve at the negative electrode (cathode), and oxygen will be formed at the positive electrode (anode) causing the dyes to migrate. Measure the migration distance of each band after 45 minutes.</p> <p>Results Conducted my experiment 3 times and average data showed most of the M&Ms candies did not migrate to the positive end (anode), but Nerds candies were closer to the positive end in the electrophoresis chamber. My results showed that the molecules traveled in different rates depending on their weight and size. If the molecule is lighter, it will travel faster. My experiment proved that M&Ms candies have more artificial food coloring than Nerds. The results from my extended project proved that American candies have artificial food colorings and European candies have natural food colorings.</p> <p>Conclusions/Discussion The results obtained from my project supported my hypothesis. My investigation helped me understand that M&Ms has more artificial food coloring than Nerds that causes health problems and should be banned in US. I come to a conclusion that the Mars (M&Ms) and Nestle (Nerds) should replace artificial colorings with natural colorings. My extended project proved that European candies have natural colorings.</p>	
Summary Statement Candies manufactured in the United States have artificial food colorings that causes health problems.	
Help Received My parents purchased Neo Sci Biotechnology Lab Kit for my investigation and supervised my project. My teacher gave me guidance.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Clara E. Luisetti	Project Number J2012
Project Title Analysis of the Solubility of Different Types of Toilet Paper in Water and Septic Solution	
Objectives/Goals To see what toilet paper dissolves most in water or water and septic tank treatment. The hypothesis was that 1-ply toilet paper would dissolve the most and the flushable wipe would dissolve the least.	
Abstract Methods/Materials Various toilet paper and flushable wipes were cut to similar mass and put in containers. 500 mL of water was placed in 9 containers. Septic tank treatment was added to 4 of the containers. The containers were shaken for 1 minute, then the contents were poured through a septic filter. The filtered toilet paper was collected and then filtered through a micro filter. Each micro filter with toilet paper was massed when dry. A second trial was done for verification.	
Results The experiment showed that toilet paper dissolves best in water. I recovered 94% of the 1-ply toilet paper, 69% of the 2-ply, 61% of the 3-ply, and 8% of the flushable wipe in water. In the septic solution, I recovered 76% of the 1-ply, 62% of the 2-ply, 46% of the 3-ply, and 3% of the flushable wipe. Possibly, the septic solution needs more time for dissolution. My control of water showed a 1% increase in mass. While I washed my materials with water between trials, it was difficult to see toilet paper stuck to the filter, pipe, and container. Possibly, small particles of toilet paper, PVC pipe, or tree droppings accounted for this 1%. It is also possible water was trapped in the micro filter and had not evaporated. Salts and metals in the water could have also affected my results.	
Conclusions/Discussion The toilet paper with the greatest percent recovered was the 1-ply toilet paper. 94% of the 1 ply toilet paper in water was recovered and 76% of the 1-ply toilet paper in septic solution passed through the filter. As the ply increased, the filtered toilet paper recovered decreased. The least percentage recovered was Kirkland's flushable wipe in septic tank treatment. My results disagreed with my hypothesis that the septic solution causes more breakdown. I am unsure if the treatment needs more time, a normal septic environment, or if it doesn't increase dissolution. Based on the results, I suggest that people use 1-ply toilet paper if they have a septic system. This toilet paper broke down the best, filtered through an effluent filter the most completely, and is less likely to clog a leach system due to solubility. I would not add a chemical additive to a septic system without further research.	
Summary Statement This project looks at the solubility of different plies of toilet papers in two different solutions and their effects on a septic system.	
Help Received My parents poured the water and filtered toilet paper into the filters while I held them. They also helped me take pictures to create photo displays of my project and showed me how to graph my results on a computer.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Hayley N. Meyer	Project Number J2013
Project Title Insulation Effectiveness: Finding the Best Insulation Product for Your Home	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine which commercial insulation product, fiberglass batt, foam board, spray foam, or blown-in cellulose, will act as the best insulator against heat.</p> <p>Methods/Materials Five 12 by 12 inch mini-walls with identical size and shape were constructed out of 2 by 4s, plywood, and plastic cloth. The four insulation products, each with an R-Value of 13, were placed inside a separate mini-wall. One wall was left empty, acting as the experimental control. All wall edges were sealed with foil tape. Each wall, one at a time, was exposed to heat for 24 minutes. The conditions were exactly the same for each experiment. These included the location of the experiment, a house temperature of 67°F, a wall starting surface temperature of between 68 and 69°F, and the average heat temperature exposed to the walls. Using a laser thermometer, the temperature of both sides of each wall was recorded every 3 minutes. The temperature of the wall side facing the heater was recorded to verify that the heat applied to each wall was consistent. The temperature of the opposite wall side was taken to determine how much heat was escaping through the insulation product. This experiment was repeated 3 times for each insulation product and the control.</p> <p>Results The spray foam insulation had the lowest heat gain in the 24 minutes, making it the best insulator of heat. The average temperature gained in the three trials was 2.7° F. In second place was the blown-in cellulose with an average temperature gain of 4.8° F. In third place was the foam board with an average temperature gain of 7.4° F. And in fourth place was the fiberglass batt with an average temperature gain of 17.2° F.</p> <p>Conclusions/Discussion Each insulation product proved to be successful at blocking the flow of heat because without any insulation, the control wall's average temperature gain was 64.3° F. There are many choices of insulation types with different factors for choosing them including availability, installation process, and price. They all insulate and have the same goal of keeping your house warmer in the winter and cooler in the summer.</p>	
Summary Statement My experiment showed that spray foam insulation is the best insulator against heat.	
Help Received My dad helped me build the mini walls, and my mom taught me how to use Excel for my result tables.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Nishtha K. Mistry	Project Number J2014
Project Title An Eggsperiment: What Is the Best Egg Substitute in Baking?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I tested which natural egg substitute best mimicked the binding, thickening, and rising properties of eggs in baking.</p> <p>Methods/Materials Four variables were compared to the control (eggs); blended silken tofu, applesauce, flax seed, and aquafaba. Each ingredient was used as a substitute for eggs in a commercial recipe for baking cupcakes. The different texture, height, and binding were observed and compared for each egg substitute used.</p> <p>Results Analyzing all the data collected, the results clearly showed aquafaba to be the best egg substitute in baking. It best mimicked the binding, height, and texture when baking with eggs. For example, aquafaba had the same exact height of 3.5 centimeters as the cupcake made with eggs.</p> <p>Conclusions/Discussion My original hypothesis, that silken tofu would be the best egg substitute, proved to be incorrect. Aquafaba resulted as the best egg substitute that mimics the binding, height, texture, and batter consistency when baking with eggs. To support today's new healthy lifestyle, this experiment shows that there are other natural ingredients that can be substituted in your favorite recipes.</p>	
Summary Statement This project demonstrated that there are various natural ingredients that can be utilized as an egg substitute in baking.	
Help Received None. I performed all aspects of the experiment by myself, but was supervised by a parental guardian while working with some baking appliances.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Amanda N. Nigro	Project Number J2015
Project Title Testing Household Materials for Lifting Fingerprints	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The experiment tests which household materials will work best as a dusting agent to lift fingerprints off of a glass surface.</p> <p>Methods/Materials Pencil lead, sidewalk chalk, charcoal briquette, cocoa powder, eye-shadow, index cards, clear tape, dusting brushes, glass surface. Dusted and lifted multiple fingerprints using each of the materials and compared to a control.</p> <p>Results Fingerprints that were dusted using five household materials were compared to a control fingerprint. Although all household materials were able to lift part of the prints, pencil lead resulted in lifted prints that most closely matched the control fingerprint.</p> <p>Conclusions/Discussion Based on counting identifiable points, pencil lead resulted in the clearest lifted fingerprints, possibly because of the similar ingredients to actual fingerprint powder.</p>	
Summary Statement I showed that household materials can be used as a dusting agent to lift fingerprints, and determined that pencil lead was the most effective.	
Help Received None. I designed and performed the experiment myself.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Elise M. Ochs	Project Number J2016
Project Title Investigating Various New and Used Cooking Oils for Saturated Fat Level	
Abstract Objectives/Goals How does deep frying chicken in different cooking oils affect their levels of saturated fat? Methods/Materials I was using an iodine density test to find and compare how saturated fat levels change in cooking oils before and after deep frying a chicken in them. I used canola, olive, peanut, and sunflower oils. Results After my investigation, I found that after deep frying chicken in these oils, canola oil has the least amount of saturated fat, and sunflower had the highest amount of saturated fat. I also found that sunflower oil had the biggest change in saturated fat before and after deep frying chicken in it. Conclusions/Discussion I concluded that canola oil is the healthiest cooking oil to cook with based on saturated fat level, and sunflower oil contains the most saturated fat after deep frying chickening it.	
Summary Statement Comparing the levels of saturated fats in certain cooking oils before and after deep frying chicken in them.	
Help Received	



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Hannah L. Ostermann	Project Number J2017
Project Title Stop the Burn!	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of the project is to determine if newer sunscreens protect better than expired older sunscreens with the same Sun Protection Factor (SPF) and brand. The sun emits electromagnetic radiation in the form of visible, ultraviolet (UV), and infrared. UV radiation is divided into three types: UVA rays 400-320 nm, UVB rays 320-290 nm, and UVC rays 290-320 nm. UVA rays play a part in skin aging and cancers and penetrate glass. UVB rays cause skin burning, play a part in skin cancer, and do not pass through glass. UVC rays are absorbed by the ozone layer. Sunscreens contain inorganic chemicals, such as zinc oxide, and organic chemicals, such as avobenzone that protect against UVA rays and salicylates that protect against UVB rays. Research showed that older expired sunscreens are less effective, because the benzene chemicals break down. The hypothesis is that older expired sunscreens do not protect as well as new sunscreens with the same SPF and brand.</p> <p>Methods/Materials UV radiation was measured with a UV meter. UV readings taken through clean glass pieces is the control. Four separate glass pieces were used as trials. Each type of sunscreen (0.1 to 0.15 grams) was smeared on each of the four glass pieces. The sunscreens are variables. Ten UV readings were taken for each glass piece. The glass pieces were cleaned between sunscreens. Four different groups of sunscreens with the same SPF and brand were tested.</p> <p>Results Of the four groups of sunscreens only the new Coppertone SPF 30 sunscreen protects better than the old Coppertone SPF 30. The new Equate SPF 30, Banana Boat SPF 30 cream, and Banana Boat SPF 30 spray sunscreens are all less protective than the expired older sunscreens with the same SPF and brand. Even the Banana Boat SPF 30 cream that turned brown and grainy protects more than the new Banana Boat SPF 30 cream.</p> <p>Conclusions/Discussion The hypothesis that expired older sunscreens do not protect as well as new sunscreens with the same SPF and brand is partially correct. Only UVA rays pass through glass. UVB rays do not. The chemicals in the sunscreens that protect against UVA rays are Avobenzone, Oxybenzone & Zinc Oxide. Avobenzone and oxybenzone chemicals are reported to break down with time. All the sunscreens contain those chemicals. But there is no relationship between those chemicals and the results.</p>	
Summary Statement The project compares the effectiveness of new sunscreens with old expired sunscreens with the same SPF and brand.	
Help Received My parents helped me with the experiment and board.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Tyler N. Quinn	Project Number J2018
Project Title Surf Wax	
Abstract Objectives/Goals the goals of my project are to help let surfers know what surf wax will give them the most grip when surfing Methods/Materials I used 9 different types of surf wax and compared them using a spring scale attached to a simulated foot and puled it across the wax under various conditions. The materials I used were surf wax, surfboards, spring scale, water, sand, silicone foot. Results The resuts showed that fu wax was there best wax in the water but sex wax cold water was the best over all. Conclusions/Discussion In my experiment I determined that these waxes had the most gip and this will help surfers pick the better wax when buying wax.	
Summary Statement My project is about determining the surf wax with the most grip.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Ellie Silvester	Project Number J2019
Project Title Comparing Levels of Trace Contaminants in Bottled Water vs. Tap Water	
Objectives/Goals Many people prefer to drink bottled water versus tap water. But is bottled water really better, especially considering that it costs significantly more and that the production and distribution contribute to environmental pollution? The purpose of this project was to test the claims and quality of the most popular bottled water brands compared to tap water.	
Abstract Methods/Materials I tested 18 different water samples including samples from Fiji, Evian, Boxed Water Is Better, Dasini, Market Pantry and tap water. I generated more than 500 data points to evaluate trace substances contained in the water samples. I used an inductively coupled plasma mass spectrometer to determine the levels of nineteen different metals and other elements in each sample. I then used a gas chromatography instrument to measure the levels of organic volatile compounds in each sample, and an ion chromatography mass spectrometer to test for inorganic anions. I averaged my data and analyzed the results.	
Results My results revealed trace amounts of contaminants present in many of the samples, but all levels were will within the EPA and FDA guidelines and limits for safe drinking water. Tap water contained significantly higher levels of aluminum, copper, and zinc at 7.805 ppb, 15.638 ppb, and 4.295 ppb respectively. The two most expensive waters, Evian and Fiji, contained high levels of elements not represented in other test samples: Evian contained levels of barium at least 105 ppb higher than all the other samples, and Fiji had a level of vanadium at least 50 ppb higher than all other samples. Evian also contained nineteen times the level of uranium found in the tap water sample, and Fiji contained nearly twice the amount of lead found in tap water. Levels of organic compounds were undetectable in all samples tested.	
Conclusions/Discussion Based on my results, I would recommend not choosing Fiji, Evian, or Dasini water over other bottled water brands. They are much more expensive, yet still contain many contaminants. I would recommend drinking tap water, but to run the faucet for at least 30 seconds before pouring a glass of water in the morning because trace metal might build up in the water from the pipes overnight. If I had to choose one brand of bottled water from my test samples, I would recommend drinking Market Panty (Target#s store brand) because it is inexpensive and contained the lowest levels of contaminants.	
Summary Statement In my project I compared trace levels of contaminants in bottled water and tap water.	
Help Received I designed and carried out the experiment myself. I had help from Thermo Fisher Scientific understanding how to set parameters for each instrument, and how to run each of the instruments.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Dylan J. Taitano	Project Number J2020
Project Title Paintball Ammo: Is the More Expensive Brand Worth the Price?	
Abstract Objectives/Goals The objective of this study is to determine the efficacy of paintball ammunition at different price points. Methods/Materials Method: Make the wooden target. Measure 10 meters away. Shoot 30 inexpensive paintballs at the target. Measure how close each shot is from the center. Repeat for the reasonable and expensive paintballs. Move to 15 meters from the target. Repeat shooting process for all 3 types of paintballs. Move to 20 meters from the target and repeat process for all 3 types of paintballs. Materials: 1 beginner paintball gun, 2 tanks of carbon dioxide, safety goggles, 500 rounds of inexpensive paintballs, 500 rounds of reasonably priced paintballs, 500 rounds of expensive paintballs, and 1 wooden target Results After each of the paintball shots (180 shots in total), the distance from the target's center and the quadrant in which it landed was recorded. This provided a good variety of data to review. The data showed that there was not a statistical difference between the accuracy of the more expensive paintballs and the less expensive paintballs. Conclusions/Discussion After testing the brands, it was determined that the less expensive brand did not do any better or worse than the medium or the expensive brand. After further review, the inexpensive brand and the medium brand were the same. When comparing the inexpensive brand and the expensive brand, the inexpensive brand was more accurate. This is surprising because people generally think that more expensive items are better. Based on this experiment, people who want to buy paintballs do not need to pay the higher prices. Less expensive brands are just as effective. However, different versions of the paintball game may not support this conclusion (competitive vs. hobby).	
Summary Statement Based on my tests, there is no statistical difference in accuracy between the differently priced paintballs.	
Help Received My uncle, who is an engineer, helped me build the wooden target.	



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Matthew J. Waldman	Project Number J2021
Project Title Testing Oxidation on Skateboard Bearings	
Abstract Objectives/Goals In my project I am testing to see which bearing company can withstand the most oxidation while sitting in water for three days. I will be using salt water, fresh water, and chlorine. After seeing which has the most rust, I will then go on to see which spins for the longest. I will be putting each bearing on one wheel and timing it in seconds. Methods/Materials I will start by getting each substance of water and placing the bearings in, for approximately seventy two hours. Next, I will take each bearing out and leave them at rest for twenty four hours. After this, I will continue to test which spins the best by placing them in a standard 52mm wheel. I will test to see which company lasts the longest, then I will compare to see if the rust effects the motion. Results In my first project, I saw that the cheapest company did the best. These bearings by Active Brand did great and had minimal rust. This was great to see that people do not need to spend a lot of money on bearings that might not be as good as cheaper ones. Conclusions/Discussion My project showed that if something is expensive, it doesn't always mean it is great. For example, one pair of Red skateboard bearings were not as good as the cheaper Active Bearings. So I suggest that customers should look at prices in between.	
Summary Statement My project is testing the oxidation on skateboard bearings in three different substances of water and how well they spin.	
Help Received I tested all the bearings by myself, but was helped out by Active Ride Shop, who donated supplies, the TOHS mentours, my science teacher, Virginia Bartley, and my family and friends for support.	