



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Julia M. Abele	Project Number J2101
Project Title Dissolving Diphenhydramine: What Is the Most Efficient Form and Brand of Diphenhydramine?	
Objectives/Goals I conducted this experiment to determine which form (tablet, capsule, or liquigel) and which brand (Benadryl, CVS, or Walgreens) of quick-relief allergy medicine (diphenhydramine) dissolves the fastest in simulated stomach fluid and thus offers the fastest relief.	Abstract To make the stomach fluid, I used 150 milliliters of water and 75 milliliters of hydrochloric acid. I placed a diphenhydramine tablet in the fluid, swirled every two minutes, and measured how long the tablet took to dissolve. I conducted this process for Benadryl, CVS, and Walgreens tablets, capsules, and liquigels. I conducted six trials.
Methods/Materials The tablets (at just over 10 minutes on average) dissolved faster than the capsules (nearly 30 minutes) and liquigels (over an hour). The Benadryl tablets dissolved the fastest, but the Benadryl liquigels were the slowest.	Results The results and data support my hypothesis that the gelatin or silica gel coating on the capsules and liquigels delays dissolution. Also, the Benadryl tablets dissolved faster than their generic equivalents, supporting my hypothesis that Benadryl's unique combination of ingredients, including the superdisintegrant croscarmellose sodium, aids dissolution. The CVS tablets, which have a different superdisintegrant, were not far behind. The next time I have an allergic reaction, I will take a Benadryl or CVS tablet.
Conclusions/Discussion I learned that Benadryl tablets dissolve faster than other forms and brands of diphenhydramine and thus offer the fastest relief for allergy symptoms.	
Help Received My parents, Ms. Margeson, Mrs. Hoffmann, and Mrs. Benedict	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Miriam Ahamed; Andrew Vizcaya	Project Number J2102
Project Title Is It Hot in Here?	
Objectives/Goals The purpose of this project was to discover how high up smoke detectors can detect smoke. The hypothesis for this experiment, was that the ionization smoke detector will detect a burning towel faster than a photoelectric or dual sensor smoke detector, since ionization smoke detectors can detect smaller fires, faster than the photoelectric and dual sensor smoke detectors.	Abstract The controlled variables in this experiment were the towels used to create smoke, the blow torch used to light the towels on fire, and vaseline put on the towels. The dependent variable in this experiment was the amount of time the smoke detectors go off. The independent variables in this experiment were the ionization, photoelectric, and dual sensor smoke detectors used.
Methods/Materials The first ionization smoke detector, called Fire X, from the company, Kidde, took 37.15 seconds from 1.82 meters, and 44.8 seconds from 3.04 meters. The second ionization smoke detector used was called, Code One, from Kidde, and took 12.03 seconds from 1.82 meters, and 53.29 seconds from 3.04 meters. The third smoke detector was the photoelectric, from Kidde. It took 9.14 seconds from 1.82 meters, and 50.59 seconds from 3.04 meters. The last smoke detector tested, was from USI Electric, and took 23.81 seconds from 1.82 meters, and 35.41 seconds from 3.04 meters. In short description, the results were that our hypothesis was wrong and the fastest smoke detector from 1.82 up was the photoelectric detector, while the fastest smoke detector from 3.04 meters was the dual sensor smoke detector.	Results In a not short description, the results were that our hypothesis was wrong, and the fastest smoke detector from 1.82 meters up, is the photoelectric detector from Kidde, with 9.14 seconds and the fastest detector from 3.04 meters, was the dual sensor detector, from USI Electric, with 35.41 seconds.
Conclusions/Discussion My project is about testing 3 different smoke detectors from 6 and 10 feet, vertically.	
Summary Statement My project is about testing 3 different smoke detectors from 6 and 10 feet, vertically.	
Help Received I would like to thank my parents, fellow classmates, science teacher and the fire department firefighters. Each one of them helped with the project for example, they helped with transportation, buying supplies, proof-reading my writing, and testing.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Nakolo S. Anderson Joens-Poulton	Project Number J2103
Project Title Oh Come On, Wash Me! Which Laundry Detergent Reduces Bacon Grease Stains the Most?	
Objectives/Goals My objective was to find out which of five laundry detergents was most effective in reducing the diameter of bacon grease stains on cloth.	Abstract Five different liquid laundry detergents, bacon grease, a 1/2 teaspoon measuring spoon, 18 identical white cloths, measuring tape, a timer, a plastic tub for water, and cold tap water. The diameters of bacon grease stains on white cloths were measured before and after being washed in liquid laundry detergents.
Methods/Materials Each of five liquid laundry detergents was used to wash bacon grease stains out of white cloth. After several trials, the results show that when Fab Summer Rain liquid laundry detergent was used, on average, the diameter of bacon grease stains were reduced by 32 percent. The use of this liquid laundry detergent showed the greatest reduction in the diameter of bacon grease stains out of the five tested.	Results After testing each of five liquid laundry detergents multiple times, the results show that when Fab Summer Rain liquid laundry detergent was used, the diameter of bacon grease stains were reduced the most, on average. The other detergents tested showed a reduction in the diameter of the bacon grease stain to varying degrees.
Conclusions/Discussion After testing the effectiveness of five liquid laundry detergents in reducing the diameter of bacon grease stains, I found that one detergent was more effective than the others.	
Summary Statement After testing the effectiveness of five liquid laundry detergents in reducing the diameter of bacon grease stains, I found that one detergent was more effective than the others.	
Help Received I designed and performed the experiment myself.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Sean Cook	Project Number J2104
Project Title Are Caps on Medication Bottles Really Childproof?	
Objectives/Goals All my life I have taken medications because I have Arterial Tortuosity Syndrome, which is a very rare connective tissue and heart disorder. Over time I have taken a variety of medications to help, and ever since I was six years old I have been able to open these so called #child proof# containers in which the medications are packaged. I wanted to see if other young children might be able to open these containers, since many accidental poisonings occur each year due to children ingesting medication not intended for their use.	Abstract During my experiment, I tested the kindergarten and first grade students, I tested 5 different types of childproof medication bottles on each test subject. I gave them up to 30 seconds to attempt to open each bottle. I recorded whether the child was able to open the bottle. If they was able to open the bottle, I documented the number of seconds it took them.
Methods/Materials In my experiment I tested a total of twenty students, 12 in kindergarten and eight from first grade. The students all ranged from ages five to seven. The kindergarteners were my first test group. I was alarmed at how quickly many of the bottles were opened. The kindergarteners were able to open three of the five test bottles, approximately 50% of the time. The first graders were able to open four of the five test bottles 50% of the time. One of the medication bottles, the Walgreens bottle, was only opened by one student, a first grader. This container was the only one that seemed to have an effective cap.	Results Through my project, I have learned how ineffective many child proof medication caps are. The students opened many of the medication bottles in less than 2.5 seconds. An example was the cough syrup bottle, which had the least protective bottle cap of the five child proof containers tested. The Walgreens bottle in contrast was very effective in keeping children safe, since only one child was able to open it. More testing should be done to see if other types of child proof medication bottles and other child proof containers are actually helping to keep children safe.
Conclusions/Discussion Testing if many kinds of childproof medication bottles are really childproof	
Summary Statement None. I designed, built, and performed the experiments myself.	
Help Received None. I designed, built, and performed the experiments myself.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Jake T. Danowsky	Project Number J2105
Project Title The Effectiveness of Commercial Netting in Preventing Erosion	
Objectives/Goals Soil erosion has always been an interesting topic for me. My goal in this project is to find the best way to stop erosion, or at least slow its progress with the use of netting. In my experiment I tested two types of commercial netting: Burlap netting, and Mesh netting. I also tested no erosion protection at all as my control. I decided to experiment with three different types of soil: garden soil, sand based soil, and Clay based soil.	Abstract In this experiment, I performed 27 tests. For my materials, I needed 54 pans to hold soil (2 different sizes, 27 pans of each size). I also used a knife to remove the front of the smaller pans so that the soil could "erode" when I placed them on a 35 degree angle. I needed three types of soil, water to simulate rain, a scale to weigh the eroded soil, and a stopwatch to time the amount of "rain".
Methods/Materials I performed the 27 tests in trials, each time testing garden soil, sand based soil, and clay based soil. The mesh netting had the best results with approximately 80.2g on average of soil eroded, the burlap netting on average had 130.8g eroded soil, and the control, with no erosion protection, had an average of 452.5g soil eroded.	Results The mesh netting had 82% less eroded soil on average than the control soils with no protection netting. The burlap netting had 71% less eroded soil than the controls. Both commercial nettings prevented soil erosion effectively compared to the controls, which allowed more than three times as much soil to erode. I would recommend the burlap netting, since it is a natural fiber, will reduce erosion, and will not contribute plastics to the environment. Mesh netting is a plastic material, so it harms the environment.
Conclusions/Discussion I compared commercial netting materials for erosion prevention for different types of soil.	
Summary Statement In my project, my grandmother Diane Price helped hold the pans in place while I filtered them, so the water would not spill.	
Help Received In my project, my grandmother Diane Price helped hold the pans in place while I filtered them, so the water would not spill.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Alexander R. DeGuzman	Project Number J2106
Project Title Solar Cell Power Output vs. Light Intensity and Temperature	
Objectives/Goals The object of this study is to determine the effects of variations of light intensity and temperature on solar cell power production.	Abstract Tested 330 lumen, 1600 lumen, and 4000 lumen light bulbs' effects on solar cell power production. Also used dry ice spray and a hair dryer to test the effects of cooler and warmer temperatures on solar cell power production. Two 100mA mini solar cells were used in the test.
Methods/Materials Conducted 20 trials each for the 330 lumen, 1600 lumen and 4000 lumen light bulbs, and varied the temperature of the solar panel with dry ice spray and a hair dryer for the three sets of 20 trials. For all three light bulbs, the results showed increased solar cell power production at cooler temperatures vs warmer temperatures. Also, the higher the lumen light bulb output, the more power the solar cell produced.	Results The 60 total trials produced consistent results. In conclusion, a solar panel will generate more power when it is exposed to more light and cooler temperatures and will generate less power when it is exposed to less light and warmer temperatures.
Conclusions/Discussion	
Summary Statement I showed that solar cell power production is directly proportional to light intensity and inversely proportional to temperature.	
Help Received I conducted the experiment myself, and my science teacher advisor reviewed my results.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Sacha S. Del Bosque	Project Number J2107
Project Title Can a Smartphone Do Medical Imaging?	
Objectives/Goals The objective is to test a smartphone microscope and determine the best way to design a functional prototype with multiple applications centered around the prevention and detection of disease, illness, and environmental pollutants.	Abstract Smartphone with working camera, 1mm ball lens, circuit to illuminate slide, microscope slides with specimens, toilet paper tubes, and materials to draw a technical drawing. I tested two parts of a smartphone microscope, then used this information to design a functional prototype.
Methods/Materials Smartphone with working camera, 1mm ball lens, circuit to illuminate slide, microscope slides with specimens, toilet paper tubes, and materials to draw a technical drawing. I tested two parts of a smartphone microscope, then used this information to design a functional prototype.	Results There were two parts to my experiment, specimen illumination, and different sized objectives. The best illumination for a smartphone microscope is one small light bulb. The microscope is the most accurate when it is the closest to the slide. These questions had to be determined before the prototype could be designed. In my findings what would work best is a prototype designed like a microscope and phone case combined. This allows it to detach and attach for multiple uses.
Conclusions/Discussion This prototype could enable doctors to diagnose and treat patients for blood borne diseases and other illnesses that can be seen through a microscope. Doctors and scientists can determine if there is an environmental pollutant in water, food, or soil that could be affecting health. My goal was to test and create a product that is inexpensive, easily accessible, and could do the above tasks. My experiment was successful.	
Summary Statement This project proposes a way to create a smartphone microscope, and introduces a prototype design that can be utilized as a solution to a lack of access to medical diagnostic facilities.	
Help Received I designed and tested the experiment myself. My mentor was Bonita Hamilton, she answered my questions, and gave moral support. My mother edited my report and assisted with my display board. My father bought my online supplies. My school lent me the microscope slides used to test my experiment.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Navleen K. Dhot	Project Number J2108
Project Title The Dissolution Time of Decongestants in Water and Stomach Acid	
Objectives/Goals The objective of this study was to determine which decongestant dissolved the fastest in stomach acid.	Abstract Three different decongestants, hydrochloric acid, magnetic mixer, water, and stopwatch. I dropped a decongestant into water and stirred it with the magnetic mixer for 10 seconds. Then, I added the hydrochloric acid and noted the time taken for the decongestant to dissolve.
Methods/Materials Three different decongestants, hydrochloric acid, magnetic mixer, water, and stopwatch. I dropped a decongestant into water and stirred it with the magnetic mixer for 10 seconds. Then, I added the hydrochloric acid and noted the time taken for the decongestant to dissolve.	Results Sudafed dissolved the quickest in the hydrochloric acid and water, meaning that it will take effect the fastest when taken.
Conclusions/Discussion Sudafed dissolved the quickest in the acid and water. This means that Sudafed will begin taking effect before the other medications. This information has helped me and my family because we switched our medications and have noticed drastic change.	
Summary Statement I determined which decongestant begins affecting congestion the fastest by dissolving different decongestants in simulated stomach acid.	
Help Received My doctor helped me understand how much acid and water to use for dissolving the decongestants in. A science teacher at my school provided the hydrochloric acid and magnetic mixer.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Kadence C. Golightly	Project Number J2109
Project Title Cosmetic Chemistry	
Objectives/Goals The Objectives/Goals for my project were 1) compare the ability of name brand lip balms to homemade lip balms in softening dried apples over a one-week time period & 2) comparing the ability of the 3 types of homemade lip balms, each with a different oil base, in softening dried apples over a one-week time period.	Abstract Using a recipe I found on the blog Growing-Minds.org, I made homemade lip balms. I modified the recipe by using different types of oils, to compare them to 3 name brand balms & see which would soften dried apples the most over a one week time period. The homemade lip balms were made with beeswax, honey, coconut oil/extravirgin olive oil/canola oil, & a 15 drops of mint essential oil for scent and flavor. The top name brands were all mint "flavored" as well. I spread a thin, even coating of each type of lip balm on store bought dried apples & then recorded each day how soft & flexible the apples got. I repeated the experiment by using four apple pieces of relatively equal size & thickness for each type of lip balm. I used a batch of dried apples with no lip balm as the control group. The homemade balms were all made with the same type & amount of beeswax, honey & essential oil & the same amount of each type of oil. The experiment used the brand of dried apple slices from the same bag. The experiment apples were all covered & kept in the same cool area in my kitchen.
Results All of the lip balms had an effect on the dried apples. There was no significant softening until Day 4 & several apples slices started to show signs of softening up, except the control batch. By the end of the week, all of the apples except the control batch, had softened. After 7 days, the Blistex apples were the least flexible & the coconut oil apples were the most flexible. The E.O.S. balm & the olive oil balm worked better than the Chapstick & the canola oil balms. One additional observation was that the canola oil & Blistex apples turned brown during the week.	
Conclusions/Discussion My 4 trials showed that the homemade coconut oil lip balm worked the best at softening the dried apples. This supported my hypothesis. However, the name brand E.O.S. lip balm softened the dried apples better than the other two name brand lip balms & better than the canola oil lip balm. These results support making your own lip balm from natural ingredients to get a better softening result than name brand lip balms & it's fun!	
Summary Statement I discovered that homemade lip balm can have a better effect on the softness of dried apples as compared to name brand lip balms over the period of 1 week.	
Help Received This project was my idea. I did my own research and product choices. My mother helped me to set up the double boiler, pour the hot, liquid lip balms into their containers to cool, and helped me cover the display board with contact paper.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Krista M. Hobbib	Project Number J2110
Project Title Pucker Up: Putting Long-Lasting Lipstick to the Test	
Objectives/Goals Many people spend money on lipsticks marketed as long-lasting (eg, "16-hour kiss-proof lip color", etc.). My goal was to i.d. which brand of 6 long-lasting lipsticks is the most durable when tested in 2 conditions (Blot & Humidity). Based on previous research, I believed Maybelline would prove to be the most durable, & L'Oreal would be the 2nd most durable. My study saves consumers money & time by proving what brands are more durable & also reveals what key ingredients to look for when buying lipsticks claiming to be long-lasting.	Abstract A Blot Test simulated what causes color to fade/smear as lips press against a surface (speaking, kissing). A Humidity Test simulated what causes color to transfer/run in heat & moisture (eating/drinking, humid weather). I applied each color to 3-D synthetic lips (soft flexible silicone), since real lips vary in size, shape, firmness, & texture. I conducted both tests 8 times x 6 brands (98 total data points). I devised a 1-6 rank order scale to score brand durability (1 is most durable; 6 least durable), then analyzed & score the data & pre/post photos.
Methods/Materials Maybelline proved to be the most durable brand in both test conditions. The L'Oreal brand didn't perform as expected, scoring a 2 (2nd most durable) in the Blot Test but only a 6 in the Humidity Test (tied for least durable). MAC brand costs the most but was the 2nd least durable in the Humidity Test & just average (3) in the Blot Test. Wet N Wild was the 2nd most durable of the 6 brands, which was unexpected given the limited research on it & its low price.	
Results Maybelline was the most durable in both tests because it contains 3 ingredients key to sustaining color, while other brands have just 1 or 2. Somewhat surprising is the performance of Wet N Wild, the least costly, yet proved to be the 2nd most durable. My study proves Maybelline to be more durable than Wet N Wild, Revlon, MAC, & Covergirl or L'Oreal. As a result, consumers know what ingredients to look for in a long-lasting lipstick, saving time & money. My findings also support previous research that more expensive cosmetics don't necessarily guarantee higher quality.	
Conclusions/Discussion I tested the durability of 6 long-lasting lipstick brands in 2 test conditions (Blot & Humidity), applied color to 98 3-D synthetic skin lips, devised a 1-6 rank order scale, & proved 1 brand to be the most durable.	
Help Received I designed the study & scoring system myself, & found the synthetic skin product; My advisor reviewed my notes & suggested Humidity Test modifications; My mentor read my research paper & clarified info. re. the chemistry of product ingredients; My parents timed 48 Humidity tests & aligned graphs	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Emily A. Hsi	Project Number J2111
Project Title How to Remove Ink Stains	
Objectives/Goals My project identified substances that removed ballpoint, gel, and highlighter ink stains, and tested the impact of immediate treatment, wash time delay, and multiple washes.	Abstract For each ink stain (ballpoint, gel, highlighter), 7 substances (bleach, lemon juice, Shout remover, nail polish remover (acetone), hand sanitizer (ethyl alcohol), skim milk, and detergent) plus control were studied in 4 trials which varied immediate stain treatment (Y/N) and wash delay time (8h vs 2d with pre-treatment). Each trial assessed the impact of a second wash. A stain assessment scale (0-10) was created. Each trial had 30 iterations to detect a 1-unit difference in stain score with 88% power at $P \leq 0.05$. Cotton shirts (24) were cut into 120 sections. Each section had 8 quarter-sized stains per ink type, and was treated per assignment. Stains were photographed and scored after each intervention step. Average stain scores were compared across substances using one-way ANOVA tests. Fisher's Exact tests compared the proportion of completely removed stains.
Methods/Materials For each ink stain (ballpoint, gel, highlighter), 7 substances (bleach, lemon juice, Shout remover, nail polish remover (acetone), hand sanitizer (ethyl alcohol), skim milk, and detergent) plus control were studied in 4 trials which varied immediate stain treatment (Y/N) and wash delay time (8h vs 2d with pre-treatment). Each trial assessed the impact of a second wash. A stain assessment scale (0-10) was created. Each trial had 30 iterations to detect a 1-unit difference in stain score with 88% power at $P \leq 0.05$. Cotton shirts (24) were cut into 120 sections. Each section had 8 quarter-sized stains per ink type, and was treated per assignment. Stains were photographed and scored after each intervention step. Average stain scores were compared across substances using one-way ANOVA tests. Fisher's Exact tests compared the proportion of completely removed stains.	Results For ballpoint ink, the lowest average residual stain scores were with hand sanitizer (0.1) and nail polish remover (0.3). Complete removal was best achieved with hand sanitizer with immediate treatment, short wash delay (8h) and double washing. Gel ink was completely removed by bleach in any scenario (0.0), but an equivalent alternative was to immediately treat with either hand sanitizer (0.0) or Shout (0.0) with a short wash delay and double wash. Any wash removed highlighter, but lemon juice made it disappear without washing.
Conclusions/Discussion Hand sanitizer completely removed ballpoint and gel ink with immediate treatment, a short wash delay, and double washing. Alternatives for removing gel ink were Shout remover or bleach (white clothes only). Lemon juice made highlighter stains disappear without washing. Limitations included potential cross contamination when washing 5 shirt sections per load.	
Summary Statement Although alternatives exist, hand sanitizer is a safe and readily available substance that completely removes ballpoint and gel ink with early application and washing.	
Help Received I conceived of the project, researched substances to test, and conducted all experiments, but I received training on one-way ANOVA tests and sample size calculations from my mother (Dr. Susan Huang, Professor of Medicine, UC Irvine).	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Khadijah A. Hussain	Project Number J2112
Project Title Burn Rate of Fabric Softeners	
Objectives/Goals The purpose of this experiment is to observe the flammability of different fabrics and how harmful they may be on common fabrics worn daily.	Abstract Five types of fabrics are soaked in a solution with one of three fabric softeners and left to dry overnight. Using a stopwatch and lighter, the burn rate of each of the fabric softeners on the different fabrics was measured including a control group that was not soaked.
Methods/Materials Five types of fabrics are soaked in a solution with one of three fabric softeners and left to dry overnight. Using a stopwatch and lighter, the burn rate of each of the fabric softeners on the different fabrics was measured including a control group that was not soaked.	Results Of all the softeners, Downy had the most fabrics with higher burn rates, which includes cotton and linen. Wool had the greatest burn rate of all fabrics regardless of softener. Fleece had approximately the same burn time for all softeners as well as the control. Snuggle had the highest burn time for silk and Gain had the highest burn time for wool.
Conclusions/Discussion Fabric softeners, in fact, tend to increase the burning time of the fabrics. The type of fabric also has an effect on what the result of the flammability rate will be. Untreated natural fibers (i.e. cotton and linen) burn quicker than fabrics like wool and fleece. This concludes that fabric softener can increase the time it takes for fabric to completely burn. However, during the trials, it was observed that it was much easier to ignite these fabrics than the fabrics without any softener.	
Summary Statement As measured by the burn rate of different fabrics, I found that fabric softeners can increase the time it takes for fabric to completely burn, but can make them easier to ignite.	
Help Received	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Kate E. Jackson	Project Number J2113
Project Title Sustainable Play: Comparing the Safety of Renewable Alternatives to Commercial Playground Surface Materials	
Objectives/Goals My project goal was to test if alternative renewable surface materials can perform as well as commercial materials in preventing playground head injuries. After researching the topic and choosing 4 renewable and 4 commercial materials, I hypothesized the effectiveness of each in preventing head injuries. Overall, I predicted that no alternative material would perform better than the best commercial material (rubber mulch).	Abstract I selected 8 surface materials to test (rubber mulch, wood chips, sand, pea gravel, cherry pits, pistachio shells, coconut chips, and straw). I dropped an 8 lb (3.6 kg) plastic skull containing an accelerometer from three heights [6 ft (1.8 m), 9 ft (2.7 m), 12 ft (3.7 m)] onto three thicknesses of surface material [3 in (7.6 cm), 6 in (15.2 cm), 9 in (22.8 cm)]. In total, I performed 216 experiments with three tests per combination. I recorded my results on an oscilloscope and transferred them onto my computer for analysis. I evaluated my results in peak g-force (deceleration of the skull) and HIC (head injury criteria). HIC is a way to access brain injury that takes into account the duration of the deceleration.
Methods/Materials The safety of the materials varied greatly depending on thickness and drop height. At 9 inches thick, the thickness the Consumer Product Safety Commission recommends, I was able to identify the best and worst materials. The top three materials were pistachio shells, cherry pits, and rubber mulch, and the bottom three materials were straw, coconut chips, and pea gravel.	Results The safety of the materials varied greatly depending on thickness and drop height. At 9 inches thick, the thickness the Consumer Product Safety Commission recommends, I was able to identify the best and worst materials. The top three materials were pistachio shells, cherry pits, and rubber mulch, and the bottom three materials were straw, coconut chips, and pea gravel.
Conclusions/Discussion After comparing my results at 9 inches to my hypothesis, I concluded that my hypothesis was incorrect. My hypothesis predicted that the commercial rubber mulch material would be safest, with the alternative coconut chip material a close second. In my results, the two safest materials (pistachio shells and cherry pits) were renewable rather than commercial. Another way to analyze my results is to consider the safety of the materials at different thicknesses. For example, rubber mulch was one of the best materials at 9 inches, but at 3 inches it was one of the worst materials. On the other hand, cherry pits were one of the top two materials at all three thicknesses. Therefore, the answer to my project objective is a confirmed yes. Alternative renewable materials exist that perform better than commercial materials when preventing playground head injuries.	
Summary Statement I constructed an experimental setup to drop a plastic skull containing an accelerometer in order to compare the safety of renewable alternatives to commercial surface materials for preventing playground head injuries.	
Help Received My father helped me understand the formula for HIC and assisted my with lifting the 8 pound skull during my experimentation.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Colin S. Kovarik	Project Number J2114
Project Title Comparing EMF Emissions of Common Household Appliances	
Objectives/Goals Starting in the 1960s, concerns about electromagnetic fields (EMFs) have been raised. Multiple international organizations have researched these concerns, finding little or no evidence that EMFs are linked with cancer. However, scientists suggest it may be best to limit your EMF exposure. For my project, I compared EMF levels of older electrical appliances (5+ years old) to newer ones. I hoped to find whether older and newer appliances had a significant difference in EMF levels. I hypothesized that newer appliances will generate a lower electromagnetic field level due to their higher electrical efficiency.	Abstract
Methods/Materials In total I tested 121 household appliances, (24 microwaves, 43 vacuums, and 54 hairdryers). Using a detector I purchased, I recorded the average electromagnetic field level at distances of 15, 30, 90, and 150 centimeters.	
Results From my 484 tests, I learned that newer appliances had a lower electromagnetic field level than older ones. Of the 43 vacuums, older vacuums averaged 36.496% higher than newer ones. Older microwaves averaged 14.110% higher than the new ones, and of the 55 hairdryers, newer hairdryers averaged 13.373% lower than older ones.	
Conclusions/Discussion In my project, I found evidence that older household appliances emitted more electromagnetic fields than newer ones. Although EMFs have not yet been proven to be dangerous, my findings could help if 60 Hz electromagnetic fields are proven to be a danger.	
Summary Statement In my project, I compared EMF levels of older electrical appliances (5+ years old) to newer ones.	
Help Received My parents purchased the detector from Amazon, and drove me places to test. My friends and family members allowed me to test their home.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Nisha Kumar; Malavika Raghuram	Project Number J2115
Project Title An Analysis of Water Content in Determining the Efficacy of Emollients	
Objectives/Goals The goal of this project is to determine the most effective moisturizer by measuring the amount of water loss in each moisturizer. The less water loss in the emollient the more moisture stays on the skin therefore that emollient is the most effective.	Abstract Gravimetric analysis, balance, a packet of agar flakes (model for human skin), 9 petri dishes, hot plate, latex gloves, wooden stirrers, beaker tongs, 100 mL of distilled water, graduated cylinder, glass stir rod, beaker, pinch mittens, and moisturizer brands (Cetaphil, Nivea, Aveeno, Loreal, Lubriderm, Neutrogena, Olay, and CeraVe)
Results The result showed that Nivea was the most effective over long periods of time because it had lost the least amount of water over 24 hours and Lubriderm was the most effective over short periods of time because it had lost the least amount of water over 3 hours.	
Conclusions/Discussion The repeated experiment using the most common moisturizers (such as Loreal, Aveeno, Olay, and Nivea) showed that different moisturizers are effective over different time periods. The change in results show that different moisturizers impact the results because of their reactions towards the agar flakes (used as the model for human skin in experiment).	
Summary Statement This experiment was conducted to find out the most effective moisturizer by determining the amount of water loss among them.	
Help Received A chemistry teacher in my school helped us conduct this experiment the first time around so that we could conduct it ourselves like we did the next multiple times. Our science teacher had guided us through this project. A earth science teacher at our school had given us the idea to use agar flakes as our model for	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Jude T. Lifset	Project Number J2116
Project Title Reducing Hot Water to Safe Drinking Temperatures Using Phase Change Materials	
Objectives/Goals I recently learned that even though drinking coffee and tea is said to have health benefits, consuming these beverages at high temperatures might be unhealthful. A recent study showed that drinking hot beverages above 65°C (149°F) is related to esophageal cancer. So I found two products, the Just Right Joe temperature regulators and the Coffee Joulies, that were said to lower the temperature of beverages quickly and hold that temperature for a prolonged period of time. This is accomplished through a material called a phase change material (PCM).	Abstract In my project, I evaluated a total of 572 data points. In two separate trials consisting of five tests each, I performed ten total tests. In these tests, I used five containers: ceramic, covered ceramic, Styrofoam, metal and paper. In the first test, the control, I added no PCM to the containers. In the next two tests, I placed one of each PCM product in the containers. Finally, in the last two tests, I used two of each PCM product but only the metal and Styrofoam containers.
Methods/Materials The PCM products were designed for two purposes: lower the temperature of your beverage, and keep it at that temperature for a prolonged period of time. In tests with the Coffee Joulies and the Just Right Joe Coffee Regulators, the water temperature decreased to a safe temperature (65°C (149°F)) faster than with no added PCM. The PCM products were designed to keep a hot beverage at a desired temperature (65°C to 55°C) for a prolonged period of time; this effect was seen in the metal container only. The water temperature in the metal container with the added PCM stayed between 65°C and 55°C for 10 and 15 minutes longer than the control.	Results According to my findings, the phase change material products tested did reduce temperature of hot liquids to a safe drinking temperatures in a shorter period of time compared to control, thereby reducing the risk of burns of the esophagus and tongue. This may help lower the risk of esophageal cancer. The products are also marketed to keep beverages at a desired temperature (65°C-55°C) for a longer time, and I found them to be not as effective in doing this, except in the case of the metal beverage container.
Conclusions/Discussion The goal of this project was to investigate whether phase change material products were effective at lowering the temperatures of hot beverages to safe temperatures, and maintain those temperatures for a prolonged period of time.	
Summary Statement My father and mother provided me with most of the materials along with my science teacher, who additionally helped me develop my project.	
Help Received The goal of this project was to investigate whether phase change material products were effective at lowering the temperatures of hot beverages to safe temperatures, and maintain those temperatures for a prolonged period of time.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Harshini N. Ravi	Project Number J2117
Project Title Antacid vs. Antacid: Comparing the Neutralization Levels of Different Antacids	
Objectives/Goals By testing the effectiveness of different antacids in the same acid, I was able to determine which antacid had the highest acid neutralizing capacity, and I was also able to prove whether name brand products are truly superior to cheaper, store brand products.	Abstract A solution was made consisting of two tablets of each crushed antacid tablet and 20 mL of water, along with another mixture containing 40 mL hydrochloric acid and 500 mL of water. Using an eyedropper and pH meter, the amount of the antacid solution needed to raise the pH of 50 mL of the HCL mixture from two to four was recorded.
Methods/Materials Equate Tums proved to be the best performing antacid at an average of 5 drops. It also had the cheapest unit price of 3.3 cents. Equate Pepto-Bismol was the least effective antacid at an average acid neutralizing capacity of 161 drops. On average, name brand antacids neutralized the acid more thoroughly than store brand antacids.	Results My hypothesis was proven to be partially correct with the Equate brand of Tums being the best performing and cheapest antacid. However rather than my prediction of Alka-Seltzer, the Equate brand of Pepto-Bismol proved to be the least effective antacid.
Conclusions/Discussion I compared the acid neutralizing capacities of different antacids and proved whether name brand medications are truly superior to store brands.	
Summary Statement None. I designed and performed the experiment myself.	
Help Received None. I designed and performed the experiment myself.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Naiya Samios McQuain; Sofia Storlazzi	Project Number J2118
Project Title The Effect of Concussion Bands Tested at Various Heights	
Objectives/Goals We want to know the effectiveness of a concussion band to protect a player from a concussion while playing soccer. We think the results of this experiment will help our community by increasing the awareness of the options available to prevent head trauma. This information will help athletes of all levels by increasing safety.	Abstract Run the control tests by utilizing a deadfall to release the weight onto the force gauge from preset heights without the use of any protective device. Repeat the same test above but include a sweatband and then a 6mm concussion prevention headband. Test the experiment ten times per height in each category. 1 deadfall (self designed and manufactured) 1 5 pound weight 1 Storelli concussion headband 1 force gauge model HF500 1 Nike sweatband
Results The impact the headware had in reducing the force measured was clearly observed. For example, when the weight was dropped 2" with no protection it measured 41.15 newtons and with the concussion band it measured an average of 27.84 newtons. Therefore, the concussion band reduced the force by 13.31 newtons. We also noticed the concussion band was more effective as the height of the drop increased. For example, while the force reduction was 13.31 newtons in the 2" tests, the concussion band reduced the force by 18.49 newtons in the same scenario but at the 5" height tests.	Conclusions/Discussion We hypothesized since the material in readily available concussion bands is designed to absorb impact, their use will reduce more force than using non-specific headwear. Our data supported our hypothesis and provided additional insight. There is enough repetition in our data collection to make valid conclusions. The weight was dropped ten times at four heights for each variable: no protection, sweatband, and concussion band. We minimized the variables before we completed the experiments by designing and building a deadfall. Our data suggests the safety of athletes would increase if concussion bands were worn. Furthermore, the protection offered to the athlete increases with the severity of the impact experienced.
Summary Statement Our project tests the effectiveness concussion bands have in relation to impact reduction.	
Help Received Allison Birkhead and Collin McCormick	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Alyssa Tang	Project Number J2119
Project Title Testing the Effectiveness of Mycofoam as an Eco-Friendly Packing Material	
Objectives/Goals The objective of this study is to investigate the shock absorbency of Mycofoam, a biodegradable mycelium-based packing material, grown with 3 different variations of ingredients. Styrofoam was used as part of the testing for comparison of the performance of Mycofoam to the standard synthetic packing material.	Abstract The objective of this study is to investigate the shock absorbency of Mycofoam, a biodegradable mycelium-based packing material, grown with 3 different variations of ingredients. Styrofoam was used as part of the testing for comparison of the performance of Mycofoam to the standard synthetic packing material.
Methods/Materials My project consisted of 2 parts. The first part was growing 3 variations of Mycofoam using the Ecovative GIY (Grow-It-Yourself) kit that contains the dry mycelium (root-like part of the mushroom) and wood hemp materials. I added one of the 3 variations of nutrients (100% flour, 50% flour and 50% cornstarch and 100% cornstarch) to each mixture to grow into a solid piece of packing material in a silicone mold. The second part of my project was testing the shock absorbency of Mycofoam as compared to styrofoam by placing a bag of crackers in between 2 pieces of packing material in a shipping box and dropping them from 3 different heights. The crackers were examined visually for the number of cracks as a way to quantify a value to compare shock absorbency.	
Results For the low and medium heights, the data collected showed that all the variations of the Mycofoam had no cracks so they were just as shock absorbent as the styrofoam. At the highest height from the top of the stairs of the second floor, styrofoam outperformed Mycofoam. For the variations of Mycofoam, the one grown with 100% cornstarch had the least number of cracks in the crackers therefore it was the most shock absorbent, followed by the combination of cornstarch and flour and the least shock absorbent one being the one with 100% flour.	
Conclusions/Discussion Mycofoam protected the crackers just as well as styrofoam when dropped from the low and medium heights. The shock absorbency of styrofoam was better only when dropped from the top of the second floor. In reality, packages being delivered are not usually dropped from that high up. According to the UPS and FedEx delivery men, even the lowest height I tested is already higher than top shelf to the floor in their trucks. Therefore, for all practical purposes, Mycofoam can be considered a good alternative for packing material.	
Summary Statement My project showed that Mycofoam can be an alternative packing material since all the variations of home-grown Mycofoam protected fragile items just as well as styrofoam from reasonable drop distances.	
Help Received I needed to know where to get dry mushroom material and Ms. Anja Scholze from Tech Museum directed me to Ecovative. My mom supervised the use of the oven during the growing process but I performed all the other steps myself. Mr. Jeff Betts of Ecovative Designs provided advice on growing Mycofoam.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Johan G. Thuen	Project Number J2120
Project Title Are Pro Teck Surfboard Fins Safer?	
Objectives/Goals The purpose of my project was to determine if the flexible edge design of a Pro Teck surfboard fin will reduce fin cuts.	Abstract I dropped ballistic gel molds onto six test fins from two heights to simulate the difference in impact between a larger versus smaller wave. Each height was tested three times. Fin cuts from the rake and tips were measured and recorded.
Methods/Materials I dropped ballistic gel molds onto six test fins from two heights to simulate the difference in impact between a larger versus smaller wave. Each height was tested three times. Fin cuts from the rake and tips were measured and recorded.	Results Rake cuts at the 80 cm drop height were barely a nick on the Pro Teck fins as compared to the others which had cuts over 2 cm deep. When the drop height increased to 150 cm the Pro Teck still only had minor rake cuts while the other fins were cutting up to 3 cm. While fin tip cuts occurred on all fins tested they were less severe on the Pro Teck fins. At an 80 cm drop they were less than 3 cm as compared to the others that were as deep as 5 cm. When tested at a 150 cm drop Pro Teck cuts were approximately 3 cm while the other fins were as deep as 6 cm.
Conclusions/Discussion The two Pro Teck fins did get shallower cuts than the other fins. While they still did cut, each of the Pro Teck fins cut less than the other fins with one exception. The FCS M5 had a smaller tip cut from a drop height of 80 cm than Pro Teck Power Flex fin. As I predicted, the fin that cut the deepest was the FCS Performer. I predicted that this one would cut the deepest since the rake felt sharper than all the other fins and it is a very stiff fin. The stiffness combined with the sharpness of the fin made for a more dangerous fin when it comes to cuts. Pro Teck fins do reduce surfer injury for fin cuts.	
Summary Statement Using ballistic gel and a testing apparatus I designed, I concluded that the Pro Teck design for surfboard fins can reduce fin cuts.	
Help Received I designed the testing apparatus, but had my Father supervise the building of it. I contacted Pro Teck and other surfboard fin distributors to request fins to be donated for testing.	



CALIFORNIA STATE SCIENCE FAIR

2017 PROJECT SUMMARY

Name(s) Abigail I. West	Project Number J2121
Project Title What Moisturizer Keeps Jello Moist the Longest?	
Objectives/Goals My goal for my project is to help people to get there moneys worth off of moisturizers because every year people pay to much money trying to find the best moisturizer to keep skin moist.	Abstract Lime Jello, a scale, Aveeno, Vaseline, Cetaphil, Gold Bond, Olay, toothpicks, Measuring tape, camera, household kitchen items, clock, Calculator, Dishes. Checked Jello for several days.
Methods/Materials My hypothesis turned out to be incorrect because Cetaphil turned out to work the best. Cetaphil worked the best because its average hight was 0.8 in the beginning and in the end it was 0.8. Cetaphil's average weight was 68.7 in the beginning and in the end it was 63.2. It kept a steady rate in height and weight. Olay came in second because its average hight was 1.025 in the beginning and in the end it was 0.775. Olay's average weight was 65.8 in the beginning and in the end it was 49.1. Olay didn't have a good steady rate like Cetaphil which is why it came in second place. Avenno and Gold Bond were middle contenders. Aveeno's average height was 0.95 when I started and then it became 0.7 in the end. Aveeno's average weight when I started was 65.3 and in the end was 55.5. Gold Bond's average height was 0.9 in the beginning and was 0.7 in the end. Gold Bond's average weight was 62.6 in the beginning and in the end was 47.2. This leaves Vaseline in last place. Vaseline's average height was 0.95 when I started and then was 0.6 in the end. Vaseline's average weight was 60.8 and then was 44.9 in the end.	Results After four trials of testing I conclude that Cetaphil moisturizer works the best to keep skin moist. In all four trials I tested 5 different moisturizers, and a controlled Jello, on lime green Jello and during these trials I found that not only the amount of Jello and moisturizers could affect the results but that the texture of the moisturizer could also affect the results. Thanks to my data we now know that Cetaphil is the best moisturizer and the most economical.
Conclusions/Discussion I tested different brands of moisturizers on Jello to see which moisturizer works the best to keep skin moist.	
Summary Statement None. I designed my experiments and tested the Jello on my own. I also wrote all my documents on my own.	
Help Received None. I designed my experiments and tested the Jello on my own. I also wrote all my documents on my own.	