



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Sae Ackerstein; Madelyn Young	Project Number J1301
Project Title Escaping Boats, Wasting Calories: Otter Disturbance in Elkhorn Slough	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals We set out to determine the energetic cost for the Southern Sea Otter foraging in Moss Landing Harbor channel, a location with increased boat disturbance. This entailed answering 3 questions: 1. How do dive times differ between sea otters that are foraging versus sea otters that are escaping from a disturbance? 2. What is the success rate of foraging? 3. What prey do sea otters eat in the Moss Landing harbor channel.</p> <p>Methods/Materials We observed southern sea otters in the Moss Landing Harbor Channel. We recorded the dive-surface times of individual sea otters. With foraging sea otters, we recorded whether the otter was successful or not and what their prey consisted of. With otters escaping from a disturbance, we recorded the dive time and the type of disturbance.</p> <p>Results The average dive time for a foraging sea otter was 64 seconds and for escaping sea otters 54 seconds. Otter success rate of foraging dives was 62% successful and 38% unsuccessful. Sea otters foraged on 55% bivalves (clams and mussels) 37% fat innkeeper worms, and 8% fat innkeeper worms and bivalves (in the same dive). 27% of dive time was used to escape boats. Otters spend about 6 kcals diving to achieve one food item.</p> <p>Conclusions/Discussion The average calories gained for 1 clam is 40 kcals. The cost to get this clam is 2.7 kcals for the successful foraging dive but since only 45% of total dives (disturbed + foraging successful + foraging unsuccessful) result in a clam the cost to get this clam is 6 calories. The energetic cost of foraging in the channel is relatively low. However, as boat traffic increases or food abundance decreases, the cost of foraging in this channel may become too high. Fat innkeeper worms are not a common food source for otters outside Elkhorn Slough. More information is needed on the quality of their nutrients and their abundance in this area.</p> <p>While observing, we could see that sea otters are not easily disturbed by boat vessels. This is especially apparent with kayakers. However, otters do dive to escape disturbances caused by boats coming too close and by noisy motors or large wakes. Boat captains can reduce otters' energetic expenditure by slowing down, moving away from otters and decreasing the noise generated by boat motors</p>	
Summary Statement We found that Southern Sea Otters foraging in Moss Landing Harbor channel spent about one quarter of all dive time escaping boats, costing about 6 kcal for each successful forage attempt.	
Help Received We consulted with Dr. Terrie Williams about the energetic cost of diving in sea otters but designed and performed the entire study ourselves.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Kathryn E. Anderson	Project Number J1302
Project Title Testing and Comparing the pH Levels of Canine, Feline, and Human Saliva	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project was designed to test whether dogs, cats or humans have more acid (a lower pH level) in their saliva.</p> <p>Methods/Materials After receiving a signed waiver, saliva samples were taken from 78 dogs, 53 cats and 106 humans using mouth swabs and pH test strips. The color change was compared to the pH key and the appropriate number was then entered into the spreadsheets. The results were sorted, analyzed and averaged.</p> <p>Results Results showed that for humans, the pH ranged from 5.5 to 8.0, with a mean of 7.01; for dogs, the pH ranged from 5.0 to 9.0 with a mean of 7.97; and for the cats the pH ranged from 7.0 to 9.0 with a mean of 8.1. This showed that the cats tested had similar saliva pH to that of dogs, and significantly higher saliva pH than that of humans.</p> <p>Conclusions/Discussion This is different from my hypothesis that dogs would have more acid (a lower pH level) in their saliva than cats and humans. All the literature ranked the pH of cat saliva to be very similar to that of humans, not dogs. Perhaps this is because dogs and cats both lick their fur, transferring substances from the environment to their saliva.</p>	
Summary Statement My project is designed to determine whether dogs, cats or humans have on average a lower pH level (more acid) in their saliva.	
Help Received I designed the experiment and did all testing myself. Mr. Shavelle helped me understand charts and statistics. Mrs. Taylor and Mrs. Pannell helped with editing and formatting. Mrs. Anderson helped with scheduling and transportation.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Haya M. Belbese	Project Number J1303
Project Title The Road to the Cure for Alzheimer's	
Abstract Objectives/Goals The objective of this project is to test the effect of heavy metals such as lead and copper on the neuronal cells. This project will also use 3 natural remedies and 1 medicine to test their effects on protecting the neuronal cells. Methods/Materials This study aimed to look at natural substances and their influencing Alzheimer's disease risk. Protective action of several natural compounds (Turmeric, Walnut, Olive leaf) and the metal chelator EDTA was studied in the culture neuroblastoma N2A cells after the addition of salt of heavy metals (lead and copper) to the culture medium. Cells were incubated with heavy metals and natural products for 24 h, and cell viability and cell death were evaluated by MTS assay Results Cells with lead increased cell viability when treated with walnut at all three concentration levels. On the other hand, cells mixed with copper, only resulted in viability in the 5% and 1% concentrations. Cells mixed with lead and copper and treated with olive leaves were viable in the 5% and 1% concentrated solutions. The turmeric treatment was only successful at the lowest concentration, .5%, in both cells mixed with lead and copper. Conclusions/Discussion In conclusion, the data obtained in this study demonstrated that it is possible to use natural products such as turmeric, olive leaves, and walnut to enhance the protection of cultured neuronal cells from damage caused by heavy metal toxicity. This may be indicative of their protective potential in vivo, in particular, for nervous tissues. The results of the experiment were encouraging and can lead to further implications and studies with the goal of attaining practical significance to effective therapies.	
Summary Statement this project tests the effect of heavy metals such as lead and copper on the neuronal cells. This project uses 3 natural remedies and 1 medicine to test their effects on protecting the neuronal cells.	
Help Received Dr. Kurabi showed me how to use the micro-plate reader	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Konish Bhattacharya	Project Number J1304
Project Title The Effect of Age on Taste Buds	
Abstract Objectives/Goals The purpose of this project is to find out if sense of taste changes with age and if the sensitivity to a certain flavor is more dominant in any particular age group than others. My hypothesis is: If the sense of taste is related to age and I people of different ages to see different taste thresholds then different ages will have different taste bud sensitivities. Methods/Materials 24 volunteers of four different age groups tasted solutions of sweet, salty, bitter, and sour. Each flavor was given in four different concentrations. The taste sensitivity of each solution recorded in 0-10 scale, 10 being the most intense and 0 being the least intense. Results For sweet and salty flavors the data shows a common trend of lowest taste sensitivity in the age group of 0-20 and the highest in 21-40, the sense of taste slowly decreased after that. This supports my hypothesis that sense of taste changes with age. For the sour taste the taste sensitivity increased with age. For the bitter taste the lowest taste sensitivity was found in the 61-80 age group. This supports the second part of my hypothesis that certain age groups are more sensitive to certain flavors. Conclusions/Discussion From my study I found out that taste changes with age. The results gave a specific trend, and this is important because it tells us that taste sensitivity is less intense in younger as well as older ages which could be helpful to food industries when they make specific food for different age groups.	
Summary Statement The sensitivity of different taste and their effect on tastebuds as it changes through age.	
Help Received My teacher Amy Schwerdtfeger	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Clara L. Cady-Dreher	Project Number J1305
Project Title Let Your Fingers Do the Talking	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to determine if children carry the same fingerprint patterns as their biological parents.</p> <p>Methods/Materials Standard FBI issued 10-print fingerprint cards, black fingerprint ink (both of which are used by law enforcement for clarity and consistency) and a lighted jeweler's loupe.</p> <p>Results Several families with varying numbers of children were fingerprinted on standard FBI fingerprint cards with black ink. Fingerprints were classified into one of the 3 basic fingerprint pattern categories. Each fingerprint of each family member was further classed down into the 3 basic fingerprint pattern sub-categories. Each family member was compared with one another to find similarities and differences.</p> <p>Conclusions/Discussion Several families were fingerprinted and compared and the results were consistent that no child carried a fingerprint pattern that one or both of their biological parents did not carry. Furthermore, when compared at the subcategory level, the results remained the same.</p>	
Summary Statement I found that children carry fingerprint patterns that one or both of their parents have.	
Help Received I conducted the fingerprinting of families myself. However, retired Evidence Technician and court qualified Latent Print Examiner reviewed my classifications to ensure they were correct.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Sadie Cronin; Jasmine McKnight	Project Number J1306
Project Title Sound Healing and the Human Response	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our worlds medical system has a gap. Acutonics FDA approved tuning forks made of space grade metal can fill that gap. Could sound healing vibration carried through a beginning level Ohm tuning fork affect heart rate and blood pressure? This was a question we set out to find the answer to.</p> <p>Methods/Materials Through the help of a certified Acutonics practitioner as well as local Physical Therapist, we gained access to a professional heart rate and blood pressure monitor as well as Acutonics Ohm tuning forks. We created a protocol from the Acutonics beginners manual, "There's no place like Ohm." We proceeded to conduct our protocol on eight different patients in the same environment and sequence . We took blood pressure and heart rate in our active group first, applied tuning fork sound healing vibration to the patient, and then took the vital signs again. Our control group was placed in the same environment, no tuning fork treatment applied, and vital signs were taken before and after. Each patient had a 15 minute treatment.</p> <p>Results The majority of our active group after treatment had a decrease in heart rate and blood pressure. Our control group came out with less significant results. After graphing our results and analyzing the data, we believe that sound healing vibration does have an affect on the human response system. Our results from this particular experiment was that the heart rate and blood pressure is decreased through a tuning fork sound frequency.</p> <p>Conclusions/Discussion Our findings are proof that tuning fork vibration has an affect on the human response system. As we pondered the power of such a simple tool, we thought about what we and the universe are made of. Humans are made primarily of water, and vibration such as a heart beat keep us alive. Pulses, expanding and contracting keeping our vital functions operating just, just as a star. When there is a block or disease in our systems , water and vibration are a perfect match that can even move through bone. If sound can move through bone , it can move through human cells as well. Cancer is a worldwide phenomena. The potential is endless.</p>	
Summary Statement Sound healing vibration from tuning forks can fill a gap in medicine and be implemented as a protocol in all health issues.	
Help Received We received help from a local Physical Therapist and three different certified Acutonics practitioners. We also interviewed a local doctor who specializes in Cancer research.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Aria Delgado	Project Number J1307
Project Title The Devil in Music: The Power of Tritones on Human Behavior	
Abstract	
Objectives/Goals Can tritones can affect human memory, pulse, and blood pressure	
Methods/Materials Make an original sheet of music with different tritones Play the tritones on the two clarinets and record it Create a group of 16 students Have one student take their memory test Take the student's blood pressure/heart rate with the monitor Repeat step 4-6 for 15 more students Have one student from the same group of 16 students listen to the tritones played on the clarinets with their earbuds while taking their memory test Take the student's blood pressure/heart rate with the monitor Repeat step 8-10 for 15 more students Collect data and compare the results of the control group and the tritone clarinet group	
Results The results of my investigation on tritones affecting human behavior indicate that the tritones did raise SYS blood pressure and lower the ability to concentrate for the students during the memory test. Control - Heart Rate Results Lowest heart rate = 60 units Highest heart rate = 102 units Average heart rate = 79.0625 units Tritone Clarinet - Heart Rate Results Lowest Heart Rate = 60 units Highest Heart Rate = 94 units Average Heart Rate = 72.0625 units Tritone Harp - Heart Rate Results Lowest Heart Rate = 60 units Highest Heart Rate = 134 units Average Heart Rate = 101.8125 units	
Conclusions/Discussion After completing my investigation on whether tritones affect human behavior by analyzing changes in heart rate and blood pressure, I discovered that my hypothesis on tritones affecting the students was supported. My hypothesis stated that the tritones would affect human behavior because of the dissonant and restless harmonies produced by this specific combination of notes. The control group resulted in levels of 103.25 units for the SYS (systolic) blood pressure, 71.0625 units for the DIA (diastolic) blood pressure, 79.0625 units for the heart rate, and 30.1875 units for the memory test. The tritone clarinet group	
Summary Statement During my experiment, I noticed that the tritones played on the harp resulted in students having higher test scores, but these tones also raised students' average heart rate.	
Help Received	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Sophia J. Eno	Project Number J1308
Project Title The Influence of Sound on Brainwaves and Mood	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals With this experiment, I was aiming to gather information on how sounds could affect brainwaves. Previous studies have shown a correlation between brainwaves and mood. My goal was to determine if certain sounds could alter brainwaves, and, therefore, alter a person's mood. For example, could a certain song reduce stress? Is there a sound that could help someone fall asleep? These were the questions I was thinking about when I designed my experiment.</p> <p>Methods/Materials I used a Muse Monitor headset to collect my data. Muse is a headset the subject wears across the front and sides of their head, and is equipped with multiple sensors to accurately collect the subject's brainwaves. I also used a laptop to play sounds and an iOS app for data collection. My test took place in dark room with no stimulus besides the sounds being played. For each of the ten participants, the test started with thirty seconds of silence to allow their brainwaves to normalize; then six sounds were played for forty-five seconds each. The sounds were (in order): noise from a busy street, white noise, classical music, pink noise, sounds from nature, and pop music. There were thirty seconds of silence in between each sound to allow brainwaves to return to normal. The test took 7 minutes and 30 seconds in total (for each participant).</p> <p>Results Of the six sounds I played, I found that four reduced Beta waves. The two sounds that reduced Beta waves the most were pop music (lowered the Beta waves by 12.0%) and classical music (lowered by 6.7%). The two that raised Beta waves were white noise and street sounds. White noise raised it the most (raised by 13.6%), but street sounds also raised it by a large amount (12.8%).</p> <p>Conclusions/Discussion I concluded that sounds do have an impact on Beta waves. If my experiment, and the research showing that brainwaves correspond to mood is accurate, certain sounds could help reduce stress. Four of the sounds caused a drop in Beta waves. High levels of Beta correspond to stress, so having sounds that lower Beta waves could reduce stress.</p>	
Summary Statement I measured changes in brainwaves when subjects listened to sounds, finding that certain sounds can alter the levels of brainwaves.	
Help Received I designed and performed my experiment and analyzed the data myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Shane D. Gage	Project Number J1309
Project Title High Heat: The Science behind Throwing a Baseball	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal/objectives in this project was to have all of my test subject's improve their average kilometer per hour speeds by introducing new mechanics that are focused on linear and rotational energy. Also, I want to provide pitching mechanics that result in less injury. My question being addressed is, how does linear and rotational energy increase your velocity when pitching a baseball?</p> <p>Methods/Materials My main methods that I used were; Turn on your radar gun. Measure test subject's height in centimeters. Measure their stride. Have subjects throw 5 normal pitches. Record. Have them throw 5 more with increased stride and rotation. Record. Find the average speeds for both sets of 5 pitches. My main materials that are necessary are; One radar gun, one baseball per test subject, a pitchers mound, camera, one baseball glove per tester, a tape measure, and a spreadsheet.</p> <p>Results From my project, I proved that my hypothesis was true. This is true because once my test subject's increased their strides and hip rotations by 10%, they increased their average speed. I discovered though that you can max off on your stride length if your stride length is already over 80% of your total height. A total of 120 out of 160 pitches improved speeds using my mechanics. The top speed increase was 12.2 kilometers per hour. These relate to my objective because I wanted the pitches to improve in speed, and they did. My new mechanics presented were focused around those two energy types, and that was also my objective for this project.</p> <p>Conclusions/Discussion My project was a success as I was able to improve my test subject's pitch speeds and also create a new delivery or pitching motion. My project expands on the mammalian biology field as I expanded on the functions of humans (mammals) and also I further researched on how energy travels throughout the human body. It is important as my mechanics also provide an injury-free way to pitch because they focus on linear energy transfer which puts less stress on your arm. In my project, I accomplished my goals of increasing pitch speeds, and</p>	
Summary Statement I tested how linear and rotational energy is seen in your throwing motion while pitching a baseball, and I was able to produce working mechanics that were based upon linear and rotational energy found in your stride length and hip.	
Help Received I recieved help from my dad, who is a biology teacher, and also my science teacher at school.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Ishan Ghosh	Project Number J1310
Project Title Modeling Kidney Filtration	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The primary objective of this study is to show how the filtration system in the kidney works and how different amounts of salt affect the efficiency of filtration. My hypothesis was that, if there was an excessive amount of salt in the kidney, then the kidney would take longer time to reduce the salt concentration.</p> <p>Methods/Materials Prepared 3 concentrations of salt solutions and 1 glucose solution, filled separate dialysis tubing (diffusion cells) with each solution and combinations of salt and glucose solutions. Placed cells in plastic containers with filtered tap water and measured conductivity and glucose content inside and outside the cells over a period of 4 hours. Conductivity of a solution was used as a measure of dissolved salt concentration. The glucose concentration in the solution was measured using the dip stick method. Filtered tap water, table salt, ReliOn Glucose tablets, Diastix Reagent Strips for Urinalysis, 1-inch diameter dialysis tubing, 450 mL clear plastic glass containers, plastic plate, scissor, cotton threads, digital measuring scale, Myron 6P Ultrameter, and sharpie.</p> <p>Results Results showed, over a fixed period of time, higher initial salt concentrations took longer time to reduce to a lower value. Results also showed that diffusion cells with high salt concentrations inside produced high salt concentrations in the outside solution at the end of the experiment. Similar results were noted when these salt solutions were mixed with a known strength of glucose solution. The osmosis experiment showed that since the salt crystals could not pass through diffusion cell membrane, water from outside moved across the membrane via osmosis to bring the salt concentration in equilibrium.</p> <p>Conclusions/Discussion The results obtained during the experiment fully supported my hypothesis. The study showed as the salt concentration becomes elevated in the influent blood entering the kidneys, it would take longer time to filter out all the unnecessary salt. The high salt concentration in the filtered blood will also trend to retain back more water, which would put more pressure on the blood vessels. Hence, the more table salt we have in food, the more water we are going to reabsorb back into the body. In real life to counter this phenomenon doctors prescribe diuretic medications which forces greater volume of urine generation to help the body in getting rid of excess water to lower blood pressure.</p>	
Summary Statement The study showed as the salt concentration becomes elevated in the influent blood entering the kidneys, it would take longer time to filter out all the unnecessary salt.	
Help Received Mr. John Wood, Mr. Joel Sotolongo, and Dr. Susamita Kesh	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Suzanne M. Haycraft	Project Number J1311
Project Title Do You See What I See?	
Abstract Objectives/Goals The objective of the experiment was to use red and green filters to improve red and green shade distinction in red/green color deficient individuals. The hypothesis was that the filters would help color deficient individuals better match shades of red and green by filtering out other colors of light. Methods/Materials Color deficient individuals were presented with an array of red and green cards in various shades and asked to match identical shades. They did this 3 times each with no filter, red filter, and green filter. The number of correctly matched pairs was counted at the end of each trial and then averaged at the end of the experiment. The same test was given to 2 normal vision subjects for comparison. Results On average, all subjects were less able to correctly match shades of red and green when using the red and green filters. Conclusions/Discussion The hypothesis was incorrect; red and green filters do not improve shade distinction in color deficient individuals. Although color deficient individuals do have some cones allowing them to detect the colors red and green, those cones are not adequate in number to see red and green in a normal way, using filters.	
Summary Statement I investigated the effect of colored filters on the ability of color deficient humans to distinguish among different shades of red and green.	
Help Received I designed and performed the experiments by myself, using volunteers.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Spencer Hise; Anthony Serrano	Project Number J1312
Project Title Immersive Battlefield Video Games and Adrenaline Fluctuations as Measured through pH Variations within Players	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The reason and objective for this experiment was to see the effects of immersive and intense gaming on the body. We focused specifically on pH level in players due to the lack of information relative to gaming. The experiment was conducted in order to expand our knowledge of this subject, as well as other people's knowledge of the subject.</p> <p>Methods/Materials pH strips, water, a gaming system with controller, Battlefield 1 TM, 5 participants, pen, paper.</p> <p>Results All of our participants' results showed a drop in pH level with an average pH drop of .45. This means that the pH in their saliva has become more acidic over the course of gaming.</p> <p>Conclusions/Discussion The pH levels of all our participants dropped and in doing so became more acidic. Due to adrenaline's acidic compound, we were able to infer that adrenaline is produced during the gaming process. After learning this we were able to expand our knowledge of gaming's effects. This knowledge could be used by game developers and by the consumer of said game in multiple ways that would be very beneficial.</p>	
Summary Statement Our project on immersive gaming, as well as pH and its correspondence to adrenaline, showed the effects of gaming on the human body and gave us an insight on how engaging gaming can be.	
Help Received Yes, we had help from our parents, Susan and Edward Hise, and Irma and Luis Serrano provided supplies. Our participants, Edward Hise, Melissa Serrano, and Rebecca Hise helped by performing the required steps for the experiment. Our teacher Mrs. Nogueira also helped us in consolidating an effect of gaming to	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Danielle H. Ito	Project Number J1313
Project Title How High Can You Tumble?	
Abstract Objectives/Goals The objective of this study is to test how tumbling backward or forward affects a gymnast's tumbling height (the distance between their back and the floor while flipping). Methods/Materials Gymnastics floor, tumble track, camera, 8 gymnasts, 2 large gymnastics blocks, 1 tape measure, 1 roll of masking tape, and a computer. Measured the tumbling height of 8 gymnasts when tumbling backward or forward. Results Eight gymnasts tumbled backward and forward 3 times each on two different surfaces. Repeated trials were run to determine whether a gymnast receives a higher tumbling height when tumbling backward or forward. When tumbling backward, all of the gymnasts tumbled higher. Conclusions/Discussion Through my experiment, I learned that a gymnast will tumble higher when tumbling backward suppose to forward due to the amount of potential energy.	
Summary Statement The effect of tumbling backward or forward on a gymnast's tumbling height.	
Help Received Deep gratitude to my Aunt Melissa, an accomplished physicist, who took the time to help me understand the various physics laws that explained the results of my study, however, I completed the experiment independently.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Caroline F. Kargenian	Project Number J1314
Project Title Preferred Playtime	
Abstract Objectives/Goals To objective of this study is to determine the preferred playtime toy for 3 different dogs. Methods/Materials 3 dogs were individually tested with 12 dog toys of various sizes, textures, colors and shapes. Dogs were observed over a period of 4 days with timed trials of 4 toys/trial, 3 trials/day for 2 minutes/trial with the favorite toy in each category advancing to the final test trial. Results The favorite toy after all time trials conducted was the large orange squeaky ball. This toy was the clear winner for two of the three dogs and a preferred toy for one dog. Conclusions/Discussion Out of the hypotheses predicted, 2 out of the 3 were correct. The conclusion from this is that the frequently played with toy was due to the squeaking sound of the ball. This sound was satisfying to the dogs ears because of their sense of prey drive. This entire process has taught me to test many subjects and have different variables in the experimentation process. Otherwise, there will be nothing to compare the information from the experiment with.	
Summary Statement Through a series of timed trials, I determined the preferred playtime toy of three dogs and possible reasons for this favoritism.	
Help Received I designed and performed the experiments by myself. I had three friends who offered their dogs for testing in their home environment.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Asmita Majumdar; Bernardita Riffo	Project Number J1315
Project Title Doggy I.Q Test: Are Older Dogs Better at I.Q Tests than Younger Dogs?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to determine whether the experiences and prior knowledge was superior to the better physical attributes of younger dogs at a series of tests that mimic their everyday activities as lovable pets.</p> <p>Methods/Materials We used equipment for the tests that we made ourselves to achieve the best results from dogs of all sizes. We used treats to encourage our subjects to complete the tests with a grading scale based on their performance, ranging from ignoring the situation to performing it within the time limit, first try and expected method. Several dogs were tested in each category.</p> <p>Results The same tests were repeated with older and younger dogs showing that the younger dogs had a higher total average than that of the older dogs.</p> <p>Conclusions/Discussion The younger dogs achieved better results indicating that enthusiasm and better senses help dogs in their everyday activities.</p>	
Summary Statement Repeated tests show that younger dogs are more successful in activities with a little motivation than older dogs.	
Help Received We built our equipment and tests ourselves and used the websites mentioned on our bibliography and guidance from our advisor, Ms Agapoff and our parents.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Samik Pattanayak	Project Number J1316
Project Title Does Screen Time before Bedtime Impinge the Quality of Your Sleep?	
Abstract Objectives/Goals The objective of this project is to see if the use of electronic devices before bed affects the quality of your sleep. I also hope to find an amount of time you can use electronic devices before bed without affecting your sleep quality drastically. Methods/Materials I used human participants, sleep-tracking devices and the apps for these devices. The participants used devices for a specific amount of time before bed and wore the sleep-tracking devices to bed, which recorded their sleep pattern. Results The sleep patterns of several participants were recorded and I noted that quality of their sleep was affected by the use of electronics before bed. I found that 60% of the participants slept best when they did not use electronic devices before bed. Also 80% of them met the sleep requirements, when not using electronics before bed. Conclusions/Discussion The use of electronics does affect your sleep but affects kids more than adults. I found that for kids you can use devices for under thirty minutes without affecting your sleep drastically and for adults you have to find how well you sleep personally and set a limit. It is concluded that it is always best not to use electronic devices before bed.	
Summary Statement I recorded the sleep patterns of human participants and found that the use of electronic devices before bed affects quality of your sleep.	
Help Received I conducted the experiment myself. I was helped by my teacher in reviewing the presentation.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Rachel L. Rabinowitz	Project Number J1317
Project Title Swimmers vs. Singers Pulmonary Functions	
Abstract Objectives/Goals The objective and goals of my project is to see if swimmers or singers would have higher pulmonary functions by testing their resting heart rate, their forced vital compacity (FVC), and their forced expiratory volume per second (FEV1). I wanted my project to show that if you exercise then your health will be greater than someone who doesn't exercise. Methods/Materials To measure the swimmers and singers FVC and FEV1 I used a spirometer that my mentor, Dr Richard Belkin, supplied me with and trained me on. To measure the swimmers and singers resting heart rate I had them find their pulse on their wrist or their neck. Results I tested 20 swimmers and 20 singers pulmonary functions to see which group would have greater pulmonary functions. In the end the swimmers had much greater forced vital compacitys and forced expiratory volume per second, but the singing groups resting heart rates were slightly lower than the swimming groups resting heart rates. Conclusions/Discussion When testing singers and swimmers pulmonary functions in the end it showed that the athletes (swimmers) had greater pulmonary functions than the non athletes (singers). Overall in the end I leard that if you do exercise more then others your heath will be grater than someone who doesn't exercise as much.	
Summary Statement In this project I tested swimmers pulmonary functions (resting heart rate, FVC and FEV1) and compared the results to singers pulmonary functions, and I found that the swimmers had greater pulmonary functions than the singers.	
Help Received Dr Belkin was my mentor who supplied me with all of my materials and trained me on how to use the materials. Dr Belkin also helped me analyze my data after I collected all of it. I did the rest of the work all by myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Jaclyn N. Rawnsley	Project Number J1318
Project Title Color through a Dog's Eyes	
Abstract Objectives/Goals The objective of this study is to determine if all dogs can see color by testing subjects from different dog groups in order to observe how they see and respond to colors. Methods/Materials Self-Developed experiment using 4 dogs (from different dog groups), various dog treats, and red, blue and yellow felt squares. Trained dogs to only respond with an appropriate trick to each specific color in a randomized order. Results All the dogs tested were able to see some variation of color on each of the red, blue and yellow felt squares although not in equal ability. Each of the dogs showed various responses to how they were able to see each color. Conclusions/Discussion Dogs can see color and be trained to respond and differentiate the colors red, blue and yellow no matter the dog group. Additionally, this experiment has led me to conclude, all dog groups have different purposes which require them to see color differently. The importance of each dog's ability to see color varies depending on their groups' job/role in society.	
Summary Statement By training dogs in different dog groups to see and respond to color, I learned dogs can differentiate color although not in equal ability.	
Help Received This project is self-developed but with the support of my mother, science teacher and all those who volunteered their dogs to participate in my experiment.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Shaivi V. Shah	Project Number J1319
Project Title Smartphone-based Eye Exercising Tool to Prevent Computer Vision Syndrome Development through Visual Movement Patterns	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project is to create an eye exercising method through the use of easily accessible technology such as smartphones to reduce and measure the symptoms of Computer Vision Syndrome.</p> <p>Methods/Materials The materials used in this project are Snellen chart, measuring tape, timer, magnifying glass, flashlight, fluorescein strips, disinfecting solution, smartphone, and computer.</p> <p>Results Based on the iRelief test results, the average improvement was 64.4%. The Snellen Eye Test results had an average improvement for both eyes of 67.7%. For the TBUT test results, the average dryness of both eyes decreased about 79.4%.</p> <p>Conclusions/Discussion From the data I have collected so far, I can conclude that iRelief is a novel way to reduce Computer Vision Syndrome. It reduces eye strain and dry eye plus it strengthens the eye muscles.</p>	
Summary Statement I created an eye exercising app to reduce a syndrome called Computer Vision Syndrome. To see if it actually worked I compared it with optometrist gold Standard tests.	
Help Received Dr. Kathleen Anderson, an optometrist, taught me how to perform a test to measure dry eye and provided the materials for it. Johnathon Smith taught me the programming language Swift.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Libbie G. Shykowski	Project Number J1320
Project Title How Introducing Foreign Objects Affects Horse Behavior	
Abstract Objectives/Goals My objective was to see how horses would react to different objects and to find the "Horseanality" of each horse according to the Parelli "Horseanality" type. Methods/Materials I took three objects, a pool noodle, plastic bag, and a Parelli horse ball, and brought it up to each horse 3 times. Then I noted how severe their reaction was and used their results to compare what "Horseanality" they have with the Parelli "Horseanality" chart. Results I found that Priscilla was not alarmed or playful with any of the objects I presented to her, and therefore is a left brain introvert. Moose was curious with the objects I presented to him, and is therefore a left brain extravert. Lastly, Crow had extreme reactions to the objects I presented to him, and therefore is a right brain introvert. I found that the Parelli "Horseanality" types accurately represented the personalities of my horses. Conclusions/Discussion My results matched my hypothesis. This helps horse people to see what "Horseanality" their horse has and helps them have a better relationship with their horse. For example, with this insight they can have an idea on how to best play with their horse, what methods will be calming to their horse in stressful situations, and what motivates their horse.	
Summary Statement In this experiment I found that each horse had its own "Horseanality" by observing their reaction to different objects.	
Help Received My science teacher instructed me on the requirements to have a successful project, reviewed my work, and showed me how to create graphs on the computer. I also may email Parelli Natural Horsemanship on more information regarding their "Horseanality" research.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Elisha L. Tong	Project Number J1321
Project Title Finding Calm: Meditation vs. Mobile Games	
Abstract Objectives/Goals The objective of this study is to determine whether meditation or mobile games are more effective in activating calming brain waves. Methods/Materials 40 subjects, a Muse meditation application on an ipad, Two Dots game application on an iphone, and a portable electroencephalogram. Subjects were tested in two sessions with a washout period in between. Subjects were randomized to meditate or play the mobile game for 5 minutes, while the electroencephalogram measured the brain waves. After a washout period, the subjects performed the opposite task. MUSE brain sensing EEG headband (InterAxon Inc.), disposable alcohol wipes. Results The p-value of the two tailed t-test indicated that negligible carryover effects existed from one treatment to the next. Another two tailed t-test was performed to test for differences within subjects and identify which treatment resulted in more seconds of calm. The p-value revealed that differences in treatment effects were significant. The average duration of calm for meditation was 197 seconds out of 300 and 164 seconds out of 300 for mobile games. Conclusions/Discussion The results supported my hypothesis that meditation would be more calming than mobile games. Meditation is more effective in achieving a calmer state of mind than mobile games because it produces more gamma brain waves, which are beneficial in improving memory recall, sensory perception, and focus. Mobile games, however, still activated gamma brain waves, which indicate high levels of calm. Knowing that mobile games also produce a calming effect is useful because one can calm themselves in a noisy and crowded environment by playing a mobile game, when meditation may not be feasible or socially acceptable.	
Summary Statement I showed that both meditation and mobile games produced calm brain waves, but meditation was more calming.	
Help Received I designed and tested the experiment myself. I reviewed excel calculations under the supervision of T. Tong. I got help in understanding the statistical comparison of data from Dr. Jiaxiao X. Shi at Kaiser Permanente in Woodland Hills.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Fatimah Ismail	Project Number J1399
Project Title Developing an Artificial Pancreas: Dealing with Diabetes	
Abstract Objectives/Goals The objective of the project is to create an artificial pancreas and provide a solution to increase efficiency of the closed-loop system. It is tested to see if it can model a real pancreas and tested on different levels of pH (modeling glucose and insulin). The goal is to find an optimum range of the difference in the pH of the modeled solutions that will reduce dangers involved with incorrect dose of insulin for a Type 1 diabetic.	
Methods/Materials A conductivity sensor is designed using plastic straw, copper wire, and Styrofoam. The artificial pancreas is designed on a breadboard using resistors, jumper wires, potentiometers, MOSFET, and AA batteries. The conductivity sensor is connected to the artificial pancreas using alligator clip wires. The artificial pancreas is tested using vinegar and baking soda modeling insulin and blood sugar levels. Peristaltic liquid pump with metal leads is used. The resistors form voltage divider. The potentiometers and conductivity sensor form a voltage divider. The output of the second voltage divider is equal to the voltage of the gate on the MOSFET. The voltage divider controls whether the gate conducts energy between the drain and source. When pH of the solution turns 7, the conductivity sensor senses and the MOSFET turns off so current doesn't flow and the pump turns off.	
Results The conductivity sensor senses the solution with pH above 7. The pump starts to run and neutralizes the pH of the solution to 7 and stops. This happens 50 times, which means the pump works. The pH of vinegar solutions ranged from 2.5-6.5 and that of baking soda were 6, 6.5, 7, 7.5, and 8. I observed that if two sets of vinegar and baking soda solution have same difference in pH levels, the time taken to neutralize the solutions are same.	
Conclusions/Discussion The artificial pancreas met all requirements in the engineering goal. It sensed the low pH making the pump run, which operated 50 times. Another observation is when the difference in pH and time taken to neutralize the solutions are plotted on x-y plane, the graph is a straight line. There is a linear correlation between difference of pH levels of solutions and time to neutralize the solutions. Correlation is modeled by the equation $y = 3.75x - 0.01$ with $r^2 = 1$. From the correlation line, it is concluded that if we can maintain the difference of the pH level at some central tendency, the risk of Type 1 diabetes can be minimized.	
Summary Statement I created and tested an artificial pancreas using various pH levels of baking soda and vinegar (modeling glucose and insulin); linear correlation was found when difference of pH and time to neutralize the solutions were plotted on x-y plane	
Help Received I designed the project and conducted the experiment independently. My science teacher guided me through this project and reviewed my results.	