



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Mackenzie M. Bailey	Project Number J1901
Project Title Eagle Lake Appetizers	
Abstract Objectives/Goals The objective of this research project was to determine the December food habits of the Eagle Lake Trout (<i>Oncorhynchus mykiss aquilarum</i>) in Eagle Lake located in Northeastern California. Methods/Materials A sample size of 50 Eagle Lake Trout stomachs were collected from licensed sportfishermen at the southern end of Eagle Lake during the month of December, 2004. The content of each stomach was analyzed in a laboratory setting and prey items were identified. Collection and analysis was authorized by Calif. Dept. of Fish and Game Lt. Warden Lisa Stone. Results In the 50 Eagle Lake Trout stomachs analyzed, leeches (30%) were the most frequent prey item identified. Also identified as prey items were : shrimp (26%), snails (26%), and Tui chubs (12%). Conclusions/Discussion Leeches (30%), shrimp (26%), and snails (26%) were concluded to be the three most frequent prey items selected by the Eagle Lake Trout during the month of December, 2004. Other items discovered in the Eagle Lake Trout stomachs analyzed included pieces of aquatic vegetation (tule, etc.) and plastic. A 10 cm by 20 cm piece of clear plastic was identified in the stomach contents of one sample. Below average lake level (- 4 ft.) in December of 2004 may have resulted in a lower shrimp prey frequency than has been discovered in the most previous food habit study completed in 1997. In order to manage this unique trout species, a thorough understanding of it's food habits and niche in the Eagle Lake aquatic ecosystem is of vital importance.	
Summary Statement This research project explored the prey item frequency for the Eagle Lake Trout (<i>Oncorhynchus mykiss aquilarum</i>) in Eagle Lake, Calif. in December of 2004.	
Help Received My dad, a U.S. Forest Service biologist and educator, helped transport me to Eagle Lake, Calif. to collect stomachs for analysis. He also served as a consultant on my project by reviewing my methodology and scientific writing.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Adam R. Bess	Project Number J1902
Project Title Light Preferences among Crickets	
Abstract Objectives/Goals The purpose of this experiment was to see which colored light (purple, green, red or white) crickets are attracted to. By understanding what light crickets are attracted to, we will be able to create traps that will more efficiently catch crickets either for research purposes or extermination purposes. Methods/Materials 150 Crickets; Scissors; Tape; 4 small boxes; 1 large box; Purple, green, red, and white cellophane; White paper; Journal; Stop Watch; 4 pieces of heavy paper. Results The following data was collected from my three controlled experiments: Color Experiment #1 Experiment #2 Experiment #3 Average White: 1 1 4 2 Purple: 4 3 1 2.66667 Red: 3 2 8 4.33333 Green: 3 7 3 4.33333 Dark: 36 35 31 34 Deceased: 3 2 3 2.66667 Total: 50 50 50 50 Based on the data above, I created two graphs. Graph 1 represents the exact number of crickets in each of the four colored boxes in addition to the number of crickets in the dark. This graph also includes the incidental deaths of some of the crickets. Graph 2 represents the average light preferences from all of the experiments. In my experiment, the crickets more or less stayed in the dark area. Therefore, my hypothesis was incorrect when I predicted that the crickets would move towards the white light. Conclusions/Discussion The experiment accomplished what it set out to do. I believe that it was important to understand what light crickets are attracted to in order to be able to create traps that would more efficiently catch crickets either for research purposes or extermination purposes. My prediction that crickets would generally gravitate towards the white light was completely incorrect. I believed that the crickets would travel to the white box; yet, they decided to stay in the dark. The significance of the result of this experiment is great because this information would be helpful to use in catching crickets. This experiment was a valid experiment because it showed that crickets# preference is to stay in darkness. For me this experiment was	
Summary Statement My experiment is about what colored light crickets are attracted to.	
Help Received Mom helped purchase supplies.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Elizabeth J. Bouchard	Project Number J1903
Project Title A Rainbow of Ultraviolet Color	
Abstract Objectives/Goals I love animals and am fascinated that scientists knew birds had more cones in their eyes than humans which means they see more colors than humans, but they still believed that birds saw like humans. My goal was to design an experiment to observe bird behaviors affected by ultraviolet colors with materials I have available at home. I hypothesized that birds are attracted to the brighter ultraviolet colors. Methods/Materials I painted three paper plates in different ultraviolet colors, leaving the last one plain. Each day I filled the plates with new birdseed. I placed the plates outside and recorded the amount of birdseed left on the plates at the end of each day. Results My hypothesis that birds would prefer the brightly colored plates was correct. The birds greatly preferred the ultraviolet pink plate and the ultraviolet yellow plate. The species of birds I tested were crows, sparrows, robins, pigeons, doves and blue jays. Conclusions/Discussion Many scientists incorrectly modeled bird behavior by ignoring the fact that birds have more cones in their eyes than humans, which means they see more colors than humans. My work was inspired by the work of researchers like Dr. Andy Bennett. Dr. Bennett uses advanced electronic equipment to visualize ultraviolet colors when observing bird behavior. He showed that zebra finches use ultraviolet vision in choosing a mate. My experiment showed that the birds in my backyard prefer bright ultraviolet colored plates. If I were to do this experiment again, I would use different ultraviolet colors and if possible, different birds.	
Summary Statement To determine how ultraviolet colors affect bird behavior using commonly available materials and equipment.	
Help Received Teacher reviewed my report, mom helped type it	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Jacob Carter; Carson Sheppard	Project Number J1904
Project Title Cracking Up: Egg Shell Strengths	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal was to find out if home farm chickens have egg shells that are stronger than caged chicken egg shells. Our hypothesis was that farm chicken eggs would be stronger because farm hens have stronger bones and more calcium for eggs than commercial caged hens.</p> <p>Methods/Materials Four groups of eggs were set up. Each group had 3 home farm eggs and 3 commercial eggs that were matched for weight. We built an "egg crusher". Eggs rolled off dowels set at 1", 3", 5", and 7". Then we measured the size of the fractures.</p> <p>Results The home farm eggs broke less than commercial eggs when they dropped from 1". The commercial eggs broke less than the farm eggs when they were dropped from 3", 5", and 7".</p> <p>Conclusions/Discussion Our results did not match our hypothesis. After searching more, we found out that there are many variables that affect shell strength, not just housing conditions. Also, many caged hens are fed enzymes to make their shells stronger.</p>	
Summary Statement Caged hens have harder egg shells than home farm chickens even though they may have osteoporosis.	
Help Received Our parents helped organize the experiment and get the materials. Mrs. Sheppard helped on research.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Zoe E. Dubrow	Project Number J1905
Project Title Determining Toads' Dominant Sense for Locating Food	
Abstract Objectives/Goals The purpose of this project is to determine whether oriental fire bellied toads' dominant sense for locating food is sight or smell. An attempt will also be made to figure out if the toads can use memory or visual clues to assist them in locating food. Methods/Materials In this project there are six sets of experiments in which oriental fire bellied toads will be tested. The experiments that will be done are randomized scent, randomized sight, memory, memory negative control, randomized visual clues, and visual clues negative control. Each of these experiments will test one of the toads' senses. Precautions will be made so that the only way that fire bellied toads will be able to locate the food in a particular experiment is by the sense that is being tested. At the end of each experiment the toads accuracy and time taken to find the dish with the food will be recorded. Results The toads found the food 40 times faster in sight experiments than in scent experiments. The toads located the food 11 times faster in sight experiments than memory experiments. They also found the food 14 times faster in sight experiments than they did in visual clues experiments. In Sight experiments the toads lunged for the food as soon as they were put into the plastic container. Conclusions/Discussion Fire Bellied toads main method of locating food is sight. Toads can remember the location of a source of food for more than two days. The primitive toads are capable of using both memory and visual clues to assist them in locating food. The toad with the best memory also took the longest time to find the correct dish in the smell experiments. Almost half the time this toad went to an incorrect dish which turned out to be where the food had been in the last experiment. This tells me that her memory overwhelmed her smelling instincts.	
Summary Statement The objective of this project is to determine fire bellied toads' dominant sense for locating food.	
Help Received My dad helped me take pictures while I made sure that the toad did not hop away.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Jacob D. Dunning	Project Number J1906
Project Title Feathered Conditioning: The Sequel to Classical Conditioning	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to find out how many weeks it would take to condition my pet bird "Sunny" to respond to the sound of a bell even when no food was present. My hypothesis was that it would take four weeks to condition Sunny with the bell.</p> <p>Methods/Materials I measured the time it took for Sunny to reach her food bowl. Materials: Bird - Sunny, bird food, bell, spoon, log book, stopwatch. Procedure: 1) Put food in a spoon without Sunny seeing, 2) Ring the bell and start stopwatch, 3) Lure Sunny to the bowl with food, 4) Wait for Sunny to go to her food bowl, 5) Stop the stopwatch, 6) Put the food in the bowl, 7) Stop ringing the bell, and 8) Record data in the logbook.</p> <p>Results Sunny was conditioned with the bell in about one week.</p> <p>Conclusions/Discussion My hypothesis was that Sunny would be conditioned in four weeks but Sunny did it in one week. Therefore, Sunny is smarter than I thought.</p>	
Summary Statement Sunny learning to associate the artificial stimulus (the bell) with the natural stimulus (the bird food) is called Classical Conditioning.	
Help Received My mom and dad helped me with my Science Fair applications. My mom helped me shop for supplies. My dad gave me some advice and helped me format Microsoft Word.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Chloe L. Eicher	Project Number J1907
Project Title Hermit Crab Response to Changes in Light Conditions	
Abstract Objectives/Goals My science project addresses hermit crab (<i>Coenobita clypeatus</i>) activity patterns and what factors trigger these patterns. I wanted to find out if I could change my pet hermit crabs' natural nocturnal activity pattern to diurnal. Methods/Materials Materials and Methods: First, I documented my two hermit crabs' (Flip and Flop) activity levels during natural light conditions. Then, I gradually altered the timing of the light so that their habitat was artificially light during the night and artificially dark during the day. I detected activity using a combination of direct and indirect evidence. I used a grid to map each hermit crab's location, and if the hermit crab had moved since my last recent observation, then I knew it must have been active. This was indirect evidence. Direct evidence was when I actually observed the hermit crab moving. I monitored ambient air temperature throughout the project. Results Results: During natural light conditions, nighttime activity was higher than daytime activity. During artificial light conditions, the hermit crabs were more active during the artificially dark period than during the artificially light period, although the level of difference may not be significant. Overall, hermit crab activity declined when light conditions were altered. Air temperature was slightly higher on the side of the habitat with an infrared heater, however, temperature did not vary between day and night anywhere in the habitat. Conclusions/Discussion Conclusions: The hermit crabs were able to adapt somewhat by changing the timing of their activity, however, I think their overall decline in activity was related to the stress of an unnatural change. Likewise, people who change the timing of their normal daily activity (e.g., people who work the night shift or people who fly to a different time zone) may experience stress-induced side effects such as fatigue.	
Summary Statement In response to altered light conditions, hermit crabs changed the timing of their activity and, overall, activity levels declined.	
Help Received My mom helped by providing advise.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Leslie S. Gray	Project Number J1908
Project Title Comparing Various Natural Substances in Attracting and Repelling Drosophila	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my project was to compare various natural substances to see if they attract or repel Drosophila. My goal was to determine which category of natural substance that I have chosen will attract the greatest amount of Drosophila and what substance may work as a natural repellent.</p> <p>Methods/Materials I tested two categories of fresh substances: fruit and spices. I had four substances of each. The fruits I tested were bananas, grapes, tangerines and apples. The spices I tested were anise, garlic, rosemary and jalapeno pepper. I had 3 test vials for each of the 8 substances and 3 test vials for the control of distilled water. There was a total of 27 test vials. There were 10 Drosophila in each test vial. With the fruits and spices, I made a solution by pureeing 3 ounces of the substance with 1/3 cup of distilled water. I then dipped the sponge into the pureed substance to let it absorb but not totally saturate. Then I would cork the test vial of Drosophila with the sponge. At intervals of 15, 30, 45 and 60 minutes I would record the number of Drosophila that were on the sponge. With 3 test vials per substance and 4 tests per vial, each substance had a total of 12 tests.</p> <p>Results The results of my tests did not exhibit strong tendencies by either substance test group. The results on an individual substance basis demonstrated that garlic was a strong repellent and jalapeno peppers had a fairly strong attraction rate. The control had a very low attraction rate.</p> <p>Conclusions/Discussion My hypothesis was that the Drosophila would be most attracted to the bananas and would be repelled by the garlic. My hypothesis was incorrect. Fruit as a group had a higher attraction rate than spices. Although individually they were most attracted to jalapeno peppers and repelled by garlic. As some of my research suggested, fruit flies (Drosophila) are inaccurately named, as they are attracted to a variety of substances with different tastes and odors.</p>	
Summary Statement Which natural substances will attract or repel Drosophila, fruit flies.	
Help Received High school science teacher provided Drosophila and supplies and my mom typed the report.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Taryn R. Holliday	Project Number J1909
Project Title What Effect Does Dissolved Oxygen Level Have on Viviparis malleatus (Trapdoor Snail) Behavior?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to see if dissolved oxygen levels affect Viviparis malleatus (trapdoor snail) behavior. From the Year One Study (2003-2004), I learned that trapdoor snails do display predictable behavioral patterns. Given this, I was able to design a set of tests to see what effect varying dissolved oxygen levels have on behavioral tendencies such as movement patterns, learned behaviors, weight gain or loss, and reproduction counts.</p> <p>Methods/Materials The snails came from a local fish pond. Only mature snails of similar size were chosen, again due to data obtained from the Year One Study in which I found that the more mature the snail, the more predictable the behavior. I set up two basic populations: one in a bowl with high dissolved oxygen levels and one in a bowl with low dissolved oxygen levels. Aerators were used throughout the study to maintain or increase dissolved oxygen levels. Fish bowls of varying sizes were also used depending on the behavioral test being conducted. Colorimetric snap tests were used for dissolved oxygen testing.</p> <p>Results Results showed that snails in the non-oxygenated environment were more active. Their behavioral patterns followed that of the predictable nature established in the Year One Study. Snails in the oxygenated bowl were mostly at the bottom, inactive, and completely inside their shells. The non-oxygenated snails gained weight (+3.55%) while the oxygenated snails lost weight (-3.19%). Also, the non-oxygenated snails showed an increase in reproduction count from 4 to 47 while the oxygenated snails showed a birth count beginning at 2 and going to 24.</p> <p>Conclusions/Discussion Normal activity must be conducted by the snails in order for them to mate, feed, and give birth. The non-oxygenated environment was more conducive to snail activity. The Year One Study shows that these snails, unlike others, have anatomically designed bodies to withstand the bottoms of ponds. This year's study leads me to see that their behavior is far more life-supporting in the non-oxygenated environment. Since trapdoor snails do not like surface disturbances and they congregate where oxygen levels are lower, trapdoor snails at the water line should signal a drastic pond imbalance and should be responded to immediately by pond caretakers.</p>	
Summary Statement Trapdoor snails in lower dissolved oxygen environments have greater weight gain, display predictable behavioral patterns, and have more young.	
Help Received Teacher as facilitator.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Alanna Hoyman-Browe; O. Hope McKenney	Project Number J1910
Project Title Color, Fragrance, and Flavor: Measuring Their Influence on the Behavior of Worker Bees	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective was to isolate which element of a flower a worker bee is most attracted to: color, fragrance or flavor.</p> <p>Methods/Materials Twenty-two 5-inch rounds of paper were placed on skewers in order to resemble flowers. They were placed in a semicircle approximately 6 feet from the bee hive. Nine of the #flowers# were of various colors but had neither taste nor fragrance. Nine of the #flowers# were white but had various essential oils applied. The remaining four were white with the four basic flavors applied. We observed and documented the bee activity directed at our experiment. Each experiment was conducted for one hour. The experiment was repeated three times.</p> <p>Results On average, of the bees that were drawn to our experiment, 10 percent went to color, 52 percent went to fragrance, and 38 percent to flavor.</p> <p>Conclusions/Discussion The data from our experiment indicated that worker bees are most attracted to fragrance. However, due to variable weather there was little activity from the hive in two out of three experiments. Because of this, we feel more experiments are needed to verify our conclusion.</p>	
Summary Statement Our project studied the relative influence of color, fragrance and flavor on the behavior of worker bees.	
Help Received Jan Hoyman (mother) helped transport materials. Ross Lake (neighbor) allowed use of his hive. Jack Booth (professional bee keeper) showed his hive and provided useful information on bees.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Sakshi Joshi	Project Number J1911
Project Title Does Light Attract Aquatic Invertebrates?	
Abstract Objectives/Goals My project is to observe if light will attract aquatic invertebrates. Methods/Materials I took two containers, one with nothing in it, and the other with a flashlight inside of it. Both containers were placed in a lake at night. The next morning before sunrise, the containers were collected and the samples were analyzed under a microscope. I also used a digital camcorder, affixing it to the microscope, which provided a more up close image of the invertebrates allowing me to take pictures for the display. During each experiment, I took a sample from each container and extrapolated the results. Results In all the samples, the containers with the light had more invertebrates in it. In one of the experiments, the ratio was 40 to 1. The results also showed that not only aquatic invertebrates, but vertebrates and bugs are also attracted to light. The majority of invertebrates in the samples were "water fleas." Conclusions/Discussion As I hypothesized, the aquatic invertebrates were attracted to light. My hypothesis was based on observing specimens such as humans and mosquitos.	
Summary Statement The project is to observe if aquatic invertebrates are attracted to light.	
Help Received Parents reviewed typing and helped with the camcorder; Younger sister kept 4 year old brother away from the display board and entertained him while I conducted my experiments; Mr. Piercy (teacher) provided the microscope and petri dishes, provided guidance, and located the lake.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Jenny H. Kim	Project Number J1912
Project Title What Ethnic Food Do the Ants Like the Most?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Since I was young, I had fun looking and observing the ants. In my backyard, I had an anthole, and as I observed it, I found it very interesting how ants get food. I wondered if they also have a certain taste or favor of food. Therefore, I chose this for my science project.</p> <p>Methods/Materials Materials: ants, ants;# hole in the backyard, four ethnic foods (American food, Chinese food, Korean food, Mexican food), containers for food, a box to put the containers and ants when I do experiment, a scale to measure the amount of food. Procedure: 1. I already have an ant hole in my backyard and there are a lot of ants. 2. Measure each of the foods the ants will be offered. The same volume of the food will be offered to the ants. 3. Put the measured food onto the container. 4. Put the food on the ground with each type of food in a separate corner of the ground, leaving the ant hole in the middle. 5. Cover the ant hole and the food with the container that has holes on it so that the ants can breathe. 6. Allow the ants to go in their own direction to select the food of their choice. 7. Allow them 23 hours to find the food they will stay with. 8. Allow them to feed for 23 hours. Wait until the next day. 9. Get rid of the ants from the food. 10. Weigh each type of food that is left and know how much they ate of each food. 11. Subtract the leftover amount of food from the original amount of food. 12. Compare them and record in the log book. 13. Repeat the procedure seven times. Between each trial, the ants must be allowed to be without food for an hour.</p> <p>Results The ants liked Korean food the most and had a strong dislike for the Chinese food. The second food that the ants liked was Mexican and the third was American.</p> <p>Conclusions/Discussion The ants very obviously had a strong preference for Korean food. My original hypothesis stated that I believed that the ants would enjoy Chinese food best. Clearly, the data demonstrates that my hypothesis was not correct. I learned how to conduct an experiment by using variables and constants and the scientific method. I really enjoyed conducting this experiment. I think it would be fun to do this experiment at home in Korea and compare the results using Korean ants. I wonder would the Korean ants like the Korean food as much as the American ants do? Or would the Korean ants prefer American food? Just how ethnic are ants;# taste sensors anyway?</p>	
Summary Statement My project is about the red ants' favorite ethnic food, which was Korean food.	
Help Received Used balance beam to measure each food's weight from my science teacher, Mrs. Greenfield	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Gary J. Lent	Project Number J1913
Project Title How a Sowbug Relies on Its Sense of Smell: Common Scents about Sowbugs	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Sowbugs (<i>Oniscus asellus</i>) have a sense of smell and can find each other in darkness. I predicted that a sowbug would seek and be able to find the source of scents of other sowbugs, and of mint, lemon, and almond, without being able to see or touch the source of those scents.</p> <p>Methods/Materials I constructed a circular "track" inside a 90mm Petri dish. Outside the track, a 60mm "corral" contained either no scent (control), or 10-30 sowbugs, or 0.5-1.5ml of mint, lemon, or almond extract. I divided the track into forty regions, assigned scores from -10 (farthest from corral) to +10 (nearest). I placed a sowbug "runner" in a 0-point region, 90° from the corral side. For twenty 15-second intervals, I recorded the runner's location at the end of the interval, and changes of direction during the interval. A visual barrier blocked the runner's view of the corral.</p> <p>Results Average scores increased from the control (-0.91) to the largest scent concentrations: up 0.79 (sowbugs), 0.17 (mint), 1.19 (lemon), and 0.67 (almond), but less dramatically than expected. Changing direction could be an attempt to locate scents. From 0.43 changes of direction per minute (control), the changes increased 32.6% for sowbugs, 9.3% for mint, and 32.6% for almond, but decreased 14.0% for lemon.</p> <p>Conclusions/Discussion My hypothesis was correct although not overwhelmingly so. Runners seemed to notice the presence of each scent, but their scores show that on average they moved only slightly closer to scented corrals than they did to the unscented (control) corral, suggesting that sowbugs have difficulty locating a scent if other senses do not back up their sense of smell. In a follow-up experiment in which runners were able to see and touch each other, my preliminary data indicate that some extra scents in the environment can actually make it harder for sowbugs to find each other.</p> <p>Sowbugs have a dual role as agricultural pests and as recyclers. Understanding how various scents affect sowbugs could provide ideas for controlling their population.</p>	
Summary Statement When sowbugs can smell something without seeing or touching it, they try to locate the source of the smell, but they have difficulty actually finding the source unless their other senses verify it.	
Help Received This project was my idea, based on my interest in sowbugs, my earlier investigations showing their attraction to each other, and research showing their sense of smell. My father helped me design my experiment, drilled holes, and helped me analyze my data. My mother helped me paste up my poster.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Kiel T. Lewis	Project Number J1914
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Project Title
Effects of Orientation of Chicken Eggs to the Earth's Geomagnetic Field

Abstract

Objectives/Goals
My objective was to discover the effects of change in orientation of chicken embryos to the Earth's geomagnetic field.

Methods/Materials
First, I obtained 2 incubators and several believed-to-be-fertilized chicken and bantam eggs and followed the industry procedure for incubation. All eggs were aligned with the Earth's geomagnetic field and I separated them into two groups, Control (labeled #C#) and Rotating (labeled #R#). I rotated #C# eggs along the length of their vertical axes and #R# eggs along the length of their vertical axes and turned them 180° causing them to change orientation with the Earth's geomagnetic field about every 3 hours until the 18th day of incubation. After about 21 days, I recorded the results of the hatching process including weighing and looking for any deformities and recorded these observations by group. After 3 days, I repeated the examination of the chicks and recorded the results.

Results
In Test 1, the percentage of total hatched for the rotating group was 36% compared to 64% for the control group. The average weight was greater in the rotating group, but the average weight increase was less than that of the control group. The hatch rate for the rotating group was 33.3% versus 58.3% for the control group.
In Test 2, the percentage of total hatched for the rotating group was 46% compared to 54% for the control group. The average weight and average weight increase was less in the rotating group compared to the control group. The hatch rate for the rotating group was 66.6% versus 70.0% for the control group.

Conclusions/Discussion
In conclusion, chicken health and development is not improved by increased stimulation of the orientation of the developing embryo to the earth's geomagnetic field. In fact, less stimulation resulted in a higher average hatch rate and short-term growth rate. In general, there were no other considerable differences in the physical well being of the subjects. The possible reason for these results is the additional stimulation of the #R# or Rotation group in each test. The additional stimulation may have jostled the embryo in its earliest stages of development. The eggs might be best off by being in the #C# group for the first few days and in the #R# group for the rest of the incubation period to reach optimal conditions for the embryos. In both tests, the total number of eggs coincided with or exceeded the approximate industry hatch rate of 50%.

Summary Statement
My project is determining the effects of a chicken embryo's change in orientation with respect to the Earth's geomagnetic field.

Help Received
Mother turned eggs when I was not available to do so; Newbury Park Feed and The Trading Post gave advice; the King family and The Trading Post provided eggs



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Virginia G.M. Lodge	Project Number J1915
Project Title Under the Boardwalk: Starfish and Mussels	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals On pilings under Stearns Wharf and Goleta Pier, I always noticed that mussel beds were out of water for a long time at low tide and that very few mussels were lower. My goals were to see if sea stars are a major predator of mussels, if they eat more mussels more at deeper depths, and if mussels can even survive under water below the depth at low tide. I predicted that starfish would eat mussels a lot, that mussels in deeper water would be eaten more, and that mussels could live well underwater just as well as above.</p> <p>Methods/Materials Nine boards each with four clumps of living mussels were attached to wharf pilings so that the each clump of mussels was at a different, deeper depth in the water. Starfish were placed on or removed from the pilings for three treatments: plus treatment where three pilings had four starfish, the control treatment where there were either one or two starfish on three pilings (the natural number of starfish), and the minus treatment where there were no starfish on three pilings. Almost every day for 9 days, I counted the number of mussels that had been eaten at each depth.</p> <p>Results I found out that starfish are definitely the main predator of mussels. The number of mussels eaten was positively related to the number of starfish. I also found out that mussels can survive at deeper depths: where there were no starfish (the minus treatment), the mussels survived fine. The results of my depth test were not as clear. Mussels were eaten at all depths, although it seemed my hypothesis was true only in the plus treatment.</p> <p>Conclusions/Discussion I think that my experimental design may not have tested depth as well as it could have. Most of my mussels were still above water at low tide, but under water more than a regular mussel bed. If I had had longer boards so that some mussels were always under water, the test would have been more accurate. I still do not know why mussel beds are always situated high on pilings. On the pilings that I was using, I realized that there were lots of crabs. This helped to prove that sea stars are the one of the main predators of mussels because I could see that crabs were not eating the mussels, even in the minus treatment.</p>	
Summary Statement My project tested three hypotheses about whether starfish predation is important for the population and location of mussels.	
Help Received Dad helped with the set-up and snorkeled with me when I was collecting data.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Kaley E. Mulligan	Project Number J1916
Project Title How Does the Coloring and Sweetness of a Flower Affect Bee Visitation?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to determine how the coloring and sweetness of a flower affects bee visitation. My hypothesis was that bees would be most attracted to pink "flowers" with yellow, sweetened centers.</p> <p>Methods/Materials I made twenty paper flowers out of five different colors (red, blue, white, yellow, and pink); the centers of the flowers varied (by color and by sweetness). On three different occasions, I set the flowers out for approximately twenty-five minutes each time. I tabulated the number of bees that landed on each flower to determine what the bees were most attracted to.</p> <p>Results The total number of "bee visitations" was as follows: white flowers--48, pink flowers--36, blue flowers--33, yellow flowers--33, and red flowers--31. Flowers with sweetened centers--87, with honey--64, with a center--7, and with nothing--4.</p> <p>Conclusions/Discussion Due to the number of bee visitations to each type of flower, I concluded that bees were most attracted to white flowers with sweetened, yellow centers. Because these were paper flowers, the results may be different in an experiment with real flowers.</p>	
Summary Statement My project was to determine how the coloring and sweetness of a flower affected bee visitation.	
Help Received My parents helped put together my board.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Erin L. Newport	Project Number J1917
Project Title How Strong Are Your Mussels?	
Abstract Objectives/Goals The objective is to find out what type of shell can withstand the most pressure; the Green Shell Mussel, Common Black Mussel, Pitar Venus Clam, Turban Stenoggrus, or Green Top Trochus. Methods/Materials 10 of each of the 5 types of shells were tested. First they were weighed and measured, then placed in a vice. A spring scale was attached to the the lever of the vice, and pulled on. The amount of pressure that was needed for the shell to crack was recorded. Results The Green Top Trochus was able to withstand the most pressure, and was followed by the Turban Stenoggrus. The Common Black Mussel, Pitar Venus Clam, and Greenshell Mussel, all withstood a amount of pressure, which was only about one third of that of the Trochus. Conclusions/Discussion I found that shape had more to do with shell strength, than length or mass, and that shells with some kind of internal structure are stronger. This is important, because shells have been evolving for millions of years, and their basic designs can be used to create things that we use in our everyday lives.	
Summary Statement This project was about the effect of a shell's shape on its mass.	
Help Received Dad took me to get shells and helped me set up experiment; Neighbor loaned me book about shells and helped me come up with idea; My science teacher from last year also helped me come up with idea.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Megan E. Reese	Project Number J1918
Project Title Roundworms and Hookworms, Year Two: Prevalence in Shelter Puppies	
Abstract Objectives/Goals This is a continuation of last year's project. Last year I compared the prevalence of roundworms and hookworms in shelter puppies, dogs residing in an animal shelter, and companion puppies, dogs living with an individual or family. I found that 42% of shelter puppies tested positive for roundworms or hookworms, while only 11% of companion puppies were positive. I hypothesized that population density would have an affect on this prevalence. This year, I decided to test this hypothesis. Methods/Materials I collected 80 fecal samples, 20 samples from each of four animal shelters. I tested each sample using the fecal flotation method. I used a sodium nitrate solution, which was denser than the parasite ova. The ova rose to the surface, where a cover slip was placed. I carefully transferred the cover slip to the microscope slide and viewed the specimen under the microscope, looking for hookworm and roundworm eggs. I recorded my results. I used gloves while performing my procedures. Results My data shows that population density has no affect on the prevalence of roundworm and hookworm infection. The most densely populated shelter had 200 dogs per kennel in a year and a 55% infection rate. The second most populated shelter had 160 dogs per kennel in a year, and an 80% infection rate. The third most densely populated shelter had 125 dogs per kennel in a year and a 20% infection rate. The least densely populated pound had an average of 95 dogs per kennel in a year, and a 60% infection rate. I also looked at population density based on the number of dogs in the kennel on the day the samples were collected. Again, I found no correlation. 54% of all dogs tested positive. Conclusions/Discussion My hypothesis was proved wrong. As my results demonstrate, I found no correlation between roundworm and hookworm infection and population density. I found that deworming seems to have the bigger impact upon this incidence. The shelter with the highest prevalence of infection was out of wormer. The shelter with the second highest prevalence tried to worm puppies only once. The shelter with the second lowest prevalence of infection does their best to worm all dogs once. The shelter with the lowest prevalence of infection worms all dogs at least once. This shows that deworming is very important in controlling parasite infection. A follow up project would be to study deworming programs closer and suggest improvements.	
Summary Statement My project demonstrated that population density has no affect on the prevalence of roundworm and hookworm infection in puppies.	
Help Received Dr. Sally Phillips granted me the use of her microscope.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Renana Adar Schutzer	Project Number J1919
Project Title Do Ants Really Need Their Antennae?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to see which kind of ant would finish the maze in the shortest amount of time: an intact ant, an ant missing its right antenna, or an ant missing its left antenna? What kind of behavior would each type of ant present?</p> <p>Methods/Materials Draw a 12-inch long, tube-shaped maze on the board. Stand the board up against the board in a vertical position. Put the ants through the maze one at a time. Each TYPE of ant should have 20 trails to go on the maze. Rinse and dry the board after each trial. Observe and time each ant as it goes through the maze. Wild intact ants, ants missing their right antenna, ant missing their left antenna, a board, chalk, paper towel, tap water, timer, cleaned medicine vial (with lid).</p> <p>Results On average, the intact ants got to the end of the maze the fastest. The ants missing their right antenna walked through the maze second-fastest. The only behavior these ants showed that was different from the intact ants was: walking only on the left side of the maze. The ants missing their left antenna walked through the maze the slowest. These ants walked on both sides of the maze, but they seemed "confused."</p> <p>Conclusions/Discussion An ant that has both of its antennas will get to its destination usually faster than an ant that is missing its right antenna or left antenna. In conclusion, I found that ants that are missing their right antenna can still get to their destination fast, if not sometimes faster than ants that have still have both their antennae. The only thing that was wrong with the ants that were missing their right antenna (that I could tell, anyway) was that they couldn't "see" things that were on the right side of their heads. I found that ants that are missing their left antenna can "see" on both sides of their heads, but their traveling speed is affected greatly. Though this doesn't have to do with my experiment results, I'll mention that I found that ants will only cooperate in an experiment when the temperature is warm. As I said before in my hypothesis: "I think that if I find an ant that is missing one or more of its antennae, and I put it on the maze, then it will have a harder time getting across the maze than an intact ant would." My data supports my hypothesis. My conclusion supports the literature in my research.</p>	
Summary Statement What is the behavior and speed differences between intact ants, ant missing a right antenna, and ants missing a left antenna?	
Help Received Mrs. Paluso told me about how ants can't get past chalk ; My father supported me with my project and helped brainstorm for a project idea.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Brandon L. Storm	Project Number J1920
Project Title What's for Dinner? The Analysis of Juvenile vs. Adult Prey in Barn Owl Pellets	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project is to determine if the common barn owl eats more juvenile prey than adult prey by dissecting and analyzing 140 owl pellets over a nine-month time span. It was hypothesized that on the graph the percentage of juvenile prey would be greater than the percentage of adult prey at the beginning of this project, but at the end of the project the percentage of adults would be higher.</p> <p>Methods/Materials Approximately 10 barn owl pellets were collected at each of two locations in the Fresno area about once every two weeks over a nine-month time span. The pellets were dissected and data were recorded in the logbook including the date, site, and number of how many juvenile prey and adult prey there were. You can tell if it is a juvenile or adult by looking to see if the two knobs at the end of the femur are attached. If they are then it was an adult, but if they are not then it was a juvenile. The percentage of juvenile and adult prey was determined for each date and location and graphs were made using Microsoft Excel.</p> <p>Results Towards the beginning of my project the number of juvenile prey was higher than the number of adult prey. On the first date of collection of this project on June 10, 2004 at one location there was a 77.78% juvenile prey and 22.22% adult prey. But at the end of the project on February 5, 2005 at this same location there was 33.33% juvenile prey and 66.67% adult prey. The percent of adult prey never exceeded the percent of juvenile prey at the other location, but when data from both locations were combined for the last collection there was 50% adult prey and 50% juvenile prey.</p> <p>Conclusions/Discussion In my hypothesis I had an educated guess that the owl would prefer juvenile over adult prey because they are more numerous and easier to catch. A large percent of rodents are born in late spring or early summer, which is about the time I started. Towards the end of the project the animals were starting to become adults before the next mating season and the owl ate more adults. I am planning on getting more results to find out what happens during the rest of this year and next year. These data may help farmers near known owl habitats and can provide information regarding rodent control.</p>	
Summary Statement In this project I analyzed 140 barn owl pellets to determine if the barn owl prefers juvenile or adult prey and to determine if this preference changes overtime.	
Help Received Ms. Burleigh Lockwood, biologist, taught me how to analyze owl pellets. Dad drove me to the locations and taught me Microsoft Excel. Parents helped me print out and glue some pieces on the board. Mom helped me copy the application.	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Geneva K. Tripp	Project Number J1921
Project Title Right-Pawed or Left-Pawed?	
Objectives/Goals My objective for my project was to find out if more cats are right-pawed, left-pawed, or ambidextrous.	
Abstract	
Methods/Materials Materials: 5 cats, Narrow cats, cat food, pencil, paper, and camera.	
Procedure:	
<ol style="list-style-type: none">1. At a cat's feeding time, give a cat his or her food in a narrow cup. Make sure the cup is too narrow for the cat's head.2. See which paw the cat uses to scoop the food out. Also note which paw is used next. Test each cat six times.3. Record the observations.	
Results Cats don't seem to know which paw they use as a habit; the cat will use a certain paw first, but get more food with the other. Some cats use their paw to move the cup closer. If the cat finds out that "this" paw gets more food, or feels more comfortable, that is usually the habit paw. I can tell which paw the cats get more food with. If they clean one paw more than the other, that is the one the cat used most. If the cat used a paw around 5-10 times in a row, that meant that the cat was getting more food with that paw, so it keeps trying with that same paw.	
Conclusions/Discussion I have found that out of five cats, there was a tie for right and left-pawed cats (40%), and the rest (20%) were ambidextrous. Two cats were right pawed, two were left-pawed, and one was ambidextrous. My hypothesis, that most cats would be right-pawed, was incorrect.	
Summary Statement I tested to see if cats are ambidextrous or have a dominant paw like humans are ambidextrous or have a dominant hand.	
Help Received None	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Benjamin P. Wagner	Project Number J1922
Project Title Does Soil Matter? Worms in Their World	
Objectives/Goals The purpose of this experiment is to determine which type of soil is the best for worms to live in and reproduce. Having this knowledge will help people choose the best soil for their plants. The worms, with their beneficial castings, will take care of the rest.	
Abstract	
Methods/Materials MATERIALS ·4 five gallon buckets / ·¼ inch drill bit / ·1 drill / ·4 plates / ·5 gallons of decomposed granite / ·5 gallons of garden soil / ·5 gallons of peat moss / ·5 gallons of mulch / ·100 worms / ·6 liters of tap water / ·4 black plastic trash bags / ·Thermometer METHODS ·Drill 4 drainage holes at the bottom of each bucket. ·Place 5 liters of each soil mixture in separate buckets. ·Place the 4 buckets onto the drainage plates, hole sides down. ·Count the worms and ensure that the mixtures are worm and egg free ·Place 25 worms on top of each mixture. ·Maintain a constant temperature of 35C. ·Add 60 ml of water to each bucket and continue this process weekly. ·Cover the buckets with the plastic. ·Place 4 buckets in a controlled environment. ·After 6 weeks determine the number of worms in each bucket.	
Results After six weeks there were 22 worms in decomposed granite soil. This was a decrease of 3 worms. The garden soil mixture showed an increase of 66 worms. The mulch mixture showed an increase of 5 worms. The mixture with the largest population growth was the garden soil. The mixture with the least amount of worms was the peat moss.	
Conclusions/Discussion The data does not support this researcher's hypothesis. The garden soil mixture increased the worm population the most. Raising worms in a garden soil mixture will ensure a thriving worm population. Decomposed granite, on the other hand, will cause a worm population to decrease. Further research could be done to find the effect of different vegetable and fruit peelings on worm populations. To improve this project the scientist would repeat this experiment at least 20 times.	
Summary Statement My project explores the best soil environment for worms to live and reproduce.	
Help Received None	



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Heather M. Walker	Project Number J1999
Project Title Shake Ya Tail Feathers: In Dirt or Water?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my experiment was to find out if bacteria samples from land fowl or water fowl would produce the most bacterial growth.</p> <p>Methods/Materials To conduct my experiment, I swabbed turkeys, chickens, a peacock, geese, ducks, and an emu, and then swabbed the surface of a sterile agar-filled petri dish. While swabbing the fowl, I used sterile swabs, gloves, and sterile techniques. On my display board, I have feathers that resulted from a natural periodic shedding process, also known as molting, and the feathers were previously but are no longer live material. I also used an incubator, set at 25 degrees Celsius, and a refrigerator set at about 1 degree Celsius. I placed the petri dishes in the incubator and observed the growth for one week or until there were two or three consecutive days of no new growth in any petri dishes. I checked for new growth twice daily, once at 6:30 AM and once at 6:30 PM.</p> <p>Results Throughout all of the trials that I conducted, the bacteria samples collected from the land fowl generated more bacterial growth in the petri dishes than the samples taken from the water fowl.</p> <p>Conclusions/Discussion The conclusion that I have drawn from conducting this experiment is that land fowl have more bacteria and germs on the surface of their feathers than water fowl. The water fowl were so clean due to their preen gland, which, when stimulated, produces an oil. This oil gets rolled onto the surface of the feathers with the bird's bill and creates a waterproof seal over the feathers. This seal serves as a barrier to germs and bacteria, and any bacteria that stuck to the surface of the feathers got washed away when they bathed. The land fowl, on the other hand, do not have a preen gland, and to bathe, they roll around in the dirt, which in this case, made them dirtier. The peacock, which is officially classified as water fowl, has a preen gland. The peacock used in my experiment does not come in contact with water besides the water that it drinks from. When the peacock preens and rolls the oil all over its feathers, it decides to take a dust bath. The dirt and germs stuck to the oil and to their feathers, thus making the peacock the dirtiest bird out of both the land fowl and the water fowl.</p>	
Summary Statement My project is about finding the difference in bacterial growth of bacteria samples taken from land fowl (3 turkeys, 7 chickens, and 1 peacock) and water fowl (3 geese, 7 ducks, and 1 emu) to determine if land or water fowl are dirtier.	
Help Received My mom helped make the agar used in the petri dishes, catch fowl, and sterilize petri dishes after use; my dad bought all materials and helped catch fowl; my sister took pictures and helped with a few graphs; a family friend gave advice on how to start the petri dishes.	