**Name(s)**

Kirbie G. Daily

**Project Number**

# J2201

**Project Title**

## Can Chickens See Color?

### Abstract

**Objectives/Goals**

My objective was to determine if chickens see color.

**Methods/Materials**

Method-

Step 1: paint three different feeding areas;one red, one blue, and one green

Step 2: set up the feeding areas in a large space

Step 3: put a food bowl in each area with some type of chicken food(each bowl has the same type of food in it)

Step 4: release chicken into large space with feeding areas in it

Step 5: observe which color the chicken goes to and record data

Do this every day for three weeks, making sure to move the colors around for each trial

Step 6: after three weeks, look over data to see which color the chicken went to most and if there is a pattern

Materials:

-a chicken

-food bowls

-three separate feeding areas

-blue paint

-green paint

-red paint

**Results**

At first, the chickens were unsure of their new feeding environment, but by the end of the experiment, the chickens had established a preference for the red colored feeding area. Out of forty-five trials, they chose red twenty-six times, green ten times, and blue nine times.

**Conclusions/Discussion**

In this project, I tested to see if color affects a chicken's appetite. My hypothesis was that color would affect their appetite and that they would like red the most. My hypothesis was correct. The chicken's appetite was affected by color and they liked red the best.

**Summary Statement**

The purpose of my project was to determine if chickens see color.

**Help Received**

Dad helped build feeding areas, Mother helped with supplies for board, and science teacher, Lynn Macy, helped find research on chickens

| Name(s) | Project Number |
|---|---|
| **Margaret E. Donaho** | **J2202** |

**Project Title**

# Hummingbird Nectar Preference

## Abstract

**Objectives/Goals**
Is color important to a hummingbird when choosing food sources?

**Methods/Materials**
Materials: 5 hummingbird feeders, sugar, water, non-toxic tasteless food color, journal, camera, ruler
I made a sugar and water solution and added red, yellow, brown and black food color and put in feeders. I left one clear. I put them in a tree and observed and noted changes. I moved the feeders and continued observing. I refilled the feeders and changed the order to see which feeders were visited most.

**Results**
When the feeders were placed in the tree, the hummingbirds went for the brighter colors instead of the darker ones. There was no significant change in the volume of dark nectar. After observing for several days, I moved the feeders to a new location. The hummingbirds continued to drink from the bright colors and did not drink from the dark colors. I saw hummingbirds drinking from the yellow and the clear feeders. Then I repositioned the feeders so that the dark colors replaced the bright colors. The dark color nectar volume went down and the bright colors were unchanged. I also saw hummingbirds feeding from the dark feeders.

**Conclusions/Discussion**
I found out that lighter colors appeal to hummingbirds for finding food sources, but the location of the nectar was what kept them coming back to the same feeder regardless of the color of the nectar. Based on my observations, after I changed the feeder#s location from the tree to the railing, hummingbirds continued to prefer brighter color nectar instead of darker colors. The change in location did not change the color choice because it was like a new food source. After I changed the order of the feeders so that the black replaced the yellow, and the brown replaced the clear, they continued to drink from the locations of the yellow and clear feeders even though they were now the brown and black nectars. In conclusion, through my research and experimentation, I believe that at first color attracts them, but in the end, what matters is that they are able to locate a food source that they can continue to feed from. Even when there is a color choice they still choose the one they remember.

**Summary Statement**
My project is about feeding habits of hummingbirds based on color of nectar.

**Help Received**
My mom helped me make the sugar solution. She also helped my purchase the feeders. She helped me with the display board and typing. My dad helped me make the graphs.

| Name(s) | Project Number |
|---|---|
| **Ashlee J. Fong** | **J2203** |

**Project Title**

## Ouch... A Cut!

**Abstract**

**Objectives/Goals**

The objective of this project was to see if ultraviolet rays, or UV rays, effected the regeneration of planarians. My hypothesis was that the group of planarians with no exposure to the UV rays would grow more than the groups of planarians with one minute, two minutes, and three minutes of contact with UV rays because UV rays can decrease the generation of cells in an organism.

**Methods/Materials**

Before I cut the planarians with the razor, I numbered 20 plastic containers 1-20 and filled them with 100mL of bottled water. Then I took twenty planarians and with a razor, I cut the head off so that the head measures 4mm and placed one head in each container using a pipette. After each container has one planarian head, I placed one container under UV lights for one minute. After one minute, I took the first container out and replaced it with another one for one minute until five containers have been under the UV lights for one minute. Next, I placed five containers under the UV light for two minutes and then five more containers were placed under the UV lights for three minutes. The next day, I used a caliper to measure how long each planarians was. Finally, I repeated the steps above for eight more days to be able to monitor the planarians# growth rate.

**Results**

Looking at the resulting data, the planarians with no contact with the UV rays averaged 2.99 mm of growth in nine days, which is the most amount of growth in the nine days, and the planarians with one minute of exposure only averaged 1.29 mm of growth in nine days. With two minutes of contact with UV rays, the planarians in this group averaged 0.69 mm of growth in 9 days, but the planarians with three minutes of exposure had an average of 0.96 mm of growth in nine days. The last average, the average of the planarians with three minutes of exposure, actually grew an average of 0.33 mm more than the planarians with two minutes of exposure.

**Conclusions/Discussion**

The hypothesis that the group of planarians with no exposure to the UV rays would grow more than the groups of planarians with one minute, two minutes, and three minutes of contact with UV rays was supported. The planarian group with no exposure to the UV rays regenerated the most proving my hypothesis to be correct. Therefore, people should spend less time under the sun and its UV rays, since their cuts, wounds or injuries would regenerate slower if they are over-exposed to the sun#s UV rays.

**Summary Statement**

I investigated how the amount of time planarians spend under UV rays would affect their regeneration.

**Help Received**

My science teacher, Ms. Fisher guided me on the project and let me use her supplies. My mother and father dropped me off at school each day for over a week. My Language Arts teacher, Mrs. Diaz helped me with my research report.

| Name(s)  Tara Foroohar | Project Number  **J2204** |
| --- | --- |

**Project Title**
# The Effect of Calcium on Bones

**Abstract**

**Objectives/Goals**
Through my investigation, I hope to discover the effect of a loss of calcium on bone strength. I have heard that you must have a lot of calcium per day in order to have strong bones, but I have not yet understood exactly how the calcium impacts the bones. So, my question is, what is the result of a loss of calcium in bones?

**Methods/Materials**
I start the experiment with nine chicken bones, in which three of them are put in just vinegar, while the other six are also put in vinegar but with different amounts of calcium (from calcium tablets: 300 mg, 600 mg, 1,200 mg, 1,800 mg, and 2,400 mg). The control is one of the bones in water. The independent variable is the amount of calcium each bone receives, and the dependent variable is how bendy the bone becomes. Each day, I examine the bones (touch and bend them) and record what differences they have. I repeat this process for five days, and then the experiment is complete.

**Results**
I found many astounding results from my projects. First, the bones in the vinegar became bendier every day. Also, the bones got spongier every day. However, the bones that were in calcium stayed pretty strong throughout the entire project. The more calcium the bone had, the stronger it was. For example, on the last day of the experiment, the bone with 300 mg calcium was a bit spongy, but the bone with the most calcium (2400 mg) was the strongest. Also, the bones got darker on the tips every day.

**Conclusions/Discussion**
I concluded from my experiment that calcium is a very important substance that your body requires. This experiment completely answered my question to how important calcium is to your bones. The more calcium you have, the stronger your bones are. However, a lack of calcium causes your bones to become spongy and weak. I did prove my hypotheses in saying that calcium is very important to your bones. If I were to do this project again, I would keep the bones in the vinegar until even the bone with the most calcium becomes weak. This might give information on how much calcium your bones require to stay healthy and how often calcium should be taken. This project will inform people about how important calcium is, and it can help prevent people from getting osteoporosis.

**Summary Statement**
This project is about the effect of calcium on bones, and what happens to bone if there is a loss of calcium.

**Help Received**
Teacher instructed me; Parents helped me construct my board and take pictures.

| Name(s) | Project Number |
|---|---|
| **Ryan J. Golden** | **J2205** |

**Project Title**

## Can Tree Frog Behavior Predict Earthquake Activity?

**Abstract**

**Objectives/Goals**

The objective was to see if Tree Frog behavior could help predict Earthquake activity.  My hypothesis was that the frogs would climb above mid-tank and be active before or after a seismic event.

**Methods/Materials**

Four Tree Frogs were observed in a contained terrarium three times per day for 30 days.  An "Active-Frog" event was recorded when 2 or more frogs were above 15 cm and moving.  The experiment was conducted at a site on the Maacaama fault centered at 39.17N, 123.15W (my bedroom).  Seismic activity was downloaded from the USGS site for the same period, limited to earthquakes greater than 2.0 on the Richter Scale and with epicenters between 38.8 N and 39.8N.  The frog behavior and the seismic data times were recorded on a spreadsheet and then graphed on a scatter diagram to show the correlations between the two.

**Results**

18 seismic events above 2.0 occurred on 13 different days during the experiment with 13 "Active-Frog" events on 11 days.   If we changed the search criterion to >1.75, all 13 frog events coincided with a seismic event.  There were a number of seismic events without an "Active-Frog" event.

**Conclusions/Discussion**

I could not conclude from my data that frogs would climb and be active prior to or just after a seismic event.  There was no direct correlation between the two events.  I concluded that I need to have more frequent observations of more frogs and some measure of seismic activity directly at the site of the experiment.

**Summary Statement**

An experiment was designed to see if Tree Frog behavior could help predict earthquake activity.

**Help Received**

My grandfather helped me buy the Tree Frogs.  My mother helped type the data and glued the print-outs onto the board.  My father and I bought the terrarium and he helped me put the data into a spreadsheet.  Mr Zellman, my advisor, asked me a lot of questions and helped me understand the value of multiple data

**Name(s)**

Chelsea Gonzalez; Cecilia Paz

**Project Number**

# J2206

**Project Title**

## Sea Cucumber Substrate Preference

**Abstract**

**Objectives/Goals**
My goal was to find which surface the giant sea cucumber would rather be on or move to. I wanted to see if it would rather be on a plastic, sand, or rock surface.

**Methods/Materials**
I used 3 tubs and filled them with water. Then I placed to of the 3 surfaces in one tub. I then placed the giant sea cucumber in the middle of both surfaces. I would switch the container every trial so the light wouldn't affect the giant sea cucumber. Each trial would last 20 min. and I would keep a separate timer for when it would go onto a surface.

**Results**
The giant sea cucumber spent 1185 seconds on the sand surface. It spent the 2nd most amount of time on the rock surface which is 1152 seconds. It spent the least amount of time on the plastic surface which was 201 seconds.

**Conclusions/Discussion**
I came to the conclusion that the giant sea cucumber preferred the sand surface over the other two surfaces it was exposed to. It did not really spend a lot of time on the plastic surface. This showed me that the giant sea cucumber is most comfortable in its natural habitat.

**Summary Statement**

My project is about the sea cucumber substrate preference given 3 choices rock, sand, and plastic.

**Help Received**

Cabrillo Marine Aquarium by providing us with the giant sea cucumbers and the materials.

| Name(s) | Project Number |
|---|---|
| **Claire E. Ha** | **J2207** |

**Project Title**

**Bombyx mori: Life, Death, and Dieting in Between**

**Abstract**

**Objectives/Goals**
The objective of this experiment was to determine whether 1 gram of bacteroidetes, 0.5 gram of bacteroidetes, or no bacteroidetes causes the most weight loss. My hypothesis was the silkworms consuming 1 gram of bacteroidetes would lose more weight than the silkworms consuming 0.5 gram and 0 grams of bacteroidetes, since bacteroidetes cause weight loss.

**Methods/Materials**
After I evenly distributed thirty silkworms into fifteen containers by placing two in each container and separating them with dividers, I labeled one side of a container N-1 and the other N-2 (no bacteroidetes 1, no bacteroidetes 2), N-3 and N-4 on another, continuing until N-10. I did the same with five L (low) containers and five H (high). I weighed each silkworm#s initial weight. I cooked the food by boiling and mixing water with the artificial mulberry powder, microwaving, and storing the food in the refrigerator. I cooked three batches of food: one with no bacteroidetes, one with 0.5 grams of bacteroidetes powder, and one with 1 gram. I sliced the hardened food into pieces that weigh 0.5 grams and gave a piece of food to each silkworm (no bacteroidetes silkworms eat the no bacteroidetes food, etc.). The next day, I weighed all thirty silkworms. I cleaned containers by removing the contents and rinsing and drying the container. I gave one piece of food to each silkworm. For eleven days, feed, clean, and weigh the silkworms.

**Results**
The resulting averages illustrated that since Day 1, the silkworms exposed to 1 gram of bacteroidetes gained the most weight, the silkworms exposed to 0.5 grams of bacteroidetes gained the least weight, and the silkworms exposed to no bacteroidetes were in between.

**Conclusions/Discussion**
The data rejects the hypothesis that the silkworms consuming the 1 gram bacteroidetes food will lose more weight than the silkworms consuming the 0.5 gram food or the no bacteroidetes food since bacteroidetes cause weight loss. According to the results, the silkworms consuming 1 gram gained the most weight, the silkworms consuming 0.5 grams gained the least, and the no bacteroidetes silkworms were in between. This experiment connects to the real world because bacteroidetes live in human small intestines. Bacteroidetes are gut micro biota that cause weight loss by extracting less calories from food. Since they cause weight loss, bacteroidetes are used in diet products to help people lose weight.

**Summary Statement**

I tested how bacteroidetes affect the weight of silkworms.

**Help Received**

Teacher gave suggestions/ corrections. Mother and Father bought supplies.

**Name(s)**

Katie M. Heath

**Project Number**

# J2208

**Project Title**

## Bon Appetite

**Abstract**

**Objectives/Goals**
My Ojective was to learn if desert tortoises prefer iceberg lettuce over spinach and/or romaine.

**Methods/Materials**
In this experiment i used two desert torioises, a desertlike aquarium, one head of romaine lettuce, one head of iceberg leaduce, one head of spianch, a kinfe, a cutting board, a notebook, a pencil, and a carmera. I first cut each type of lettuce into small leaves, thenm seperated them into five groups of ten leaves.  I used a total of ten days, on the first day i set the first group
(each type of lettuce-3 groups) and the next day i counted how many leaves were aeten out of the ten and record my results in the notebook. I repeated this tep every other day for the reaminig days.

**Results**
The tortoises did not eat any spinach, the iceberg percentage dropped by day, and lastly the romaine started out low and then towards the end of experiment the amount of leaves increased.

**Conclusions/Discussion**
I found that my hypothesis was proven wrong. I predicted the tortoises would prefer the iceberg lettuce because of the fact they have no teeth therfore cannot chew. Iceberg lettuce has a high water content so i thought the lettuce could dissolve in their motuh so they would not have to chew anything. Alothugh my theory was worng they actualy prefer romaine lettuce. My reasonign behing this is beause it is more leavy therfore the toroises would not hav to chew as much yet its not complete water so the lettuce fills their quench for food

**Summary Statement**
My ecxperiment was testing to see if desert torotises have a lettuce prefernce.

**Help Received**
My teacher Miss Michele Mulen helped in the writing report prcoess, and father helped to feed the tortoises.

**Name(s)**

Atticus J. Humphrey

**Project Number**

# J2209

**Project Title**

## Effects of Inherited and Non-inherited Calcium Feed on the Shell Strength of Egg Laying Chickens

**Abstract**

**Objectives/Goals**

Objective:The purpose of my science project is to compare which calcium feed produces the strongest egg shell in egg laying chickens.

Hypothesis:The inherited egg shell calcium feed will produce the strongest egg shells in egg laying chickens.

**Methods/Materials**

The procedures for my investigation of inherited and non-inherited calcium feed and how they affect egg shell strength are to first separate the six hens chosen for my experiment. First I will measure the feed and the calcium feed for each individual hen. Second I will collect eggs daily and place them in an airtight container,one container for each individual hen. Third I will select five eggs randomly from each hen. The fourth step will be breaking the eggs. The fifth step will be to measure the grams that it took to break the egg. This will test the strength of each egg shell. The sixth step will be to compile my data by averaging each hen#s egg strength. The first test will be the effects of no calcium feed on egg strength. The second test will be of oyster shell calcium feed on egg strength. The third test will be inherited egg shell calcium feed on egg strength. The fourth test will be store bought egg shells as calcium feed on egg strength.

6 chicken cages; 6 chickens; PVC pipe; PVC pipe end cover; One tube of silicone; Gram scale; Rain gutter; Caps for the ends of the rain gutter; Oyster shell; Collected chicken eggs; Store bought eggs; Chicken feed; Water float; Lead weights; Sand; 1 ½ measuring cup; 1 ¼ measuring cup; 16 18" boards; Rabbit wire; Hose; 6 plastic containers; Pie pan; 3 plastic bowls.

**Results**

The results of my investigation on egg shell strength indicated that the inherited egg shell calcium feed produced the strongest egg shells.

No calcium feed results

Average egg strength =4336.00

Oyster shell feed results

Average egg strength =4515.93

Inherited egg shell calcium feed results

Average egg strength =5623.97

Store bought egg shell feed results

Average egg strength =4941.33

**Conclusions/Discussion**

**Summary Statement**

The purpose of my project is to compare which calcium feed produces the strongest egg shell in egg laying chickens.

**Help Received**

| Name(s) | Project Number |
|---|---|
| **Michelle Pastrana** | **J2210** |

**Project Title**

## Red Fish, Blue Fish

**Abstract**

**Objectives/Goals**

The objective of my science project"Red Fish, Blue Fish" was to observe and analyze whether or not there were any observable changes in the behavior of male Siamese Fighting Fish(also known as Betta's)when placed together during a non-feeding time period and a feeding period.

My goal in this science project was mainly to really get to know a male Siamese Fighting Fish's behavior habits and aggression towards each other during the non-feeding time period and the feeding period.

**Methods/Materials**

Materials:

1.two Siamese Fighting Fish of similar age, size, and gender

2.One small fish net

3.Two small 1/2 cup volume fish containers

4.One lightly furnished 1 liter fish tank with divider

5.One container of "Aqueon" Betta fish pellets

6.Digital timer

**Results**

There was slightly more aggression shown during the feeding period with an average of 1.66 versus 1.33 for the non-feeding period.the total aggressive responses for the non-feeding period was 4 and the feeding period was 5.

**Conclusions/Discussion**

In conclusion my hypothesis was incorrect.I believed the Siamese Fighting Fish would exhibit increased aggression toward each other during feeding in an attempt to control the food resources.There was no observable increase in aggression following three feeding trials; in fact, it appeared there may have been a decrease. The level of aggression toward each other was very low due to the familiarity of the fish to one another resultant from the three week acclimation phase.

**Summary Statement**

My science project was about observing any aggressive behavior between two male Siamese Fighting Fish during a non-feeding period and a feeding period.

**Help Received**

**Name(s)**

Sara J. Pedro

**Project Number**

# J2211

**Project Title**

# Bird's Cafe: Colored Birdseed vs. Natural Birdseed

**Abstract**

**Objectives/Goals**

My project goal was to determine if the color of birdseed would make a difference in how much birds would eat it. My hypothesis was that the color would affect how much the birds ate, and they would eat more green birdseed because the color green is often found in nature.

**Methods/Materials**

In my experiment, I tested wild birds, mostly finches, chickadees, and sparrows. I used one large bag of Kaytee Waste Free wild bird food and divided the bag into four parts. I used organic food dye and dyed an equal part of the bird seed blue, green, red, and left the last part uncolored. I made four bird feeders out of clear 1 liter water bottles the same size and shape. I filled each bird feeder with a different color birdseed and weighed each one at 595 oz with a food scale. I hung each bird feeder the same height off the ground and the same distance apart from each other on the same tree. Each day, for four days, I measured what was left of the birdseed using the food scale and then hung the bird feeders back on the tree, one position to the right. I repeated this four day experiment three times.

**Results**

At the end of the twelve days of testing, the birds had eaten a total of 907 grams of the natural (no dye) birdseed. They ate a total of 487 grams of the blue birdseed, 335 grams of green birdseed, and 255 grams of the red birdseed.

**Conclusions/Discussion**

The color of birdseed does affect how much birds will eat it. The birds in my backyard preferred the natural, uncolored birdseed to any of the three colors that I dyed the birdseed.

**Summary Statement**

My project was to determine if the color of birdseed would have an effect on the amount of birdseed birds eat.

**Help Received**

Mother helped to dye birdseed and helped come up with a research plan.

| Name(s) | Project Number |
|---|---|
| **Cameron M. Rossi** | **J2212** |

**Project Title**

**Earthworms: What Soil Do They Dig?**

**Abstract**

**Objectives/Goals**
My project was to determine which soil type earthworms like best.  By understanding the relationship between earthworms and soil, we can improve the growth of plants, flowers, and the overall environment.  Gravel, sand, dead leaves, and potting soil were chosen for the experiment because they have different characteristics which will give a good variety.  I believe that the earthworms will like dead leaves the best because it is organic matter which is a food supply.

**Methods/Materials**
Earthworms were tested one at a time in a box to see if they preferred gravel, sand, dead leaves, or potting soil.  Each soil type was placed in one corner of the box and none of the soils touched.   The control for the experiment was that four earthworms were placed one at a time in the center of the box.  Variables that were added were time in the box, amount of earthworms placed at one time, location placed, and coffee grounds (organic matter) added to soil.

**Results**
Final results are four earthworms were tested five times each for a total of 20 tests.  Gravel was chosen 12 times and dead leaves were chosen 8 times.  60% of the time gravel was chosen and 40% of the time dead leaves were chosen.  Potting soil and sand were never chosen which makes them both 0%.

**Conclusions/Discussion**
My conclusion is that the earthworms chose the soil that would benefit them and our environment the most.  The gravel was loose, remained moist, and was dark in color which is important characteristics for the earthworm's survival.  The earthworms also chose dead leaves which was loose, remained moist, and is organic matter which is necessary to them.  They did not choose sand which is dense, light in color, and dried quickly.  They also did not choose the potting soil which contained chemical fertilizers that can harm earthworms

**Summary Statement**

My project is to determine which soil type earthworms like best in order to better understand the relationship between earthworms and our environment.

**Help Received**

Mom helped type the report and dad helped build the box for the experiment.

| Name(s) | Project Number |
|---|---|
| **Lilly M. Ryll** | **J2213** |

**Project Title**

## Backyard Bacteria

### Abstract

**Objectives/Goals**
The objective is to identify which of the selected arthropods is covered in the most bacteria.

**Methods/Materials**
Bees, flies and pill bugs were tested for bacteria. Bees were used as a comparison for flies and pill bugs. The test subjects were tested by being allowed to roam around an empty petri dish for five minutes, then the animal was transferred into a sterile plastic tube with forceps, and then sterile water was used to wash out the dish. The same water was then transferred into the tube, where the animal was held, with a pipette and the animal was #washed# by tipping the closed tube upside-down 10 times. 50 or 25 mL of the wash water was then plated out onto a labeled agar dish and incubated in a warm, constant closet. The temperature in the closet was recorded and bacterial and/or fungal colonies growing on the agar dishes were then counted each day over three days. The results were recorded and averaged.

**Results**
Results showed that the species averaging with the most bacteria was the pill bugs, then flies and bees in last. The average for bees was 1,963 colonies per test subject. The average for flies was 5,514 colonies per test subject. Finally, the average for pill bugs was 45,847 colonies per test subject. In average flies had about 180 % more colonies than bees and pill bugs had about 2,234% more colonies than bees.

**Conclusions/Discussion**
The results proved the experimenter#s hypothesis wrong. It had been hypothesized that flies would have the most bacteria and bees the least. The bees did have the least bacteria, however, it turned out that pill bugs had much more bacteria than flies.

**Summary Statement**
The species of arthropod covered in the most bacteria has proven to be pill bugs.

**Help Received**
Dad helped with proper and clean handling of petri dishes. Parents provided all materials. Ms. Schumacher helped with scientific method and proper form for display and notebook

| Name(s) | Project Number |
|---|---|
| **Rory Sawey** | **J2214** |

**Project Title**

## Which Way Little Crab?

### Abstract

**Objectives/Goals**

The purpose of my project was to find out if hermit crabs used the Earth's magnetic field to navigate. I hypothesized that hermit crabs navigated using the Earth's magnetic field based on observations noted in my previous science project.

**Methods/Materials**

To determine if hermit crabs navigated using the Earth's magnetic field, I set up 2 environments. Environment 1 was a control that used the Earth's natural magnetic field.  Environment 2 had Neodymium magnets strapped to the bottom aligned in such a way, as to create a new magnetic field where a false East is actually true South and so on.  For each experiment, the hermit crab was placed in the center of a large circular bucket facing true North every test. The first wall they touched was the direction recorded. The time they took was also recorded as an observation.  I ran 4 trials in Environment I and 5 trials in Environment II using 5 Coenobita Clypeatus hermit crabs.

**Results**

The hermit crabs went the direction of East, even with a different magnetic field, showing that evidence they navigate using the Earth's magnetic field.  When testing hermit crabs in the control environment they predominantly went East 68% of the time or 13 tests out of 19 total. When being tested in Environment 2 the hermit crabs went predominantly false East (true South) the most, 44% of the time or 11 tests out of 25 total.

**Conclusions/Discussion**

My results show conclusive evidence that hermit crabs do navigate using the Earth's magnetic field. In addition they have a tendency to go East.  This data suggests that the hermit crabs are migrating somewhere, such as a breeding ground. This knowledge could be used to help and protect the species' survival.

**Summary Statement**

My project's purpose is to determine if hermit crabs navigate using the earth's magnetic field.

**Help Received**

My parent helped me edit my grammar and buy my materials.

| Name(s) | Project Number |
|---|---|
| **Eleanor M.H. Schley** | **J2215** |

**Project Title**

**The Living Soil: Investigation of Microarthropod Diversity beneath Tree Canopies**

**Abstract**

**Objectives/Goals**
This experiment investigated microarthropod diversity beneath the canopies of three trees native to the San Francisco Bay area: oak, redwood, and eucalyptus.

**Methods/Materials**
Two half-gallon samples of soil were collected near the base of each tree, halfway between the tree trunk and the drip line at the edge of the tree canopy, and placed into separate Berlese funnels where they were heated for three days. The heat separated the microarthropods from the soil into cups of alcohol placed below the funnels. The number and types of microarthropods were counted under a microscope.

**Results**
All three trees had a diversity of microarthropods. In addition we noticed that all three trees contained nematodes in the soil, which were then added into the data. Nematodes are a similar, microscopic organism.

The oak trees had 35%-50% more microarthropods than both other trees. We also found spider-like microarthropods that did not appear beneath the other two trees.

Redwood trees have a higher percentage of nematodes than the other trees but less microarthropods in total.

**Conclusions/Discussion**
Research shows that microarthropods help decompose soil. These results would indicate that the soil beneath oak trees is higher quality, and more fitting for microarthropods.

Redwood trees are more suitable for nematodes. There is an unknown factor causing redwood trees to have more nematodes.

Future investigations would look at these factors: alkaline soils versus acidic soils, moist soils versus dry soils, and whether spider-like microarthropods are specific to the soil beneath oak trees.

This information is valuable to farmers and gardeners because it will help them obtain healthier soil and better crops.

**Summary Statement**

Investigation of microarthropod diversity beneath three species of tree canopies.

**Help Received**

My Aunt Christina helped me to understand the scientific reports on microarthropods. She also showed me how to use graphs on Excel. My mother helped me to find the materials necessary to perform this experiment.

| Name(s) | Project Number |
|---|---|
| **Benny Siam; Benjamin Zdasiuk** | **J2216** |

**Project Title**

# How Does Sound Affect Goldfish Feeding Habits?

**Abstract**

**Objectives/Goals**
To find how underwater sound affects fish feeding habits. Our hypothesizes were for the single frequency sound tests, we thought that the higher frequency sounds would affect the fish more than the lower frequency sounds because the former seem to be more irritating to the human ear. For the swept frequency tests our hypothesis was similar; the higher frequencies would have a greater effect than the lower. For the real world sound tests we thought that the motorboat sound would affect them the most because it is the least natural.

**Methods/Materials**
The materials for this project were a fully-equipped household aquarium, four goldfish, a DaravocTM Underwater Speaker, a LG Sweep/Function Signal Generator, a Tektronix Oscilloscope to check signal generator and attenuator, an iPod to play real world sounds, a Realistic# sound level meter, an a stereo 20W amplifier. The sound source was a signal generator or an iPod. We measured the time it took for the fish to start eating after the food was released into the tank. We ran three different types of tests: single frequency tests, swept frequency (chirp) tests, and real world sound tests. Single frequency tests used frequencies of 250, 500, 1000, and 2000 Hz. Chirp tests used 500, 1000, and 2000 Hz lowest frequencies, and real world sound tests used sounds of a pond, a motorboat, and rain.

**Results**
We found that certain single frequency sounds, chirps, and real world sounds slow down fish#s feeding. 500 Hz had the longest of the single frequency sound delays with a total of 11.5 seconds, then came 2000 Hz, then 1000 Hz, and lastly 250 Hz with a time shorter than the control. For swept frequencies the frequency that seemed to affect the fish the most was the frequency chirp that was in between the others. This frequency was between 1000 to 2000 Hz. In our real world sound tests the rain sound affected the fish the most.

**Conclusions/Discussion**
During the frequency tests we made some interesting observations. We noticed that the fish#s feeding delay shortened over time and repeated tests; therefore we controlled for this effect. This led us to believe that the fish had learned to associate sound with feeding. For our real world sound tests the rain affected the fish the most, probably because it was a strange and different sound to the fish. We thought that the motor boat sound was going to affect them the most but ended up being close to the sound of aquarium pumps.

**Summary Statement**
We tested how various sounds affected how fish fed by measuring feeding delay.

**Help Received**
Parents helped with experimental set-up, write-up, and board design.

| Name(s) | Project Number |
|---|---|
| **Matthew Sorge** | **J2217** |

**Project Title**

## Do Cool Temperatures Impact the Parasitism Rate of Psyttalia humilis?

### Abstract

**Objectives/Goals**

Parasitoid wasps are natural predators that are a great alternative to pesticides. Scientists are currently releasing a parasitoid wasp, Psyttalia humilis, to combat the olive fruit fly which has become a huge threat to California#s olive industry. Scientists are still unsure if P. humilis will survive during the cool winter months. Therefore, my project is to determine if cool winter temperatures affect the ability of P. humilis to parasitize the olive fruit fly larvae inside of the olive fruit.

**Methods/Materials**

U. C. Riverside#s Entomology Department provided me with 160 olives infested with fruit fly larvae and 40 mated female P. humilis. I prepared 20 identical containers and divided them into four treatments: Infested olives without P. humilis held at room temperatures; infested olives with P. humilis held at room temperatures; infested olives without P. humilis held at cool outside temperatures; infested olives with P. humilis held at cool outside temperatures. Each treatment was replicated 5 times. The high and low temperature was recorded daily. After seven days, all of the cool temperature containers were placed inside and all of the parasitoids were removed. The containers were checked daily and the number of emerging larvae, fruit flies, and parasitoid wasps were counted and recorded.

**Results**

The results show that cool temperatures did impact P. humilis# ability to parasitize the fruit fly larvae, but overall P. humilis was able to reproduce in cool temperatures at numbers similar to the parasitoids held in warmer temperatures.

**Conclusions/Discussion**

Although more adult fruit flies did develop from the cool temperature larvae exposed to P. humilis, P. humilis was still able to stop a large number of the larvae from developing into adult fruit flies. In addition, the cool temperatures slowed the development of P. humilis by ten days. Although the cool temperature treatment suggested that P. humilis# mobility is affected when parasitizing olive fly larvae, the most important fact is that the cool temperature treatment also produced adult P. humilis parasitoids. This means there is promise in using Psyttalia humilis as a biological control, and there is the possibility of establishing permanent populations in Southern California.

**Summary Statement**

The purpose of this project was to determine if cool winter temperatures affect the ability of Psytallia humilis to parasitize the olive fruit fly larvae inside of the olive fruit.

**Help Received**

| Name(s) | Project Number |
|---|---|
| **Andrew J.N. Takata** | **J2218** |

**Project Title**

**The Effect of CO(2) on Ctenocephalides felis**

**Abstract**

**Objectives/Goals**
What concentration of carbon dioxide will reduce the lifespan of Ctenocephalides felis, the cat flea? I predict that the carbon dioxide will negatively affect the fleas at approximately 50,000 ppm.

**Methods/Materials**
0.5 kg of dry ice,10 identical "Voss" 850 ml water containers,Vernier CO2 sensor,90 fleas,Vernier Go Link software,flea comb,cats with fleas,cup for weighing.
1.Label five bottles for Co2, five bottles for controls, and label trial numbers.2.Measure weight of medicine cup, and record weight. 3.Put on safety glasses.4.Using tongs,carefully break the ice in the chest into tiny pieces.5. Place dry ice piece into medicine cup.6. Allow dry ice piece to melt inside the cup until it is at needed weight.7. Use weight difference to find the weight of dry ice.8. Empty cup into any carbon dioxide bottle. 9. Allow the dry ice piece to melt completely.10. Repeat four times, using different weights for each bottle. 11. Using a flea comb, comb the cat until fleas are found.12. Drop five fleas in each bottle for each trial. 13. Time, observe, and record flea activity.14. Repeat until all five trials are complete.15. Place a tiny piece of dry ice into the medicine cup.16. Allow the ice to melt to exactly .1 gram.17. Place dry ice into any control bottle that had finished experimenting. 18. Take a Co2 reading in the bottle.19. Record the Co2 reading.20. Repeat four times.21.Take an average of the Co2 readings. 22.Calculate the Co2 readings inside the other Co2 bottles using this information.

**Results**
35 fleas exposed to no CO2 (controls) and contained in individual test containers filled with room air, lived between one and four days, for an average of 2.49 days/ flea.  2. Fleas exposed to varying CO2 levels from 0.5 g to 1.2 g of dry ice lived between two sec. at 1.0 g of dry ice, all the way to 85,500 sec. (23 hrs. 45 min.) at 0.5 g of dry ice.3. At 0.5 g and 0.7 g of dry ice, fleas# average lifespan was between an average of 42,324 sec. at 0.5 g of dry ice, and 33,648 sec. at 0.7 g of dry ice.4. When fleas were exposed to higher levels of CO2, 1.0 g to 1.2 g, their lifespan reduced to 26 sec. and less.  The average lifespan at 1.0 g was 8.6 sec. An increase to 1.2 g averaged 9.2 sec.

**Conclusions/Discussion**
The targeted flea reaction, cessation of life, was under 10 sec, achieved consistently at 1.0 g of dry ice (approx. 539,246 ppm)and above.

**Summary Statement**

The targeted flea reaction, cessation of life, occurred in under 10 seconds, using 1.0 g of dry ice in a 850 ml container.

**Help Received**

My mother helped proofread my report.  My dad helped catch fleas.

| Name(s) | Project Number |
|---|---|
| **Danielle A. Valenzuela** | **J2219** |

| Project Title |
|---|
| **The Effect of the Color of Flowers on Ladybug Behavior** |

**Abstract**

**Objectives/Goals**
The goal of my experiment is to help gardeners find a specific flower color that will attract more ladybugs. By having this information gardeners will know how to fight off garden bad guys such as aphids that may be harming their plants. By attracting ladybugs into gardens, gardeners are helping to keep themselves, others, and the environment safe. Instead of choosing deadly toxins and pesticides that are usually used on plants, ladybugs are a much safer way to control pests.

**Methods/Materials**
For my experiment I tested three different colored flowers; red, lavender, and white Cosmos, a specific type of flower that is commonly known to attract ladybugs. The experiment lasted for 5 days and consisted of watering each flower a ½ cup of water everyday and counting the number of ladybugs that had congregated, or settled, on each flower each day.

**Results**
My results showed that the most ladybugs had congregated to the white flower. Therefore the white flower was most attractive which means that lighter colored flowers would be a better choice in order to protect your garden. With this knowledge, gardeners could now be encouraged to choose lighter colored flowers to make their garden look beautiful instead of having to use toxic pesticides. My results supported my hypothesis that #If the color of flower is lighter, then the ladybug will be most attracted to it# because of the fact that ladybug#s main food source, aphids, are light colored and ladybug contaminated homes are also light colored.

**Conclusions/Discussion**
The purpose of my experiment is to help gardeners find the best flower color that will attract ladybugs and fight off garden pests such as aphids. The findings of the experiment were that the ladybugs were most attracted to the white flower. My hypothesis was supported by my data that if the color of the flower is lighter, than the ladybug will be most attracted to it. The results showed that lighter colored flower would be a better choice in order for gardeners to protect their flowers. A possible explanation for the ladybugs# attraction to the lighter colored flower would be because the Ladybug#s main food source, aphids, are light colored. This may also contribute to ladybug contaminated homes being light colored. A good way to improve the experiment would be to test if pesticides contain a chemical which may be the reason why ladybugs are so luring to them.

| Summary Statement |
|---|
| My project is about helping gardeners find a specific flower color that will attract more ladybugs, which is a much safer way to control garden pests rather than choosing deadly toxins and pestices that are usually used on plants. |

| Help Received |
|---|
| |

| Name(s) | Project Number |
|---|---|
| Esmeralda J. Velasquez | **J2220** |

**Project Title**

## What Is the Effect of Physa acuta Breeding Populations on Embryo Count and Maturation?

**Abstract**

**Objectives/Goals**
My objective for this project was to see if the difference in breeding populations would affect the Physa acuta snail reproduction and the development of the eggs laid. I hypothesized that the embryo count would be insignificant between the inbred and outbred populations. For the egg maturation, I hypothesized that the outbred population would be in advantage; I thought they would have the healthiest eggs in terms of days to hatch and complete development.

**Methods/Materials**
The inbred or outbred snails were only in the same bowl for a controlled mating period provided after isolation. The eggs that they laid were counted and weighed, and further observed for maturation. Egg development data was the weight taken in milligrams; a special scale was used.

**Results**
Standard deviation was calculated by percent difference in weight gain or loss. SD of Set 1 eggs of initial weight (in grams) for outbred was 0.0435, the inbred SD was 0.0384 (averages= 0.1095 g outbred, 0.08918 g inbred). Egg capsules laid after breeding resulted in 14 for outbred and 16 for inbred. Weight change SD was 0.057 for outbred and 0.075 for inbred (averages= 0.16% outbred, -2.57% inbred). Hatchling results showed that both populations had the same average of 54 hatchlings (SD= 24.65 inbred, 21.44 outbred). Days to hatch for both populations also resulted the same with an average of 14 days to hatch. Set 2 trials are currently in progress.

**Conclusions/Discussion**
My hypothesis for embryo count and days for hatching was proven correct because results showed an insignificant difference. Capsule weight however, did show a significant difference; the outbred egg capsules gained weight, while the inbred egg capsules lost weight. Research is fairly certain that mate choice is not affected by partner novelty but that sperm donation (quantity) may be affected (Koene, 2008). If we know that there are triggers that enable sperm differentiation, then we must accept that there could also be a mechanism for albumen differentiation in the female role of this hermaphroditic organism.

**Summary Statement**

Physa acuta breeding population affects embryo count and maturation.

**Help Received**

| Name(s)                 | Project Number |
|-------------------------|----------------|
| **Daniel I. Vitenson**  | **J2221**      |

**Project Title**

**Influence of Tides on Behavior of Light-Footed Clapper Rails**

**Abstract**

**Objectives/Goals**
The Light-footed Clapper Rail is an endangered bird that inhabits Western coastal marshes. Light-footed Clapper Rails are shy animals and difficult to monitor for behavior and population counts. The goal of this project was to find out if tidal movement might affect Clapper Rail behavior as much as time of day. In my review of literature, I had read that Clapper Rails are crepuscular, and only a few articles suggested that Clapper Rail behavior is based on the tide. My hypothesis was that Clapper Rail behavior will be based on the tide. As the tide goes down, more food will be exposed for Clapper Rails, and Clapper Rails will forage throughout the marsh for food. At high tide, Clapper Rails might be #flushed out# and exposed due to the flooding.

**Methods/Materials**
The materials used in this project included a laser range finder (measuring to the nearest meter), an anemometer, binoculars, a notepad, a tide chart, and a digital hygrometer-thermometer clock. The procedures followed in this project were: I gathered my materials at the location, I logged the climate conditions, tide, time, location, and weather, and finally, I searched for Clapper Rails and documented other bird species.

**Results**
I visited three different saltwater marshes and lagoons a total of 23 times; I spotted a Light-footed Clapper Rail on approximately twenty five percent of my visits. My three project sites were the Tijuana Estuary, the San Elijo Lagoon, and the Buena Vista Lagoon. My results suggested that tides have an impact on Clapper Rail behavior because eighty three percent of the times I spotted Clapper Rails were at low tide and within a few hours of midday. I also spotted a Clapper Rail once during high tide.

**Conclusions/Discussion**
My conclusion was that Light-Footed Clapper Rails may be more active during low tide because they were spotted foraging during a low tide. The time did not seem to matter because all the times Clapper Rails were spotted were near or during mid day. I plan to continue to visit the marshes and observe the Light-Footed Clapper Rail at various times of day and tides to confirm my findings. The results of this project can be applied when taking a census of Clapper Rails because this project states that low tide may be a time when Clapper Rails are more active.

**Summary Statement**

I observed the endangered Light-footed Clapper Rail in its native environment to investigate the effects of tidal movements on behavior.

**Help Received**

Parents provided transportation to and from the project sites.

**Name(s)**

Katie E. Weaver

**Project Number**

# J2222

**Project Title**

## The Effects of Carbohydrates on Lifespan

### Abstract

**Objectives/Goals**

Dietary restriction has been shown to extend lifespan and reduce age related diseases. However, new research suggests that dietary composition may also effect lifespan. Specifically, one candidate for this phenomenon may be dietary carbohydrate, as insulin and insulin-like growth factor are linked to age-related diseases. Therefore, we tested whether dietary carbohydrate would influence lifespan in Drosophila, an organism with a carbohydrate metabolism similar to ours.

**Methods/Materials**

Oregon R Wild Type Drosophila (Carolina Biological); Yeast Hydrolysate Enzymatic (MP Bio Medicals); Tegosept M- Mold Inhibitor (Carolina Biological); Agar, Reagent Grade (Carolina Biological); Sucrose (Vons); Microscope; Freezer; Humidifier; Heater; Seal-a-Meal vacuum pump and bags; Autoclave.
Procedures:
Commercially avail. Dros. media is not a fully defined material. For the study, the exact amount of carbohydrate had to be known; we therefore made our own media, with defined carbohydrate. Media was prepared, sterilized by autoclave, cooled and dispensed into tubes.
Drosophila:
Sex 480 (day 0 after emerging from pupal case) Drosophila: 240 females, 240 males.
Culture with approx. 12 hours light/dark cycle, at approx. 77 degrees F and 60-70% humidity. Change food every 3 to 4 d. Score for dead daily.

**Results**

For males, the Control Diet group (50% less CHO than std. American diet) had the longest lifespan. This finding supports other studies, which have shown that reduced carbohydrate diets are correlated with a longer lifespan. In Drosophila, a lower carbohydrate intake leads to less insulin (Chico), and doesn#t stimulate the release of FOXO proteins from DNA, which promotes a longer life.

For females, the Medium Carbohydrate Diet (25% less CHO than std. American diet) had the longest average life span. It may be that females of the Oregon R strain need more carbohydrate than the males.

**Conclusions/Discussion**

In conclusion, when extrapolated, it can be estimated that an average human male on the control diet (50% less CHO than std. Am. diet), would live an extra 38 years (total 113). Human females on the medium-carbohydrate diet (25% less CHO than std. Am. diet) would live an extra 128 years (total 209). Our results indicate that a reduced carbohydrate diet extends lifespan in Drosophila, a finding that may be

**Summary Statement**

Testing whether a low-carbohydrate diet will effect lifespan in Drosophila.

**Help Received**

Mother helped with working with fruit flies.

| Name(s) | Project Number |
|---|---|
| **Maddie R. Wood** | **J2223** |

**Project Title**

## The Effect of Water Temperature on Goldfish Respiration

**Abstract**

**Objectives/Goals**
The goal of my project was to see how water temperature affects goldfish respiration. My hypothesis was that when fish are put in warmer water their breathing speeds up and when fish are put in cooler water their breathing slows down.

**Methods/Materials**
My materials were two goldfish bowls, three goldfish, water, a thermometer, a net, ice and a microwave. I put one goldfish in fifty degree water and counted its breaths for one minute. Then I tested the rest of the goldfish the same way. After that I tested the goldfish one at a time in sixty degree water. On my last test I tested the goldfish in seventy degree water. Lastly I made a graph with my data.

**Results**
I found that when fish are put in warmer water their breathing speeds up and when fish are put in cooler water their breathing slows down. The average breaths for 50 degrees is 82, the average for 60 degrees is 90 breaths per minute and the average for 70 degrees is 110 breaths per minute.

**Conclusions/Discussion**
I found that my data supported my hypothesis. It is true that when fish are put in warmer water their breathing speeds up and when fish are put in cooler water their breathing slows down. I think that this research is valuable because it shows what might happen to fish in the ocean when the ocean heats up.

**Summary Statement**

My project shows how goldfish respiration reacts to different temperatures of water.

**Help Received**

My mom ran the timer while I counted the breaths of my fish. She also helped with editing at the end.