# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Nadia S. Ashour

**Project Number**
**J1702**

**Project Title**
**Bubbles, Bubbles, Away!**

**Abstract**

**Objectives/Goals**
My objective was to see if sparkling water makes teeth shrink as much as soda does.

**Methods/Materials**
I used 75 teeth which were collected by dentists to conduct my experiment. I put the teeth in small cups containing either tap water, sparkling water, Coke, Coke Zero, or 7-Up. I measured the teeth with a caliper to see how wide the teeth were, and a dental pick to measure the depth of any holes in the teeth. I measured the teeth every day for 14 days, and I changed the five liquids every other day.

**Results**
After measuring the teeth for 14 days, I found that Coke and Coke Zero had worse effects on teeth than sparkling water did, but sparkling water had worse effects on teeth than 7-Up did.

**Conclusions/Discussion**
My hypothesis that sparkling water will make teeth shrink, but not as much as soda does was partially correct because, as shown in my results, sparkling water does not erode teeth as much as Coke or Coke Zero, but it has worse effects on teeth than 7-Up has on teeth.

**Summary Statement**
The effects of sparkling water on teeth versus the effects of different types of sodas on teeth.

**Help Received**
My mother bought my supplies and got the teeth from dentists. Dentists gave me teeth to use in my experiment.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Austin G. Bathgate

**Project Number**
**J1703**

**Project Title**
## How Does Pain Medication Affect Your Liver?

**Abstract**

**Objectives/Goals**
To determine if and what effects the commonly used pain relievers, acetaminophen, ibuprofen, and aspirin have on beef liver cells.

**Methods/Materials**
Materials: beef liver from the grocery store, acetaminophen, ibuprofen, aspirin, saline (.9% NaCl), test tubes, beakers, pipettes, microscope, microscope slides, slide covers, methylene blue, test tube holder, camera, computer.

Methods:
I mixed each of the medicines with saline, and let it sit for a day to dissolve at room temperature. Then I mixed small pieces of beef liver with the saline to make a cell solution. Next I placed the medicine solution and cells in a test tube and let it sit for ten days. After 10 days I looked at the solution under a microscope at 40X using methylene blue stain. I looked at the damage to the cells. Then I took pictures of the cells.

**Results**
After performing my experiment, I saw that aspirin barely damages the liver cells compared to acetaminophen and ibuprofen. The acetaminophen and ibuprofen damage the cell's membrane with the ibuprofen doing the most damage.

**Conclusions/Discussion**
After completing my experiment, I would not recommend taking acetaminophen or ibuprofen because it damages the liver cells. I would recommend taking aspirin since it does little damage to the cells.

**Summary Statement**
My project is to show the effects of acetaminophen, aspirin, and ibuprofen on the liver.

**Help Received**
Used microscope at Rancho Christian School under supervision of Mrs. Wight

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Monica L. Boedigheimer

**Project Number**
**J1704**

**Project Title**
## The Effects of Caffeine and Pharmacological Agents on Web-Spinning Spiders

**Abstract**

**Objectives/Goals**
This project is designed to test pharmacological agents with different effects on humans, namely caffeine, acetaminophen, and pseudoephedrine, on a spider's ability to spin a proper orb web.

**Methods/Materials**
Each spider was dosed with 100 micrograms of either caffeine, acetaminophen, or pseudoephedrine. The drugs were dissolved in water and dripped it on the spiders in the proper concentrations. Depending on how much of an effect that amount had, either a higher dose of more than 600 micrograms or a lower dose of 50 micrograms was administered. Webs were photographed and compared to each spider's drug-free control web.

**Results**
Low Caffeine-no effect
High Caffeine-missing spirals and only 3 main spokes, started a second web at this dosage that was just as chaotic as first, evacuated home
Low Acetaminophen-cannot find web or spider
High Acetaminophen-spirals get more spaced out towards middle, there was a finished web that evening, cannot find spider
Low Pseudoephedrine- no effect
High Pseudoephedrine-minimal effect, small crescent shaped areas with no webbing

**Conclusions/Discussion**
I was surprised with the results. Caffeine was the most predictable. I suspect that the reason the acetaminophen spiders could not be found was because of an artifact, considering it rained later that day. However, it might have been that they were getting a higher effective dose than realized because it absorbed more through their exoskeletons, causing them to flee from discomfort. Also, I thought pseudoephedrine would have more of an effect because of how heavily it was guarded at the drug store, its amphetamine-like chemical structure, and the rates of abuse with it.

**Summary Statement**
I tested how caffeine, acetaminophen, and pseudophedrine affected a spider's ability to spin a proper orb web.

**Help Received**
Neighbor provided spiders. Parents are scientists and offered feedback.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Toni D. Bronars

**Project Number**
**J1705**

**Project Title**
## The Effects of Salt on Drosophila: Does a Tasty Diet Take Its Toll?

**Abstract**

**Objectives/Goals**
The objective of this project is to learn if tasty levels of salt harm the health of mature Drosophila melanogaster. This was tested through cold stress and lifespan tests.

**Methods/Materials**
300 wingless Drosophila melanogaster (aged 2-11 days old) were placed on three diets, high salt (containing 3 additional grams of salt per 200 ml of food), medium salt (containing 1.5 grams of additional salt per 200 ml of food) and low salt (containing negligible amounts of salt from the bananas in the food). These salt levels are ones larval fruit flies find appetizing. These flies were left on their specified diets for their entire lives and the number of surviving flies in each group was counted and recorded each day. Three stress tests were conducted with around 300 Drosophila melanogaster per trial. The flies were placed on the specific diets for five days and then brought to 2°C for 12 hours. The flies were removed from the cold and after 30 minutes, and the number of mobile flies was recorded. In total, 325 flies in the high salt group, 322 flies in the medium salt group, and 315 flies in the low salt group were stressed.

**Results**
The average lifespan of flies after being placed on a high salt diet was 12 days. For the flies on the medium and low salt diets, the average lifespan was 18 days on the diets. The flies used in the longevity test were separated into males and females. By day 21 on the diets, only 2% of the high salt males still remained whereas 47% of the medium salt males remained and 59% of the high salt males remained. 24% of the high salt, 26% of the medium salt, and 37% of the low salt females were still alive by day 21. The stress tests showed that 39% of the high salt flies, 50% of the medium salt flies, and 59% of the low salt flies were mobile.

**Conclusions/Discussion**
This study finds that the lifespan of fruit flies is substantially reduced by a high, but tasty, salt diet. The overall negative effect of salt is almost entirely due to the negative effects of salt on males: females on all three diets had similar survival rates. The effect of a medium salt diet was similar to the effects of a low salt diet for both sexes. The stress tests led to similar conclusions. After stress, medium and low salt mobility was similar while high salt mobility was much lower. This result can be used to infer the effects of a high, but still tasty, salt diet on human beings.

**Summary Statement**
Adult Drosophila melanogaster have a substantially shorter lifespan and poorer responses to stress when on a high, but still tasty, salt diet.

**Help Received**
Erilynn Russo gave me research advice and information on Drosophila. My mom bought my supplies. My dad, mom, and uncle edited and commented on my work. Ms. Rosichan stayed after school and during lunch so I could work under the fume hood.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Kyra L. Estrada

**Project Number**
**J1706**

**Project Title**
## Used for Tools and Death for Fools

**Abstract**

**Objectives/Goals**
The objective was to determine whether crickets exposed to lead contaminated water would develop more aggressive behavior and exhale a lower level of carbon dioxide. My hypothesis was that the crickets exposed to the lead contaminated water will develop aggressive behavior and lower levels of carbon dioxide than the crickets with tap water because of the biochemical reaction that occurs within living creatures. Lead will act as other minerals that the body needs such as calcium and zinc resulting in illness.

**Methods/Materials**
Place Christmas lights, known for containing lead, in a pitcher with water and soak for 48 hours. Put 5 crickets into 6 different containers. Cut 6 egg cartons into small pieces to fit in cage. Place 1 piece of egg carton into each of the containers to provide more surface area for the crickets. Puree carrots to a very fine consistency. After, add ½ a cup of tap water to half of the carrots and ½ a cup of water diluted with lead to the other half of carrots. Place 2 table spoons of the carrots into each of the food containers and place into the cages with crickets. Put the remaining food into storage containers and refill food as necessary. Make observations for the next four days. Finally measure the carbon dioxide each cricket exhales by using the carbon dioxide meter.

**Results**
With the data collected, I noticed the crickets that had lead contaminated water had lower exhaled carbon dioxide levels then the crickets that did not have lead contaminated water. On average the crickets with lead exhaled carbon dioxide levels of 350.5 ppm, 173.75 ppm, and 459.8 ppm. The crickets without lead contaminated water exhaled on average carbon dioxide levels of 520.25 ppm, 622.6 ppm, and 650 ppm.

**Conclusions/Discussion**
My hypothesis that the crickets exposed to the lead contaminated water will develop more aggressive behavior and produce lower levels of carbon dioxide than the crickets without lead contaminated water was supported. My hypothesis is correct because the crickets that had lead got into more fights and were much more active. The crickets without lead were not as active and very passive. There are millions of children all over the world that have lead poisoning. Everyone is at risk of getting lead poisoning since we all come in contact with lead almost every day. If we all become more educated on lead poisoning and learn how to prevent it many people#s lives can be improved and saved.

**Summary Statement**
In my project Used for Tools and Death for Fools I tested how a gryllus assimilis behavior changes and how much carbon dioxide a gryllus assimilis would exhale when exposed to lead.

**Help Received**
Mrs. Diaz helped with my Research Report and Annotated Bibliography; Ms. Fisher let me borrow her carbon dioxide meter and let me conduct part of my experiment in her classroom; Mrs. Mills let me borrow her magic bullet; my grandfather let me use his old Christmas lights; my sister took pictures

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**

Anastasia M. Every

**Project Number**

**J1707**

**Project Title**

## Monitoring of Glucose Levels to Prevent Equine Laminitis

**Abstract**

**Objectives/Goals**

To help prevent Laminitis cases and raise awareness to Equine owners, by testing Equine's glucose levels. Laminitis is a deadly disease affecting Equine due to high amounts of consumed sugar. By testing Equine glucose levels before and after popular treats are fed, I am trying to see if treats that most people would feed on a regular basis has enough sugar content to affect the Equine's glucose levels.

**Methods/Materials**

Blood samples from four Equine of different agaes, carrots, apples, Altiods, Carrot and Spice store brand Equine treats, glucose testing meter, and small needles were used during my project. I gathered the four Equines and took some blood samples by pricking each of their shoulders with one small needle. I then collected the blood on a glucose testing meter strip. After the glucose amount in each Equine's blood was recored, I fed them each one type of treat. Then, after twenty minutes, I gathered more blood samples to see if there was any change in the glucose amounts in each Equine's blood. Each day,I repeated until all popular treats were used.

**Results**

Glucose levels were collected from all four of the Equine. Results before and after each treat was giving were recorded as well.

**Conclusions/Discussion**

I was able to find the change in Equine glucose levels before and after certain amounts of sugar were consumed. However, my hypothesis that Altoids would raise the glucose levels the most in Equine was rejected. Most of the Equine's glucose levels were lowered even when sugar was added to their systems. I believe this is due to the fact that we tested their glucose levels after thier insulin had time to react to the large sugar amounts. If I was to redo or add on to this project, I would take the blood samples at earlier and later times such as ten minutes and thirthy minutes.

**Summary Statement**

This project is used to raise awareness about Equine Laminitis by testing glucose levels to see if regularly fed treats have any affect on Equine glucose levels..

**Help Received**

Mother assisted in handleing of all Equine, photo documentation, and layout of project board.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Nathan R. Fennacy

**Project Number**
**J1708**

**Project Title**
# The Ants Go Marching Along. Can a Natural Substance Be Used to Repel Ants?

**Abstract**

**Objectives/Goals**
The objective of this experiment is to determine if everyday natural substances -- in particular cinnamon, talc powder or vinegar -- can create a barrier that would repel ants and act as a deterrent to keep those pesky ants away from a food source that otherwise they would pursue.

**Methods/Materials**
In a clear box, a small bowl of honey was placed as bait. The bowl sat on a square plate slightly bigger than the circumference of the bowl. The plate was filled with one of the three natural substances being tested. Ants were introduced into the enclosed environment on the opposite end of the bowl. The ants were observed and every 15 minute, for one hour total, the amount of ants that had crossed the barrier and were in the honey was counted. The substances tested were cinnamon, talc powder and vinegar. There were four trials conducted with each substance.

**Results**
Cinnamon worked best to keep ants from going to the honey. Only one ant in one of the four trials crossed the cinnamon barrier and went to the honey; in the other three trials, there were no ants that crossed over the cinnamon. Talc worked second best, with at most, only two ants having crossed the barrier of talc powder. Vinegar did not work as a barrier to repel ants. In one trial, 12 ants were in the honey and had easily marched over the vinegar barrier. The results did determine that there are natural substances that can be used to repel ants.

**Conclusions/Discussion**
This project concludes that a natural substance can be used to keep ants out of unwanted places. I had hypothesized this would be the case, but I thought vinegar would be the repellant to do it. I learned vinegar did not work, but cinnamon and talc did. This is very important. Natural repellents would be useful because they aren't harmful to the ecosystem and the environment. Most people turn to poisons to get rid of ants or keep them out of unwanted spaces. There needs to be something environmentally friendly that people could use that would not harm the environment. Since cinnamon worked best, the next step would be to study ways it could be distributed as a repellant (perhaps mixed with wood chips or as an ingredient in a spray) where it is easy to apply and cost efficient.

**Summary Statement**
My project is about finding a way to create a barrier made out of a natural, eco-friendly substance that ants will find unappealing and will not cross.

**Help Received**
Dad helped gather the live ants and get them into the box. Neighbor helped find rubber ants to glue to the display board. Brother helped with the graphics program to make the graph. Mother helped edit my writing. My advisor helped me stay on track and was encouraging.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Lily N. Greenberg Call

**Project Number**
**J1709**

**Project Title**
## Leave Me the Birds and the Bees Please!

**Abstract**

**Objectives/Goals**
My objective was to learn if the pesticide imidacloprid affects a bee's appetite in that it makes the bee partial to foods higher in sugar content than their natural foods.

**Methods/Materials**
Materials:
Plastic Vials, 1 tablespoon of pollen, Pollen Holder ( the lid of a Mason jar), Nectar (1/2 cup) and nectar jar, Tripod (for holding the pollen holder), Pipette (P20) with tips, Pure sucrose , 7 uL of pure sucrose, 7 uL of sucrose with 2.16 ng of imidacloprid per bee, Incubator, Sterling silver harnesses, Sterling silver tweezers, Duct tape, Harness stands, Different concentrations of sucrose in water; 0.1%, 0.3%, 1%, 3%, 10%, 30%, and 50%. Distilled water (to give to bees in between testing), Testers paint,
Paint brush, and Honeybees (Apis mellifera)
Methods:
The test bees were each fed 7 uL of sucrose, or 7 uL of imidacloprid-laced sucrose. After digesting the food given, the bees were put into a sterling silver harness, placed in an incubator, and were then tested for a positive response towards different concentrations of sucrose. The positive response was the raising of their proboscis (PER, proboscis extension reflex), the feeding tube of a bee.

**Results**
Results: Sixty-six bees were tested in total. Thirty-four bees were fed sucrose, the control, and thirty-two bees were fed imidacloprid-laced sucrose, the pesticide. Most of the sucrose bees responded at 11.36% sucrose, while the average response for the imidacloprid bees was 25.85% sucrose. Sucrose bees responded to the highest concentration of sucrose 74% of the time. Imidacloprid bees responded 34% of the time. The majority of the sucrose bees responded earlier than the imidacloprid bees, which follows my hypothesis.

**Conclusions/Discussion**
Conclusion: My hypothesis was that imidacloprid affects a forager bees appetite, therefore making it crave foods high in sugar. My results followed my hypothesis because the imidacloprid bees tested only responded to high concentrations of sucrose. This agrees with prior research.

**Summary Statement**
My project about how the pesticide imidacloprid will negatively effect a bee's health if the bee is exposed to it.

**Help Received**
My dad helped me use a paper cutter for my board; Daren Eiri, a graduate student at UCSD, helped me learn how to work with bees and related equipment.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Shivani Gupta

**Project Number**
**J1710**

**Project Title**
## Used Motor Oil and Plants

**Abstract**

**Objectives/Goals**
The objective was to determine the effect of used motor oil on bean plants by measuring plant height. The prediction was that the plants placed in the contaminated soil would be adversely affected.

**Methods/Materials**
Seeds of contender bush bean plants were sowed in pots filled with soil. Three different amounts (1%, 2% and 6% of soil volume) of used motor oil were poured on top of soil. The control was the plant cultivated in clean soil. Five replicates were created for each level of soil contamination. All plants were given same amount of water and sunlight. Plant height was measured for 15 days after sowing and average heights were compared.

**Results**
Seeds started germinating on the seventh day. Until the eighth day, the average height of the control was greater than the remaining groups of plants. After this, the plants cultivated in 1% oil contaminated soil grew better than the control. The plants placed in 6% oil contaminated soil remained shortest in height during the whole experiment.

**Conclusions/Discussion**
The prediction was partly correct. At low contamination levels, the bean plants grew better than the control while at highest level (6%), the plant growth was adversely affected. Bean plants can remove toxic chemicals in the oil from the soil under low contamination conditions through a process called phytoremediation. Phytoremediation is a viable and natural alternative for soil remediation.

**Summary Statement**
The effect of used motor oil on growth of bean plants.

**Help Received**
My father helped me handle the used motor oil.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Jenna R. Heinrichs

**Project Number**
**J1711**

**Project Title**
## How Do Various Drinks Affect Blood Pressures with Exercise?

**Abstract**

**Objectives/Goals**
The objective is to determine how three different types of drinks, along with exercise, affect blood pressure.

**Methods/Materials**
Materials
Drinks- Coca Cola, Water, Gatorade
sphygmomanometer (blood pressure machine)
treadmill
stop watch

Method-
Each test subject will take a resting pulse, and blood pressure. They will then jog on a treadmill for four minutes. When finished, they will retake pulse and blood pressure.
I will then measure 12 oz of a liquid for each test subject. They will drink the liquid and rest for 30 minutes.
After 30 min. Test subject will once again, test resting pulse and blood pressure, get back on treadmill for 4 min, and immediately retake pulse and blood pressure.
retake pulse and blood pressure at 5 minute intervals until it had returned to original resting rate.

Repeat process for each person in the study, for the control, and each liquid.

**Results**
Coke made the blood pressure of each test subject spike after the second running test.
Gatorade lowered the rise of the blood pressures of each test subject after the second jogging test.
Water the lowered the rise of the blood pressures average after the second jogging test, but not as much as the Gatorade did.

**Conclusions/Discussion**
If a person has hypertension, they should drink Gatorade during and before exercise.
This will help keep their blood pressure under control.
They should stay away from Coca Cola because it causes your blood pressure to spike.

**Summary Statement**
The pupose of my project is to determine how different types of beverages affect people's blood pressures when they exercise.

**Help Received**
Teacher taught scientific method. Local doctor helped observe, and provided blood pressure machine.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Elizzabeth A. Hughes-Brown

**Project Number**
**J1712**

**Project Title**
## A Monster Problem? The Effect of Caffeinated Drinks on Heart Rate

**Abstract**

**Objectives/Goals**

The objectives are to determine 1) if caffeinated drinks, specifically soda and energy drinks, affect heart rate; and 2) if hidden ingredients in energy drinks compound their affect on heart rate.

**Methods/Materials**

Daphnia magna were used as a control system to study changes in heart rate following consumption of caffeinated drinks. In my initial experiment, the caffeine content of three sodas (Dr. Pepper, Coke, and Pepsi) and three energy drinks (Monster, Red Bull, and Rockstar) was determined. Three diluted energy drink solutions were prepared to have a caffeine concentration similar to that of soda. Water was obtained for use as a control. Five sample vials were prepared for each drink solution.

I determined the baseline heart rate of Daphnia by observing it under a microscope, counting its heart beats in 6 seconds, and determining beats per minute. One drop of drink solution was placed on the slide with the Daphnia. I waited 30 seconds to allow the caffeinated drink to be absorbed by the Daphnia. Final heart rate was determined by another six-second observation.

In the second phase of my experiment, I pre-screened Daphnia by determining heart rate for all Daphnia before beginning the experiment. Only Daphnia with a baseline heartrate of 180-220 beats per minute were used to re-test each of the caffeinated drink solutions.

**Results**

In my initial experiment, I found that caffeine does affect the heart rate of Daphnia. All caffeinated drinks produced an increase in both mean and median heart rate. The largest effect was seen produced by the high-caffeine energy drinks.

When the caffeinated drinks were diluted so that caffeine concentration was similar to that of soda, there was no significant difference in the effect on heart rate between the two groups.

**Conclusions/Discussion**

Based on the data, I concluded that energy drinks do affect heart rate. However, the difference in heart rate between the soda and dilute energy drinks was too small to conclude that hidden ingredients in energy drinks have a definite compounding effect. The most likely reason for the inconclusive data was variation in the baseline heart rate of the Daphnia. For this reason, I designed a second phase of the experiment to retest each drink using pre-screened Daphnia.

**Summary Statement**

I studied the effects of caffeinated drinks, specifically soda and energy drinks, on heart rate using Daphnia magna as a model system.

**Help Received**

My science teacher helped obtain Daphnia, edit paper, and prepare backboard. My mother purchased supplies for the backboard.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Scott Johnson

**Project Number**
**J1713**

**Project Title**
## Drunken Ants

**Abstract**

**Objectives/Goals**
My objective is to see how far apart a drunken ant's trail will move in width (in millimeters) as opposed to a
sober ant's trail.

**Methods/Materials**
At 3:30 each day, I will put out a cap full of sugar water in the center of an ant trail. Within the time period of one hour, the ants will be swarming around the cap, drinking the sugar water. After this has happened, I will put a drop or two of a certain type alcohol (depending on the trial) into the cap. The ants will not notice and will drink some of the alcohol, thereby causing them to become drunk.
I will be using the following types of alcohol:
5% alcohol, beer
13% alcohol, wine
40% alcohol,

**Results**
The 13% alcohol (wine) appeared to have the greatest effect, spreading the trail 130mm apart as opposed to only
20mm (this is the control width)
The beer caused the trail to move 120mm apart, while the rum only spread the trail 60mm apart.

**Conclusions/Discussion**
The Hypothesis was not supported.

I believe that the wine had the greatest effect as it was not too strong (where the ants could possibly sense the alcohol) nor too light (where there simply was not enough alcohol content to deliver a strong change). The project could have been better. The test was done only with Argentinean ants in one location (my front/backyard). Also, the sugar content in the alcohol could have been a cause for ants to visit the cap and drink more than usual. I was also pressed for time, as each trial took one day.

**Summary Statement**
Ants will become drunk by use of a complex strategy, and the results will explain what amount of alcohol content/type can widen an ant's trail the most in millimeters.

**Help Received**
Father bought alcohol, helped take pictures and help with printing the board. My science teacher specified that the ants would not be able to notice the alcohol.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Margaux E. Jones

**Project Number**
**J1714**

**Project Title**
# The Effect of Natural Household Substances on Deterring Tetramorium caespitum

**Abstract**

**Objectives/Goals**
The objective of this experiment was to find a safe, natural substance that would successfully repel pavement ants. Because many people are burdened by these pests, an eco-friendly alternative to harsh pesticides is in great need.

**Methods/Materials**
Two identical dishes containing 0.2 ml of pure honey were placed outdoors, 2 m from a natural ant colony. Baby powder, mint, coffee grounds, lemon, and vinegar were all tested as repellants. The repellants were spread evenly around the honey. The honey consumed by the ants was recorded by weighing the dish before and after testing. Both dishes, containing the same repellant, were left out at the same time for 24 hours.

**Results**
It was discovered that baby powder and coffee grounds both effectively repelled ants, having no honey consumed. Mint had an average of 0.45 grams of honey consumed, lemon had 0.85, and vinegar had 1.1 grams consumed. Without repellant, the ants consumed an average of 0.65 grams in a 24 hour period.

**Conclusions/Discussion**
Baby powder and coffee grounds worked best because of their large particles that get stuck to the ants, preventing proper breathing. The main ingredient in baby powder is talc, which can be hazardous to ants. Lemon and vinegar seem to have averages higher than the control because some of the liquid evaporated. Mint was blown away in places by wind, making it less effective.
To improve my experiment, I would test for a longer period of time during warmer weather to get a more precise average. The information gained from these tests could be used to create a greener planet.

**Summary Statement**
This project is about pavement ants and finding eco-friendly substances that naturally repel them without harsh pesticides.

**Help Received**
Mother checked report grammar; Father showed how to use metric scale.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Chloe F. Jot

**Project Number**
**J1715**

**Project Title**
## Swimming Sting Free

**Abstract**

**Objectives/Goals**
The objective is to determine whether the presence of white vinegar or sterile human urine prevents Moon Jelly nematocysts from discharging when they come in contact with E. coli.

**Methods/Materials**
Fresh jellyfish tentacle was placed on nine slides. E. coli was added to the first three slides. E. coli and sterile urine were added to the second three slides. E. coli and white vinegar were added to the last three slides. All slides were observed under a compound microscope and the reactions between the reactants were noted.

**Results**
In general, the E. coli and jellyfish slides had a few discharged nematocysts. The E. coli, jellyfish, and urine slides had almost no discharged nematocysts. The E. coli, jellyfish, and vinegar had many discharged nematocysts.

**Conclusions/Discussion**
My conclusion is that sterile human urine is a much better barrier against jellyfish stings than white vinegar.

**Summary Statement**
My project is about whether vinegar or human urine is a better barrier to protect human skin from being stung by jellyfish.

**Help Received**
I received help from Mr. Rod Atchley, Mr. Darrell Steely, and Ms. Jennifer Ostrowski, all science teachers from Pacific Collegiate Charter School, UCSC librarian, Helen Belardi, UCSC Seymore Center volunteer Caitlyn O Brien, my family; Rebecca, Jean-Marc, and Zackary Jot.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Michaela L. Juels

**Project Number**
**J1716**

**Project Title**
## The Effects of Caffeine

**Abstract**

**Objectives/Goals**
This project was conducted to discover the effects of caffeine and determine if caffeine can be beneficial. Is it better to eliminate caffeine altogether from your diet? If caffeine is beneficial should it be taken daily? And how much of it should be taken? I conducted this experiment to find out just that.

**Methods/Materials**
I got three Mus musculus. Everyday for two weeks, I gave one mus musculus, the equivalent of 300 mgs of caffeine to homo sapiens and another the equivalent of 600 mgs of caffeine, and the third I gave no caffeine. The independent variable (the amount of caffeine injected) affected the dependent variable, the mus musculus# behavior. I then recorded behavior such as, how much each slept, activity, mood, sensitivity to light and sounds, and any other unusual things. Then I had the mus musculus# go through a simple maze three times, in which I recorded each of their times.

**Results**
My data and observations showed that the rats with caffeine were increasingly irritable. They were often found trying to get out, ripping their cages, and sometimes even biting. The caffeinated mus musculus# showed a sensitivity to light and sound, when I clapped near them, they shuddered, while the non-caffeinated mus musculus did absolutely nothing. The caffeinated ones had a larger amount of excrement than the non-caffeinated ones. The mus musculus with 300 mgs of caffeine had the best maze times and the mus musculus 600 mgs had the worst times. The low caffeinated mus musculus stayed awake the longest and the high caffeinated mus musculus crashed within an hour, and non-caffeinated mus musculus slept most of the time. The caffeinated ones had hyperactivity. This experiment showed that caffeine can be beneficial only in small doses and occasionally, not daily because if used daily it can cause insomnia and irritability as shown in my experiment.

**Conclusions/Discussion**
If I did this experiment again I would get more mus musculus to make sure my observations weren#t coincidental. I would also inject the mus musculus# with needles instead of putting it in their water, because that way I would know for sure the caffeine was being ingested. This experiment arises further questions. Does caffeine help with digestion? Do caffeinated products pose a risk to amounts of sleep? Can caffeine be dangerous? Can a low dose of caffeine help keep you focused?

**Summary Statement**
Determining whether caffeine is beneficial or harmful through studies with mice.

**Help Received**
Teacher helped measure grams of caffeine

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Talar Kassabian

**Project Number**
**J1717**

**Project Title**
## Fruit Flies on the Radical Track Age Fast and Die Young

**Abstract**

**Objectives/Goals**
The objective of this project is to test whether increased amounts of hydrogen peroxide affects the aging process of fruit flies. I hypothesize that the fruit flies with more H2O2 in their food supply will die faster than those with less or no H2O2 in their food supply.

**Methods/Materials**
Prepare media (sugar, instant mash, yeast, vinegar) and mix with 0%, 0.5%, 1% and 3% H2O2 respectively. Also, prepare a control group by mixing media with water. Put media and 10 flies in containers and count the number of corpses each day.

**Results**
At the end of the experiment flies in groups with more H2O2 died faster than the others. Flies in the 3% H2O2 media lived for an average of 8.63 days, in the 1% H2O2 they lived for an average of 9.46 days, in the 0.5% H2O2 they lived for an average of 14.15 days, and in the control group (0% H2O2) they lived for an average of 17.68 days. Also, the lifespan of the flies in the 3% H2O2 media was reduced by 51.18%, for those in the 1% H2O2 by 46.49%, and for those in the 0.5% H2O2 by 19.96%. As to the standard deviation of each group, the control group had a STDV of 1.79, the 0.5% H2O2 group 0.91, the 1% H2O2 group 1.76, and the 3% H2O2 group 0.65.

**Conclusions/Discussion**
The results of this experiment agree with my hypothesis, wich states that oxygen radicals increase the aging process of fruit flies. However, the lifespan of the flies in my settings turned out to be longer than those stated in other studies. This could be due to the disintegration of H2O2 upon its addition to the media. To overcome this problem I would use another alternative to prepare the media to maintain the desired concentrations of H2O2.

**Summary Statement**
The purpose of my project is to determine the effect of oxygen radicals on the aging process of D. melanogaster.

**Help Received**
Mrs. Lida Gevorkian helped me with my overall project. My mother helped me handle the flies, and my father helped me decorate my poster board.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Andrew Knoell

**Project Number**
**J1718**

**Project Title**
## Wake-up Call: The Effect of Cell Phone Radiation on Drosophila melanogaster (Fruit Flies)

**Abstract**

**Objectives/Goals**
The purpose of my project was to determine if cell phone radiation is harmful to living creatures. I am interested in this project because I just got my first cell phone and through my research I discovered cell phones may cause brain and tissue damage in children and adults. I cannot test exposure of cell phones radiation on humans so I will test exposure on fruit flies (Drosophila melanogaster). By exposing fruit fly larvae to cell phone radiation I believe I can show that the development of a fruit fly will be affected.

**Methods/Materials**
I first multiplied my fruit flies. I then conducted my experiment by exposing winged and wingless fruit flies to cell phone radiation for 2 hours per day, during their developmental stages. I measured the effects of cell phone radiation on the development of my control and radiated fruit flies in a timed climbing test by counting the number of fruit flies that cross a line on a test tube, and by observing any defects of fruit flies under a microscope. Materials included 100 test tubes, drosophila melanogaster- winged and wingless, stereomicroscope, watch, 2 cell phones, anesthetizer kit, clear Petri dish with lid.

**Results**
My data from the climbing test trials showed the number of fruit flies that crossed the line in 30 seconds in each test tube. My results showed the wingless flies averaged 7.8 flies crossing the line, control wingless averaged 4.36, winged flies averaged 8.1 flies, and control winged averaged 6.52. These results showed that the radiated flies performed better in the climbing test than the control flies. Data from my microscope observations showed that the radiated winged flies were 14.81% defective, the radiated wingless were 12.82% defective, while the control winged and wingless flies were less defective, at 8.82% and 2.94%.

**Conclusions/Discussion**
I believed that exposing fruit flies to cell phone radiation could affect their development. The data I collected produced results that I did not expect. In the climbing test, the radiated flies performed better than the control flies. The control winged and wingless flies had average numbers lower than the radiated winged and wingless flies. The climbing data did not support my hypothesis. The microscope observation data only slightly supported my hypothesis. Neither of my tests and observations showed a strong effect of cell phone radiation. Therefore, I concluded my hypothesis was not correct.

**Summary Statement**
This project studied the effect of cell phone radiation on Drosophila melanogaster.

**Help Received**
Thank you to Dr. Theisen for her advice on how to care for fruit flies. Thank you to my mom for helping me obtain the supplies I needed.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Stephanie A. Kolbusz

**Project Number**
**J1719**

**Project Title**
## Bone Density

**Abstract**

**Objectives/Goals**
The objective is to determine animal bone strength and weakness when they are exposed to household liquids, and what role density plays in protecting them. My hypothesis is that the vinegar will weaken the bones the most, and that the pork bones will be the most dense making them resistant to the liquids.

**Methods/Materials**
The pork ribs, turkey bones, and chicken bones were soaked in several household liquids (vinegar, lemon juice, soda, cleaner, and water) over a one month period. The weight of each bone was measured, along with a control set of bones, at 4 day intervals. At the end of one month, the hardness of each bone was tested.

**Results**
The pork bone weight did not increase and the hardness remained the same as the pork control bone. The chicken bones increased in weight and very soft compared to the chicken control bone.

**Conclusions/Discussion**
My hypothesis about the bone density was correct. The pig has the densest one since soaking in liquids did not increase their weight. The chicken bone was the least dense since it increased in weight in most of the liquids. My other hypothesis about the most effective liquid was incorrect, lemon juice weakened the bones the most, not vinegar.

**Summary Statement**
To determine animal bone strength and weakness when they are exposed to household liquids.

**Help Received**
My parents helped me collect and prepare the bones, and showed me how to use the scale. Mrs. Leoncio, my science teacher, explained the proper research techniques and scientific method, and answered my questions.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Katie A. McAllister

**Project Number**
**J1720**

**Project Title**
## Caffeine and the Heart: A Study Using Daphnia magna

**Abstract**

**Objectives/Goals**
To find out it caffeine elevates the heart rate of Daphnia magna.

**Methods/Materials**
1. Erlenmeyer flask
2. Graduated Cylinder
3. NoDoz Caffeine Pills, 200mg
4. Fresh Spring Water
5. Daphnia magna
6. A medium plastic tank
7. Dried algae food for Daphnia magna
8. Dissecting Microscope
9. Small clear containers
10. Small plastic pipettes
11. Timer/Stop watch

Allow the Daphnia to absorb the desired dosage of caffeine and count the number of heart beats in 10 seconds, timing yourself using a stop watch.

**Results**
The average heartrate for my control, 0mg of caffeine to 1 liter of water, was 148.2. The average for 0.01mg/L was 157.3, 0.1mg/L was 156, .5mg/L was 169.35, 1mg/L was 180.9, 10mg/L was 305.25, 50mg/L was 365.82, and 100mg/L was 330. The average being the average number of heartbeats in a minute.

**Conclusions/Discussion**
Looking at my data and research on my experiment I have come to the conclusion that caffeine does in fact affect the heart rate. If you look at the data collected you can see very slight change in the heart beats until you get to about 10 mg/L to 50mg/L. There is an observable increase in the number of heartbeats. As you can observe the heartbeats seem to hit a peak at 50mg/L. At 100mg/L the heartbeats aren#t as fast. I think that is because the Daphnia is starting to die at that point from the amount of caffeine. Any higher amount that was used killed the Daphnia within five minutes. One thing that could have been done differently is to have tested organisms more closely related to humans as well.

**Summary Statement**
My project is about the affect of caffeine has on the heart rate.

**Help Received**
Uncle helped me understand the science behind the experiment; Parents bought my materials.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Charlotte B. Monke

**Project Number**
**J1721**

**Project Title**
## Energy Drinks and Their Effect on Reaction Time in Youth

**Abstract**

**Objectives/Goals**
The objective is to determine if young people react to a light signal faster after drinking an energy drink.

**Methods/Materials**
Twenty-three students, aged 12-14, are placed into either an experimental group or a control group. The experimental group is given 8.6 oz. of Red Bull Energy Drink mixed with red food coloring to avoid subjects from recognizing the normal Red Bull color (which is yellow). The control group is given 8.6 oz. of a placebo mixture of Sprite Zero (sugar-free) soda and concentrated Sugar-Free Raspberry Syrup. The two drink solutions look similar. An application called #Reaction Time# is used to measure reaction time. The application shows a green stop light that turns yellow then red. The person being tested must push a button on the screen with their index finger as soon as the light turns red. The reaction time, in milliseconds, appears. The students take the test three times for average, both before and 45 minutes after ingesting one of the two drink solutions.

**Results**
Students had no change in average reaction time (<0.5%) after drinking the control drink, which contained no sugar and no caffeine. Students had a 19% reduction in reaction time after drinking Red Bull Energy Drink. Average Pre-Drink time was 444 ms and average Post-Energy Drink time was 361 ms. Reaction times of males and females were also analyzed. Males were 16% faster than females before ingestion of any drink. Males and females had a decrease in reaction time by a similar percentage after drinking the energy drink.

**Conclusions/Discussion**
Recent research has warned of some dangers of energy drinks for youth. Some reports say they can cause heart problems or anxiety. In my experiment I found that there can be benefits to having energy drinks. Drinking energy drinks decreased reaction time to a visual signal, probably because of the high amounts of caffeine or some other ingredients found in the energy drink. If a faster reaction time means a faster #eye to muscle connection,# energy drinks could be used to swing at a baseball earlier if a pitch is a strike or determine which way to move earlier for blocking a soccer penalty kick.More tests need to be done to find out what specific ingredient makes kids faster after drinking energy drinks. Although energy drinks get bad publicity, they could have some benefits.

**Summary Statement**
This experiment shows that drinking an energy drink can make young people have a faster reaction time to a visual signal.

**Help Received**
Dr. Brian Tsukimura, Fresno State University Department of Biology, gave me advice about the experiment design. My father helped with making the drink solutions, teaching me to use the board layout software, getting the supplies, and typing. My science teacher, Mrs. Salazar, helped find students

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Tori C. Nishimoto

**Project Number**
**J1722**

**Project Title**
## How Pesticides and Fertilizers Used in Home Gardens Affect the Hatching Rate of African Dwarf Frog Eggs

**Abstract**

**Objectives/Goals**
My objective was to find out how harmful pesticides and fertilizers used in home gardens are on the hatching rate of African Dwarf frog eggs.

**Methods/Materials**
I used 2 different types of fertilizers and pesticides to test. I used water as my control group. I filtered all five solutions 3 times. I filtered each solution by putting each one into a different two inch pipe that was covered by fabric and I put 4 inches of soil in each pipe. I then poured a different solution into each pipe and collected what came out. Then I did the same thing, this time with 8 inches of soil. I also got 400 milliliters of each pollutant and the control group without filtering it. Using 15 silicone ice cube trays, I poured 20 milliliters of one of the 15 substances into all 15 compartments of the ice cube tray. I did this for the other 14 solutions, so there was a different solution in each ice cube tray. I placed these ice cube trays in a water bath set to 80 degrees. After waiting 24 hours, I placed a few frog eggs into every compartment of all of the ice cube trays. I waited another 24 hours and recorded the amount of frog eggs that hatched.

**Results**
The control group unfiltered had a hatching rate of61%. Control 4 inch filtered had a hatching rate of 58.54%. Control 8 inch filtered had a hatching rate of 45.68%. This shows that there was something in the soil that made it harmful. The Bayer Advanced unfiltered, 4 inch filtered, and 8 inch filtered all had a hatching rate of 0%.The Organocide unfiltered had a hatching rate of 1.35%, which shows that it is still very harmful and only one egg was lucky enough to survive. The Organocide 4 and 8 inch filtered had a hatching rate of 0%. The Miracle-Gro unfiltered had a hatching rate of 3.08%. Miracle-Gro 4 inch filtered had a hatching rate of 22.58%. This high hatching rate could have been caused by a human error, and maybe I filtered it wrong. Miracle-Gro 8 inch filtered had a hatching rate of 0%. Alaska Fish Fertilizer unfiltered, 4 inch filtered, and 8 inch filtered had a hatching rate of 0%. These results show that all pesticides and fertilizers can be harmful to our environment.

**Conclusions/Discussion**
All pesticides and fertilizers can be harmful to our environment, so we should try to use as little as possible. Sometimes what is in the soil and collected in the pollutant during runoff can be harmful as well.

**Summary Statement**
I determined how harmful pesticides and fertilizers used in home gardens were on the hatching rate of African Dwarf frog eggs, which shows me how harmful they are in the environment.

**Help Received**
Retired science teacher helped get the frog eggs; Dad helped edit.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Kosha H. Patel

**Project Number**
**J1723**

**Project Title**
## Open the Doors of Death

**Abstract**

**Objectives/Goals**
The goal of the experiment was to determine how radiation emitted from microwave ovens effect mealworms. My hypothesis was that the mealworms that are exposed to greater amounts of radiation from the microwave oven will have the more abnormal growth and development patterns than the mealworms that are exposed to lesser amounts of radiation because the high levels of exposure will cause them to be more affected. If mealworms are affected by radiation from microwave ovens, then humans have a chance of being affected by the leaked radiation, as well.

**Methods/Materials**
In order to conduct the experiment, I placed nine mealworms into Container A, nine mealworms into Container B, and nine mealworms into Container C. Then, I kept Containers A, B, and C in a 75 degree F environment and raised the mealworms in a room with 10 grams of food. I measured the mealworms# initial length and then exposed the mealworms in Container B to radiation from microwave oven for 10 minutes and exposed the mealworms in Container C for 15 minutes by placing the containers 17 inches away from the microwave oven every 1 hour for 6 hours, each day. The mealworms in container A were not exposed to radiation at all. Then, I observed how the length of the mealworms in Container A differed from the length of the mealworms in Containers B and C. I measured the mealworms# length every 3 days for 13 days.

**Results**
The result of the experiment was that exposure to radiation can stunt the growth of mealworms. While mealworms that were not exposed to radiation leaked from microwave oven ended up growing 6 millimeters over a span of 13 days, the mealworms that were given a mild dose of radiation grew 3.4 millimeters and the mealworms that received the highest dose of radiation grew 2.6 millimeters after 13 days. To sum it up, exposure to radiation caused for the growth rate of mealworms to slow down.

**Conclusions/Discussion**
To conclude, the data rejected my hypothesis since I had predicted that the larger the dose of leaked radiation, the faster the growth of the mealworms would be because exposure to radiation is known to mutate cells, so the growth rate would change. Instead, radiation caused the growth rate of the mealworms to slow down. Therefore, exposure to radiation causes the mealworms to grow slower than average.

**Summary Statement**
My project proves that radiation leaked from microwave ovens affects the length of tenebrio molitors (also known as mealworms) by causing their growth rate to slow down.

**Help Received**
Ms. Fisher (Science Teacher) helped to review my project, Mrs. Diaz (Language Arts teacher) helped review my research report, and my parents bought my supplies.

# CALIFORNIA STATE SCIENCE FAIR
# 2011 PROJECT SUMMARY

**Name(s)**
Anin Sayana

**Project Number**
**J1724**

**Project Title**
## Discovery of the 2,4-Diaminopyrimidine as a Novel Therapeutic Solution for c-Fms and TNF Induced Rheumatoid Arthritis

**Abstract**

**Objectives/Goals**
Rheumatoid arthritis has a worldwide estimated prevalence of 2%, according to the Johns Hopkins Arthritis Center. The current methods to treat this disease involve targeting of the pro-inflammatory cytokine Tumor Necrosis Factor (TNF-alpha) and are not entirely effective. Recent research shows that c-Fms plays a major role in joint deterioration associated with rheumatoid arthritis. My project aimed to discover a novel inhibitor of the TNF cytokine and the c-Fms receptor tyrosine kinase. This inhibitor, 2,4-diaminopyrimidine, could potentially lead to an effective treatment for rheumatoid arthritis.

**Methods/Materials**
TNF alpha-expressing Rat2 fibroblast cells were cultured in DMEM+10%FBS+1%Pen-Strep. The fibroblasts were then plated into six well plates for treatment with water (control), Imatinib, and 2,4-diaminopyrimidine. 2,4-Diaminopyrimidine was added at concentrations of 5 uM, 15 uM, and 25 uM, and dilutions were determined based on their molecular weight and calculation from the starting stock, which was 75mM. Imatinib was added at the concentrations of 5 mg/ml, 15 mg/ml, and 25 mg/ml. After a 48 hour incubation, an ELISA assay was conducted to detect TNF levels. TNF alpha concentrations were then measured using a plate reader (spectrophotometer) and converted into pg/ml after plotting the standard curve.

**Results**
2,4-Diaminopyrimidine significantly reduced the concentrations of TNF alpha in a dose dependent manner. In comparison to water, 2,4-diaminopyrimidine at 25 uM reduced TNF alpha levels by 22%, 15 uM reduced TNF alpha levels by 19%, and 5 uM reduced TNF alpha levels by 14%. In comparison to water, Imatinib at 25 mg/ml reduced TNF alpha levels by 10%, 15 mg/ml reduced TNF alpha levels by 9%, and 5 mg/ml reduced TNF alpha levels by 6%.

**Conclusions/Discussion**
This research has discovered for the first time that 2,4-diaminopyrimidine inhibits TNF alpha production, supporting my hypothesis. 2,4-Diaminopyrimidine was discovered after investigating into the structures of various inhibitors and analyzing their classifications. In the tests, higher concentrations of 2,4-diaminopyrimidine led to lower levels of TNF alpha. 2,4-Diaminopyrimidine inhibits TNF alpha by binding to the TNF in the cells, preventing its interaction with TNF alpha receptors on the surface of the cells. This discovery could lead to a possible therapeutic solution for c-Fms and TNF alpha induced rheumatoid arthritis.

**Summary Statement**
In this in vitro study, I investigated and identified 2,4-diaminopyrimidine as a novel inhibitor of Tumor Necrosis Factor Alpha, which could lead to a possible therapeutic solution for c-Fms and TNF induced rheumatoid arthritis.

**Help Received**
Dr. Ronald Birrell for guidance with cell culture; Dr. Christina Swanson (Stanford University) for help with deriving the procedure; Schmahl Science for providing me with lab space; my science teacher and parents for supporting my project.

# CALIFORNIA STATE SCIENCE FAIR
## 2011 PROJECT SUMMARY

**Name(s)**
Jack R. Walsh

**Project Number**
**J1725**

**Project Title**
# How Does Exposure to Estrogen Affect the Aggressive Response of Male Siamese Fighting Fish?

**Abstract**

**Objectives/Goals**
To determine if and how unnaturally high levels of the hormone estrogen would impact the normal instinctive aggressive response of male Siamese Fighting Fish (Betta splendens). Healthy male Siamese fighting fish have a normal, easily recognizable aggressive response when they feel threatened by another male Betta. These are instinctive responses - they are genetically programmed and do not have to be conditioned or learned. Instinctive behaviors like this impact or control the feeding, sexual and social behaviors of all animals. My hypothesis was that short term exposure (1 week) to unnaturally high levels of the hormone estrogen would impact the normal instinctive aggressive response of male Fighting Fish to perceived threats.

**Methods/Materials**
My project exposed normally aggressive male Siamese fighting fish to estrogen to see if exposure to this form of pollution changes their normal aggressive behavior. I dissolved a single estrogen birth control pill and added this estrogen solution to the water in each of the 1 liter containers of the two fish selected to be "dosed." I also had two "non-dosed" control fish that were kept under identical conditions as the dosed fish, minus the estrogen. After one week of exposure to the estrogen in their water I tested the dosed fish for the normal aggressive responses they displayed prior to estrogen exposure and recorded results. I also conducted a second trial of this experiment using four new fish to confirm my results.

**Results**
My hypothesis that short term exposure to increased estrogen levels would have an impact on the normal instinctive aggressive response of male Siamese Fighting Fish was proven by the data collected in the experiments conducted. In both trials of my experiment, after just one week exposure to unnaturally high levels of estrogen in their water, the aggressive response of male Siamese Fighting Fish to stimuli were considerably altered.

**Conclusions/Discussion**
This experiment provides concrete evidence that estrogen contamination and pollution has the potential to seriously impact genetically programmed instinctive responses in creatures that are exposed to it and raises a number of other questions and opportunities for other scientists to look deeper at these issues.

**Summary Statement**
My project exposed male Siamese Fighting Fish to unnaturally high levels of estrogen to determine if this type of pollution would alter their normal genetically programmed instinctive aggressive response.

**Help Received**
My parents drove me around to purchase the fish and materials needed for the experiment and helped with the typing of the report and construction of the display boards.