



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Jason M. Bell	Project Number S1901
Project Title Digestion of GFP (Green Florescence Protein) in Caenorhabditis elegans	
Abstract Objectives/Goals The main objective of this experiment was to further an understanding in protien digestion. Where does GFP get digested within the digestive tract of the C. elegans? I hypothesized that the GFP would be broken down and reassembled within the cells causing them to illuminate, as well as be digested and become invisible in the lower digestive tract. Methods/Materials In this experiment, I used ever renewed plates of E. Coli. The worms that I used as my model organisms were two strains of C. Elegans: N2 Wildtype and JJ48 mutant strain. Results GFP ingested by C.elegans is digested in the upper digestive tract and portions do illuminate cells of the worm itself. Conclusions/Discussion Digestion of protiens as far as this expirement is concerned occurs in the upper digestive tract. Not all protiens ingested are utilized some are still passed through the system.	
Summary Statement This project is intended to further the understanding of the digestion of proteins.	
Help Received Performed at Center High School, Worms donated by the UC Davis nematode lab, Center for Biophotonics Science and Technology Research Associate, Experiment overseen by Michael Wright.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Danielle R. Detering	Project Number S1902
Project Title Temperature, Trout	
Abstract Objectives/Goals In this on going project, I am looking for the optimum temperature for salmonid growth in the San Lorenzo River. Data from 2005 showed a positive correlation between salmonids# median size and the water temperature of the river. I hypothesize that there will again be a positive correlation between salmonid growth patterns and water temperature. Methods/Materials Don Alley, a fisheries biologist who is my mentor, and myself deployed HOBOS at seven locations along the main stem of the San Lorenzo River and Zayante Creek in mid-August 2006. HOBO temperature probes were programmed (set to collect data every thirty minutes), secured and submerged underwater at each site. They were retrieved in early October 2006, and their data was transferred to a computer using BoxCar Pro 4.3. The median temperatures at each location will be compared to the median salmonid size as provided by Don Alley. Results My data shows there is a weak correlation between median water temperature and median salmonid length. However, a previous year shows a strong correlation between median water temperature and median salmonid length. Now the question is: why are they so different? Conclusions/Discussion This difference of yearly results may be caused by the weather. The previous year was more humid, and this provided more food in comparison to this year, which was much drier.	
Summary Statement In this on going project, I am looking for the optimum temperature for salmonid growth in the San Lorenzo River.	
Help Received Don Alley, a fisheries biologist who is my mentor. mom, and sister helped with project layout. sister took pictures.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Esther Flores; Andrew Sanchez	Project Number S1903
Project Title How Does the Amount of Acanthocephalan Parasites Affect the Swimming and Burrowing Times of the Pacific Mole Crab?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective was to learn if the amount of acanthocephalan parasites affects the swimming and burrowing times of the Emerita analoga.</p> <p>Methods/Materials Each sand crab was tested for three swimming and burrowing times. Andrew would release the sand crab when one fourth of the body was in water, simultaneously starting his watch. When the swimming was over and the burrowing began Andrew would stop his watch and Esther would begin the burrowing time until the sand crab was completely under the sand. The sand crab would then be cut from the telson to the primary antennae. With the scalpel we would search the insides for parasites the number of parasites would then be recorded.</p> <p>Results Our linear regression line shows as the number of acanthocephalan (thorny head worm) parasites in Emerita analoga increased, the burrowing time also increased by .87 of a second. Our linear regression line also shows as the number of acanthocephalan (thorny head worm) parasites in Emerita analoga increased, the swimming time increased by .0055 of a second.</p> <p>Conclusions/Discussion Our results supported our hypothesis that pertains to the increase in burrowing times with increasing amounts of parasites in the crab. If the Emerita analoga takes longer to burrow into the sand, the crab will be more at risk of being dislodged by swash velocities and swept away into the open ocean-where the crab becomes easy prey. If a sea otter eats an infected sand crab it will die of peritonitis. If there is a major die off of sea otters- a keystone species- because of acanthocephalan peritonitis, like there was for Surf Scooters-a type of bird-, there could be drastic changes in bio diversity in kelp forest. A decrease in population of sea otters will cause a rise in population of sea urchins. More kelp forest would be eaten with an increase of sea urchins, upsetting the balance of the kelp forest.</p>	
Summary Statement Because of the negative effect of the acanthocephalan parasite on its definitive and dead end hosts, we sought to recognize whether the number of parasites would affect the swimming and burrowing times of Emerita analoga (pacific mole crab)	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Shelby A. Graham	Project Number S1904
Project Title How Does Feed Affect the Size and Weight of Chicken (Gallus domesticus) Eggs?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project is measuring the growth of eggs while changing the feed. I want to see if feeding my chickens different foods will increase or decrease the size of the eggs they produce. I have fed my chickens different feed at one week intervals. The first week I fed them scratch which is basically corn. The second week I fed them crumble, which is processed alfalfa. The third week I fed them table scraps. I gave them three days before each week so that they can adjust to the food before I measured the eggs. I weighed the eggs and measured their length and width. My Hypothesis is that the crumble will produce larger eggs because it is rich in protein.</p> <p>Methods/Materials My materials are: Four laying chickens, One kitchen scale for weighing eggs, Crumble feed, Scratch (corn feed), Table scraps, Cloth tape measure for measuring circumference of eggs, Journal for recording.</p> <p>Using my background information I decided what feeds I wanted to test. I chose crumble (control), which is high in protein, corn scratch, and tables scraps. I kept track of how much food I put out each day, (about a cup except for the table scraps). I Fed the chickens each feed for one week. I collected the eggs daily and recorded the size and weight of the eggs from days one - seven. I measured the weight of the eggs in grams and the circumference in inches. I repeated each step for each feed.</p> <p>Results After completing my experiment I have found that although all three feeds have produced eggs with approximately the same horizontal circumference, crumble produced heavier eggs with greater vertical circumferences.</p> <p>Conclusions/Discussion The data has shown me that all three feeds produced eggs with approximately the same horizontal circumference; crumble produced heavier eggs with greater vertical circumference. The main point that I have learned is that different feed affects the size of eggs. The results occurred because the crumble is higher in protein than the other two and it is also made specifically for laying hens. My experiment proved the feed not only affects the size and weight of eggs it also proved that crumble does in fact produce larger eggs. My Hypothesis was correct; I hypothesized that the crumble would produce larger eggs because of the high protein content.</p>	
Summary Statement The goal of my project was to measure the change in size and weight of chicken eggs while changing there feed.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Julie A. Guerin	Project Number S1905
Project Title Protocols for Haliotis rufescens Egg Cryopreservation and In Vitro Fertilization, Year 2	
Objectives/Goals Gamete cryopreservation can play an important role in conservation strategies for at-risk abalone species. Red abalone (<i>Haliotis rufescens</i>) are listed as threatened in California waters. Objectives of this study were to continue investigating red abalone egg cryopreservation protocols and to determine whether eggs which exhibit normal phenotypes after thawing could be successfully fertilized with live sperm, as well as to evaluate propylene glycol (PG) as an alternative cryoprotectant agent (CPA) to dimethyl sulfoxide (DMSO).	
Abstract Methods/Materials After induced spawning (with prepared H ₂ O/Tris Solution) and egg collection, eggs were frozen using cooled or uncooled DMSO or PG at 8 and 16 mins stepwise cooling at 14, 4, -40 degrees C, before plunging into liquid nitrogen (-196 degrees C). A total of 26 stepwise thawing protocols (5 mins at -40, 4, 14 degrees C) using 1.25g or 2.5g non-permeating sucrose/80ml water (as an aid in rehydration), and 20 in vitro fertilization tests with live sperm were conducted.	
Results Protocols using PG at 8 and 16 mins stepwise cooling and stepwise thawing with 1.25g sucrose yielded 90% to 100% (8 mins) and 75% to 80% (16mins) intact round eggs with clear chorion. Both 8 and 16 mins PG protocols using 2.5g sucrose during thawing yielded less than 10% such eggs. Protocols using uncooled or cooled DMSO stepwise cooling and thawing with 1.25g or 2.5g sucrose yielded intact round eggs ranging from 10% to 25% (8 and 16 mins), but such eggs displayed little or missing chorion. Remaining eggs in these protocols were irregular. Sperm orientation towards eggs during in vitro fertilization attempts occurred only in PG trials. No cell division occurred in any trial.	
Conclusions/Discussion PG appears to be the more effective CPA, as chemical signaling between sperm and eggs, with release of egg chemoattractant (L- tryptophan), remained bioactive after cryopreservation. CPA toxicity, ice crystallization or other factors may have, however, caused egg damage and prevented fertilization. Further research will involve refining protocols.	
Summary Statement This project was conducted to determine whether abalone eggs exhibiting normal phenotype after cryopreservation and thawing can be successfully fertilized.	
Help Received Dr. Kiersten Darrow (mentor) and Keith Okamoto (aid in procedures), at Cabrillo Marine Aquarium; my mother for encouragement and transportation; participant in Junior Southern California Academy of Sciences (JSCAS).	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Charlene C. Haskin	Project Number S1906
Project Title Goldfish in the Spotlight	
Abstract Objectives/Goals In this experiment, I would like to find out if there is an effect on the respiration rate of goldfish due to the color of light they are exposed to in their environment. I would like to experiment on this topic because, though I do not currently own a fish I have always wondered why there is always the same color of light in every fish tank I have seen. So, I have decided that I will see if a change in the color of light in a goldfish's environment will cause the respiration rate of the fish. Methods/Materials In my experiment, I plan to use four different colors of light to test for an effect on the respiration rate of the goldfish. These lights include; red light, green light, UVB light and sunlight. I will place each fish in its own individual bowl and expose them all to the same color of light for the same amount of time and then test each ones respiration rate. I will then compare the results and come to a final conclusion. Results Throughout research, I found information to lead me to the hypothesis that red light was going to affect the fish the most. The results I collected did not say that at all. I found that despite my prior hypothesis, the green light most affected the fish. The green light was followed by the UVB light which was followed by the sunlight, and bringing up the rear was the red light. Conclusions/Discussion In conclusion, despite what my research had led me to believe, I have come to the conclusion that green light has the greatest effect on the respiration rate of goldfish.	
Summary Statement testing the change in a goldfish's respiration rate depending on the color of light they are exposed to in their environment.	
Help Received Mother helped put together board; science teacher provided fish and work space; friend provided consultation for the experiment.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) John Michael L. Jones	Project Number S1907
Project Title Comparison of Two Mantid Species Exhibiting Parthenogenesis: Iris oratoria and Brunneria borealis	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project was to add the comparison of Brunneria borealis to an ongoing study of Iris oratoria and to test for the presence of pheromones. My hypothesis for this project was that pheromones still exist in Brunneria borealis. To test this hypothesis I performed behavioral assays with a Y-maze (a structure that allows the test subject to choose between two directions). Another objective was to further elucidate the survival mechanism Post-Annum Resumed Hatching. When I continue my project I will be pursuing the identification of pheromones in Iris oratoria and Brunneria borealis, and investigating parthenogenesis at the molecular level.</p> <p>Methods/Materials Mantid Rearing - Materials: various mantid lineages, their environments, food sources, heat lamp & full spectrum light, timers, thermometer. Methods: outside when warm, then add heat lamp inside when cooler, regular feeding, collect hatchlings. Y-maze - Materials - separate environments for males and females to help prevent male scent overload, custom Y-maze to test mantids, air pump(air flow)full volume music, view shields, heat lamp & full spectrum light. Methods - place male in Y-maze (female in place) and note behavior.</p> <p>Results In the Y-maze, Iris oratoria males displayed two types of behavior: caution or flight. When tested with Iris oratoria females, males advanced with slow observant caution. When tested with a female Brunneria borealis, the males demonstrated aversion or flight behavior, getting as far away as possible. Post-Annum Resumed Hatching is confirmed by the offspring of 47 isolated 2004 females: 30 produced parthenogenetic offspring. Of those 30; 19 produced Post-Annum Resumed Hatching nymphs in 2006. Also the wild caught female from 2004 produced Post-Annum Resumed Hatching nymphs in 2006.</p> <p>Conclusions/Discussion The distinct, differential and repeated behavior of the male Iris oratoria indicated the presence of scent or pheromones in both species. The reaction of the males could only have been from scent because auditory and visual stimuli were neutralized. Iris oratoria and Brunneria borealis do not have similar pheromone composition, since Brunneria gives a clear WRONG message. Iris oratoria and Brunneria borealis have similarities, important to survival, which to date do not include Post-Annum Resumed Hatching.</p>	
Summary Statement This study evaluates the survival strategies of the Mantid species Iris oratoria and Brunneria borealis, which include parthenogenesis and the presence of pheromones.	
Help Received Dr. David Yager - U of Maryland for advice. Dr. Richard Stouthamer - UCR for pheromone testing advice.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Justin Kersten; Alex Van Wandelen	Project Number S1908
Project Title Sand Crabs in Santa Cruz	
Objectives/Goals The purpose of this study is to collect reliable data on the distribution of the Pacific Mole Crab (<i>Emeritia analoga</i>) at Seabright State Beach in Santa Cruz County. We will also determine how the seasons affect gender and abundance. We predict that there will be fewer females in the winter and overall larger crabs in the spring and summer.	
Abstract Methods/Materials I. Mark out predetermined 50 meters with measuring tape II. Measure wind speed temperature, cloud cover, tide height with Kestrel and tide book III. Use stovepipe to collect sand by collecting at predetermined depth IV. Filter through screens with water (1/4 and 1/8 inch screens in that order) V. If sand crabs present record and put in Ziplock to freeze for parasite analysis if not repeat steps 6-9 VI. Repeat bimonthly Materials a) Kestrel wind speed/ temp gauge b) 2x1 gallon buckets c) Stovepipe d) 30x1 1/2 foot flag/ markers e) Measuring tapes (10 & 50m) f) Random number chart g) Calipers h) Tide book i) Screens	
Results We found a total of three sand crabs in October, six in November, two in December, one in January and seven in February. Examining the graphs you can tell there are few sand crabs in the winter months. The weather in February was unseasonably hot, we got a large increase in recruits, meaning that the sand crabs are breeding again. We will continue monitoring for 1 year.	
Conclusions/Discussion The samples of the Pacific Mole Crab (<i>emirita analoga</i>) we have collected in the past 8 months is starting to match our predictions.	
Summary Statement Monitoring size, sex, and distribution of the Pacific Mole Crab	
Help Received Sample extractor provided by San Lorenzo Valley High School Environmental Science Class	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Haley McCown; Rodger Storment; Zoe Wambaugh	Project Number S1909
Project Title Mollusk Abundance in the Rocky Intertidal Zone	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our goal for our site is to compare the abundance in the mollusk (for instance: chiton, whelk, turban snail and mussel) populations that could indicate environmental change (such as climate change or human disturbance). We also want to determine how much seasonal abundance there is for these species across the transect (the data collected in 2002 was only for December).</p> <p>Methods/Materials For this investigation we use: a 50-meter measuring tape, two 1/4 m² quadrats, knee pads, and data sheets to evaluate the tide pools. The transect extends from the upper high zone into the low zone, crossing a dense mussel bed. We plan to monitor the vertical transect at least twice monthly during low tides. Along the twenty-one meter transect we collect data every three meters, noting the abundance and species of mollusks in our quadrat.</p> <p>Results We have found that there is a wide diversity of mollusk species in the tide pools at Davenport Landing. The abundance and diversity of species varies at different locations along the transect.</p> <p>Conclusions/Discussion Currently we have not collected enough data to establish any definitive patterns.</p>	
Summary Statement Our project is all about mollusk abundance; where they are and what factors cause them to be distributed as they are.	
Help Received Dr. John Pearse helped us proofread our reports in addition to helping us identify the tidepool organisms when we were getting started.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Dana J. Norall	Project Number S1910
Project Title Organic vs. Non-Organic Fruit's Effect upon Fruit Fly Reproduction with Implications on Human Health	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project was to see if there is a substantial difference on the fruit fly (<i>Drosophila melanogaster</i>) reproduction when they eat only organic or non-organic fruit. Additionally, different conditions were tested to see if the pesticide residues were found on the skin of grapes, whether the residues were able to penetrate the skin of the grape, and finally if washing your fruit actually cleans off the pesticides.</p> <p>Methods/Materials Using small vials I added 2.5 grams of each type of fruit to a number of vials. Then I placed two male and two female flies with each piece of fruit. The flies were monitored every three days by counting the larvae and actual fly stages. This method continued for 30 days that is two full generations and the beginning of the third generation.</p> <p>Results The organic grape had a considerable positive effect on the fruit fly reproduction before the first 25 days. However if one looks subsequently to the 25-day mark the non-organic fly population boomed while the flies with the organic grape suffered. I believe this is due to the pesticides preserving the grape better than the organic grape. The washing of the grapes had little effect until the grapes were washed for 15 seconds and it molded slightly earlier than the unwashed non-organic grape counterpart.</p> <p>Conclusions/Discussion My results suggest that organic fruit sustains fruit fly life much better than the non-organic fruit. Additionally, the fifteen-second wash of the grape also had positive impact on the fruit fly reproduction. Although, humans cannot be realistically compared to fruit flies it is important to realize that we know that non-organic fruit has a negative effect upon fruit flies. Why not take the precaution for our health and either buy the expensive organic fruit or take the small amount of time and wash your fruit for at least 15 seconds?</p>	
Summary Statement I used fruit flies (<i>Drosophila Melanogaster</i>) as a bioindicator to find out if there is a health benefit of buying organic fruit over non-organic fruit.	
Help Received I used lab equipment under the supervision of Dr. Jay Vavra.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Caroline K. Salmond	Project Number S1911
Project Title A Goldfish Never Forgets: Year Two	
Abstract Objectives/Goals The objective of this experiment is to determine if goldfish contain long-term memory capabilities or the ability to remember an event or an occurrence when shown three colors through conditioning methods. Methods/Materials The goldfish were operantly conditioned using three different colored rings. Training with the rings was repeated for seven days. The fish faced three rings, with the red ring containing food, in order to attract the fish. Three final tests were conducted in a large tub (one test did include food in the red ring). Results While being operantly conditioned, the goldfish began to more rapidly recognize the red ring. They would swim to the red ring before food was placed in the tank, but they would completely avoid the blue and yellow rings. The majority of the fish swam to the red ring during their final tests, with their times continually lowering. While some fish did not swim to the red ring during the first two tests, all the fish swam to the red ring during the final test. Conclusions/Discussion The common goldfish has long-term memory capabilities, along with the ability to see and establish different colors (red, blue, and yellow), and possibly the ability to smell an object and follow that scent.	
Summary Statement This experiment is designed to determine if goldfish can be operantly conditioned in order to display long-term memory characteristics.	
Help Received Mother helped maintain fish; Father helped take pictures.	



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Cole T. Symanski	Project Number S1912
Project Title Diet, Development, and Immunocompetence in Adolescent Zebra Finches	
Abstract Objectives/Goals The objective was to determine whether adding a protein supplement(boiled hens egg) to the diet of a granivorous species of bird while it was breeding would influence the development, body size, and/or immunocompetence of offspring. Methods/Materials Fourteen caged pairs of zebra finches (<i>Taeniopygia guttata</i>) were randomly assigned to breed on one of two treatments: a basic diet (grass seed, calcium, minerals, water) or a protein-supplemented diet (basic, plus daily allotments of hard-boiled egg). When offspring reached 60 days of age (mid-adolescence), they were tested for immunocompetence using the PHA test; body size (mass, and tarsus length); and maturity level (two measures of beak score: amount of black remaining, a juvenile trait, and degree of redness, an adult trait). Results Offspring of both sexes from the protein-supplemented treatment showed a stronger immune response compared to those reared on the basic diet. Protein-supplemented birds of both sexes also had less black on their beaks at 60 days of age. For the other measures (mass, tarsus length and beak redness), males from the protein-supplemented treatment had higher scores than males from the basic diet, but no treatment differences were observed for females. Conclusions/Discussion Reproductive performance of a granivorous species of bird is constrained by the low amount of protein (12 percent) in its diet; supplementation with egg protein improves immunocompetence, the rate at which young reach maturity, and body size, with effects being greater in males.	
Summary Statement I investigated the impact of increasing dietary protein on the reproductive performance of seed-eating birds and found that this supplement improved development rate and immunocompetence of offspring.	
Help Received I used birds and equipment at University of California, Irvine, under the supervision of Professor Nancy Burley.	