



CALIFORNIA STATE SCIENCE FAIR 2003 PROJECT SUMMARY

Name(s) Sarah M. Amiri	Project Number S1901
Project Title Between Pacific Tides	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to identify any environmental, physical or biological factors that influence the larval settlement of marine invertebrates inhabiting the intertidal zone. The tuffies are also placed in the intertidal, in order to identify the larval recruitment rates in each zone, to compare them with those of the adult populations and to observe any adult larval interactions between species.</p> <p>Methods/Materials The PISCO lab, located in UCSB, supplied me with most of the equipment needed for this experiment. These included: tuffies, three used for each zone (for each biweekly trial so that the larval recruitment rates were identified), a manual drill used for drilling a tuffie in to each zone, a metal plate and bolt used for pinning the tuffie into place during each biweekly trial, and the PISCO lab, mainly used for observing the larvae under their microscope.</p> <p>Results The results quickly showed that the tuffie placed in the low tide zone, inhabited the largest population of larvae (or the juvenile stage of their adult species form), and it also had the highest rate in diversity within organisms. The low tide zone was of particular interest, because it had a high rate of adult larval interactions (a highly influential factor affecting the settlement of larvae) between several bivalve species, including <i>Mytilus californianus</i>, <i>Balanus fissus</i>, and <i>Pecten latiaratus</i>. Each zone roughly had the same diversity within adult organisms as those collected in the tuffie.</p> <p>Conclusions/Discussion Through one year of research, testing, and observation, I have found that countless factors affect the larval settlement of marine invertebrates in the intertidal zone. The time of tide, angle towards the sunlight, velocity of the water, water pressure, and substrate area all contribute to the final settlement outcome of larvae in the intertidal. In addition, they must settle in a zone that they are able to adapt to in the future. Each zone varies in: water level, salinity levels, predation, exposure to sun and air, drying winds, wave shock, and even human contact, which makes it essential for them to settle in the exact location needed for their future survival. Obviously the low tide zone had the highest larval recruitment rates (also the highest adult populations) because of the lack of limiting factors affecting larval settlement. This also shows that larval settlement may strongly be influenced by their adult species.</p>	
Summary Statement By placing a tuffie (an object that catches incoming larvae) in to each zone of the intertidal, both the larval recruitment rates of various intertidal inhabitants, and factors that affect larval settlement will be identified.	
Help Received The PISCO lab at UCSB and their staff, greatly assisted me with equipment needed for this project and their microscope for viewing the larvae collected in each zone. My parents also drove me to the PISCO lab everyday needed, and helped me with the board set up. Patricia Sadaghian at the Invertebrate Zoology	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Lisa M. Gabourie	Project Number S1902
Project Title Determining if the Weight of a Chicken Egg Affects How Large the Chicken (<i>Gallus domesticus</i>) Will Grow	
Objectives/Goals To find out if the weight of a chicken egg affects how large the chicken will grow.	
Abstract	
Methods/Materials Methods: 1. The incubator was set up to the right temperature (37 to 38 degrees Celsius). Then each was weighed, marked, and put in the incubator. 2. Each egg was turned three times a day (every 8 hours). 3. After the chicks hatched they were weighed and each day after that each chick was weighed. Materials: 1 commercial incubator w/fan, 1 electric power bar, 30 chicken eggs, 2 thermometers, light fixtures, light bulbs, chick feed, water, triple beam balance, pine shavings, 2 110 L clear plastic containers, 2 poultry water bottles, 2 poultry food troughs, newspaper	
Results The results of this experiment indicate that the egg weight did affect how large the chick was at birth, but not as the chick got older. My data showed that at birth the larger eggs did produce larger chickens and the smaller eggs did produce smaller chickens. As the chickens got older, however, more and more of them that came out of smaller eggs grew larger than those that came out of larger eggs.	
Conclusions/Discussion After completing my experiment, I found out that the first part of my hypothesis was right but the second part of my hypothesis was wrong. In the first part I predicted that the larger eggs would produce larger chickens than the smaller eggs at birth. This is true because when they were born all of the larger eggs produced larger chickens and all of the smaller eggs produced smaller chickens. Through their growth, however, the egg size didn't matter because at the end, some of the chickens that came out of the smallest eggs surpassed Sumo (the chick that came out of the largest egg).	
Summary Statement Determining if the weight of a chicken egg affects how large the chicken will grow.	
Help Received Mother and Father drove me around so I could gather my materials.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Travis T. Hinton	Project Number S1903
Project Title Monitoring Marine Mammal Predation on San Lorenzo River Steelhead	
Objectives/Goals -Problem Statement: Not enough adult steelhead are returning to the San Lorenzo River to maintain a healthy population. -Statement of Purpose: To determine the severity and frequency of marine mammal predation on the local San Lorenzo River steelhead population. -Investigative Question: Are predatory marine mammals selectively preying on a specific cross-section of the steelhead population (males, females, hatchery fish, and wild fish)? -Hypothesis: That over six percent of the local San Lorenzo River steelhead will have evidence of predatory marine mammal attack.	
Abstract	
Methods/Materials -Materials: -Partnership with Monterey Bay Salmon and Trout project, National Marine Fisheries, and the Department of Fish and Game. -Necessary access to the local San Lorenzo Valley diversion dam: facilities include an inflatable dam, fish ladder, and fish trap. -Large "salmon" net -Holding tank -Waterproof camera -Clip board -Methods: -Set trap during spawning season -Check on a regular basis Step # 1: Net fish out of the trap one at a time Step # 2: Place in holding tank Step # 3: Determine the sex of the individual (A female will have a rounded nose, and a male will have an elongated nose) Step # 4: Measure in inches Step # 5: Note the color of the steelhead Step # 6: Determine origin (A wild steelhead has its adipose fin intact, a hatchery steelhead will have its adipose fin clipped)	
Summary Statement To determine the frequency and effect of marine mammal predation on San Lorenzo River steelhead	
Help Received My teacher, Terry Umsted provided necessary materials and supervision.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Kevin Liang; Anthony Rajasingham	Project Number S1904
Project Title Analyzing the Relationship Between Dominance and Heart Rate in Red Swamp Crayfish (<i>Procambarus clarkii</i>)	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our objective is to determine if there is a relationship between formation of functional dominance and heart rate in Red Swamp Crayfish (<i>Procambarus clarkii</i>).</p> <p>Methods/Materials We obtained live crayfish from a crayfish distributor in the southern United States. We placed two crayfish in a separated environment, resembling that of their natural habitat. Using diodes connected to an electrical amplifier we monitored the heart rates of the crayfish while at rest, and after the partition was removed. We monitored the heart rate of these animals as they established functional dominance through aggressive encounters.</p> <p>Results the data we have so far obtained, there seems to be a correlation between increase of heart rate and formation of functional dominance. In trials up to this point the subordinate crayfish seems to exhibit a greater increase in heart rate during encounters than does the dominant animal.</p> <p>Conclusions/Discussion Having taped the interactions of these animals for a period of two and a half hours we went back and assessed the formation of these functional dominance and correlated these data with the heart rate of the animals. We were able to carefully correlate increase in heart rate of both crayfish with encounters between the two animals and the outcomes of these encounters. These data seem to suggest that there is a link between the stress experienced by the animals during encounters and increase in the heart rate, with a greater stress observed in the subordinate. By studying and acquiring a better understanding of the relationship between formation of functional dominance and physiological responses to these formations in invertebrates, we may be able to relate these studies to mammals and gain a new insight into how our own bodies respond to environmental factors.</p>	
Summary Statement We are studying the formation of dominance in <i>Procambarus clarkii</i> to see whether or not there is a correlation between increased heart rate and dominance.	
Help Received Dr. Newt Copp facilitated our research at Claremont McKenna College, Rebecca Dutton reviewed heart rate data and worked directly with crayfish, Elon Thompson hinged board	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Youngnam Maeng; Brian Nakao	Project Number S1905
Project Title Furious Feeding Frenzy: Developing a Feeding Protocol for Lytechinus pictus	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals We used the species <i>Lytechinus pictus</i> in an attempt to develop a feeding protocol employing the algae Tahitian blend that will enable the developing urchin to survive through the pluteus stage to metamorphosis while being economical and simple enough for the classroom setting. Through our initial experiment we concluded that the Tahitian Blend was the only algae mixture they were feeding on. Using this information, we planned a revised experiment.</p> <p>Methods/Materials We have been testing various concentrations of Tahitian blend algae paste on <i>Lytechinus pictus</i> pluteii. By observing the survival rates of the <i>Lytechinus</i> pluteii, we found the most beneficial concentration of Tahitian blend algae was approximately 8600 cells/ml. We have worked with a constant concentration of 300 embryos per ml. in 40 ml. of filtered seawater and narrowed the range of algae concentrations and tested which concentration was most successful in prolonging the urchins' survival rate. We also tested the pH level to determine if a change in acidity had occurred. A constant temperature of 18 degrees Celsius was enforced.</p> <p>Results Urchin embryos survived 14-16 days longer than cultures containing no Tahitian blend algae. These results indicate that the urchins indeed feed on the algae. We have observed a decrease in pH over the course of the feeding protocol and hypothesize that an increase in bacterial growth caused an increase in acidity. Further study is needed to determine if bacterial growth (and if so, which species of bacteria) is causing this change in acidity.</p> <p>Conclusions/Discussion We conclude that using approximately 8600-cells/ml. concentration of Tahitian blend per 40 ml. of a 300-embryos/ml culture can extend the survival of the <i>Lytechinus pictus</i> pluteii to 23 days. This is a vast improvement over the urchin larvae that died within 7-10 days when a food source was not provided.</p>	
Summary Statement We are attempting to develop a feeding protol for <i>Lytechinus pictus</i> using the algae paste Tahitian Blend	
Help Received Chris Patton (Hopkins Marine Station) provided the <i>Lytechinus pictus</i> , filtered sea water, and project support, and Pam Miller helped with project planning and materials.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Kevin McCully; Megan Schoettler	Project Number S1906
Project Title How Does Habituation to Touch Affect Sea Anemones' Ability to Feed?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our experiment measured if the habituation of sea anemones (like they are touched in tide pools) affects their food intake and ability to grow and survive.</p> <p>Methods/Materials For sixty minutes, we touched two anemones every six minutes, another two every two minutes, and the last two were not touched. After the touching, the sea anemones were fed 25 brine shrimp. We observed the number of brine shrimp that each anemone did not ingest. The materials were six sea anemones, a tank in which salt water circulated, brine shrimp, eyedroppers, and our fingers.</p> <p>Results One of our important results was that sea anemone number 5, which was touched every two minutes, died after the third week. This might show that a great amount of touching is not good for anemones. Our key result was that anemones that were touched every two minutes ingested less than all the other anemones. However, the ones that were touched every six minutes ingested more than the anemones that were not touched at all.</p> <p>Conclusions/Discussion Our final conclusion was that the anemones that were not touched at all did ingest more than the ones that were touched every 2 minutes. However, sea anemones that were touched every six minutes ingested the most. There could have been errors in our project due to the small number of sea anemones, our ability to count, how hard we touched each anemone, and how we inserted the brine shrimp for feeding. Another source of error is if the sea anemones had trouble adjusting to their new environment.</p>	
Summary Statement For our testing of the habituation to touch of sea anemones, our results were not conclusive so we would like to continue with this research.	
Help Received Our families helped with transportation, obtaining materials for our board, and proofreading the report. Linda Chilton and Alfonzo Montiel were the employees at Cabrillo Marine Aquarium who provided the sea anemones and sea water system.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Genevieve G. Mount	Project Number S1907
Project Title Aphid Populations and How They Relate to Plant Height, Parasites, and Predators	
Abstract Objectives/Goals The purpose of this project is to determine how the number of aphids on a plant affects the plant height, parasites and predators. I tested to see if aphid population increase would inversely affect the plant height. I also tested to see if aphid populations would positively affect the number of parasites and predators. Methods/Materials The plants used were pac choi, lettuce, chard, cabbage and broccoli. There were six plants of each type; they were randomly planted in two different boxes. One box was the control, when necessary I sprayed it with a simple soap spray to keep the aphids off. Twice every week I counted the number of leaves, measured plant height and counted the number of aphids, parasitized aphids and predators on each plant. Lepidopterous pests were removed by hand. Conclusions/Discussion Aphid populations affected the height of the plants; any population of aphids hindered the growth of the plants. I discovered an aphid population threshold level that attracted syrphid flies to lay their eggs in a colony of aphids. I found that there were no obvious threshold levels between the numbers of parasitized aphids and the aphid populations. The parasite and predator populations both peaked at the same time, right after the aphid populations peaked. This indicates both parasites and predators benefited from the peak in aphid population, and they both caused the aphid populations to plunge downward.	
Summary Statement Aphid populations and How They Relate to Plant Height, Parasites, and Predators	
Help Received Mr Koens helped with statistical analysis, my Father was my project advisor	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Trang C. Phan	Project Number S1908
Project Title The Relationship between Movement and Sensory Mechanism in Strongylocentrotus purpuratus	
Abstract Objectives/Goals This experiment explored the possible ability of purple sea urchins, <i>Strongylocentrotus purpuratus</i> , to detect the location of a rock (one that they had previously crawled over/attached to) placed at a distance well beyond their tactile reach. The goal was to determine if <i>S. purpuratus</i> has another sensory mechanism beside its sense of touch. Methods/Materials The experimental aquarium was 20 cm long, 10 cm wide, and 12 cm deep with only seawater and a rock. In each trial three randomly selected <i>S. purpuratus</i> were placed at one end of the tank and the rock (one that they had previously crawled over/attached to) was placed at the other end. The distances traveled by urchins were recorded using a 2-cm ² grid system every fifteen minutes for a total of three hours. Results The distances remaining from the rock in the experimental trials were indeed shorter than the distances remaining (from where the rock was positioned in the experimental trials) in the controlled trials. The experimental group (with rock), on average, resulted in subjects being 4.89575 cm from the rock (after 3 hours), while the control group (without rock), on average, resulted in subjects being 10.34725 cm from the location where rock was placed in experimental trials (after 3 hours).	
Summary Statement To determine if <i>S. purpuratus</i> has another sensory mechanism besides its sense of touch, experiments were done in an aquarium with 3 urchins on one end and a rock at the other end; the data and an ANOVA test supported my hypothesis.	
Help Received Younger sister helped collect sea urchins and seawater.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Sonia M. Sotelo	Project Number S1910
Project Title The Effects of Water Temperature and Aeration on the Hatching of Branchinecta mackini Cysts	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project was to determine an efficient way to hatch Alkali fairy shrimp (<i>Branchinecta mackini</i>) by observing the effects of water temperature and aeration on hatching rates. There are five species of freshwater shrimp that dwell in the playas of Edwards Air Force Base, located in the Mojave Desert. However, human activity is a threat to these vulnerable creatures. Many of California's fairy shrimp habitats are disappearing rapidly due to urbanization and agriculture. To prevent extinction, additional habitats, including those that are man-made, must be created.</p> <p>Methods/Materials The project was begun by actually going out to a flooded playa and examining live fairy shrimp. 13 samples of soil were collected from random locations in claypans and road pools. The control of the experiment was store-bought brine shrimp, and they were hydrated by pouring 1 liter of distilled water into the bottles. The effects temperature had on the hatching rate of cysts placed outside (with temperatures dropping as low as 20°F), inside at 63-68°F, and maintained at 80°F with the aid of a heat lamp were all observed. The same experiments were done for all of the soil samples, and over 50 samples total were observed.</p> <p>Results Of the 13 different samples of soil that had been obtained, only 8 yielded any fairy shrimp hatchlings. The control had shown that in all four experiments, some cysts should be able to hatch once exposed to water. More cysts had hatched once exposed to 80°F than at any other temperature. Those that had been placed outside had produced the second most, while aeration actually produced less. Very few shrimp hatched after two weeks of being exposed to water.</p> <p>Conclusions/Discussion The experiment did not support the hypothesis. Aerated water yielded 26% less fairy shrimp than that of the water maintained at 80°F. It can not be automatically assumed, however, that higher temperatures will always yield a higher number of fairy shrimp. More hatchlings were found in the bottles that were left outside than in those that had been placed inside at room temperature. This shows that fairy shrimp found on and around Edwards AFB are hardy creatures that have adapted to their environment. It is necessary for their hatching, growth, and reproduction rates to be high if they are to survive.</p>	
Summary Statement The study of growing <i>Branchinecta mackini</i> by experimenting with temperature and aeration.	
Help Received Allan Bourbina, a wildlife conservationist, accompanied me when I was collecting soil samples on Edwards Air Force Base.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Adam Sowlati	Project Number S1911
Project Title Cryptobiotic Performances of Tardigrades	
Abstract Objectives/Goals The research was performed to see whether tardigrades exposed to varying times in cryobiosis would experience different cryptobiotic performances (times out of cryobiosis). Methods/Materials First the tardigrades were isolated using a probe. The isolated tardigrades were placed into four separate microscopic test slides and transitioned into a state of anhydrobiosis for 24 hours by allowing them to completely dehydrate. They were then put into a freezer to induce a state of cryobiosis. The times in cryobiosis were increased in increments of five hours to a maximum of 30 hours. Immediately, after removing the tardigrades from the freezer, a timer was activated so the time it took them to come out of cryobiosis could be measured. A re-hydration medium was used to retrieve the tardigrades from cryobiosis. The time, in which the tardigrades first exhibited movement, was logged into a data table as their cryptobiotic performance. The experiment was repeated using all four test slides. Results The results of this research clearly show an upward trend in cryptobiotic performances with increased time in cryobiosis on all test subjects. Conclusions/Discussion The longer the tardigrades were in a state of cryobiosis, the longer it took them to come out of this state. This can be explained due to the fact that the longer the tardigrades were in cryobiosis, the more their metabolic functions were slowed and stopped. The recovery period from cryobiosis requires energy stored inside the tardigrade. This energy will over time be lost due to natural progressions. Therefore, the longer the tardigrade remains in cryobiosis, the more energy is lost. The tardigrades in cryobiosis for longer periods of time would have to make use of the available energy, to come out of this state. This research has brought great understanding to the field of cryobiology, cryptobiosis, and the overall physiology of tardigrades.	
Summary Statement This project studied the reactions of tardigrades (Milnesium sp.) to various states of cryobiosis.	
Help Received Technical questions answered by Professor William R. Miller, Ph.D. of Chestnut Hill College in Philadelphia, PA and The Professors of Carolina Biological. Used Biology lab and equipment at Viewpoint School.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Katrina Maria C. Steinhauer	Project Number S1912
Project Title A Three Year Study of Water Disturbance Involving Different Variables Affecting Mosquito Development	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective is to investigate an alternative to chemical mosquito control and further study how motion disturbance of water affects the development of mosquito larvae into adult mosquitos.</p> <p>Methods/Materials I tested Culex quinquefasciatus #2 mosquito larvae because I know that the larvae naturally surface to breathe, remain there, and then swim downward if they are disturbed by something like light or movement. Containers were set up with the same water at room temperature with an electric fan positioned to fan on the surface of the water. Containers were also set up with a bubbler beneath the water surface. I put twelve larvae in each container for each run and counted how many larvae developed to the next stage, pupae, and then on to adult mosquitos. I also set up a container with larvae without a fan or bubbler as a control.</p> <p>Results In the preliminary test, 2 out of 24 "bubbler container" larvae matured to pupae and to adults. In the "fan container" larvae, 2 out of 24 matured to pupae and to adults also. Fewer larvae in the bubbler container matured to the next stage pupae.</p> <p>Conclusions/Discussion The development of larvae to pupae to adult was affected by both the bubbler (below water surface disturbance) and the fan (water surface disturbance). I think that the fan slowed development of the mosquito larvae. The bubbler damaged more of the larvae stage. The bubbler is more interfering because fewer larvae survived. They died before they became pupae. I think that disturbance to the water environment where larvae live is a negative influence on the development of the mosquito.</p>	
Summary Statement I investigated motion disturbance in the mosquito larva's water environment to see if it affects development into an adult mosquito.	
Help Received I used the fan and set up at school, with help from Mr. Whittington; Mom helped with board; Kearney Mosquito Lab supplied me with larvae.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Ryan S. Terrill	Project Number S1913
Project Title Potential Effects of Conversion of Salt Ponds to Tidal Wetlands on Wintering Birds	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Recently, the Federal and State Governments purchased thousands of acres of salt ponds. These salt ponds had been established a century ago through reclamation of tidal wetlands when tens of thousands of acres of tidal wetlands were converted to a massive system of salt evaporator ponds. This substantial alteration of the natural bay estuarine system has had devastating effects on the San Francisco Bay ecosystem and has resulted in some of the San Francisco Bay endemic species being listed under the Endangered Species Act. In an effort to restore the habitats that support these species, as well as a large number of species dependant upon these habitats, the salt ponds were purchased in order to convert them back to their original tidal habitats. While this restoration will undoubtedly benefit these endemic species dependant on San Francisco Bay tidal habitats, a large number of migratory birds use these salt ponds. The potential impact of restoration on these species is largely unknown.</p> <p>Methods/Materials Therefore, I attempted to obtain data that would enable one to generate predictions regarding the potential effects of such a massive project on a large number of migratory birds. The null hypothesis was that conversion of salt ponds to tidal wetlands would have no effect on these populations. To do this, I collected data from fourteen sites (6 salt pond and 8 tidal wetland sites). I made direct counts of all birds using these sites within a thirty minute period. The area surveyed was determined using Global Information System (GIS) Arcinfo software. Numbers of birds in each habitat were converted to densities (birds/acre) for each site surveyed. These densities were used to determine the potential effects of conversion of nine thousand acres of salt ponds to tidal wetlands in the South San Francisco Bay on important wintering bird populations</p> <p>Results Although a few species would suffer from salt pond conversion to tidal wetlands (e.g., Eared Grebe, California Gull), the majority of migratory birds that winter in the South San Francisco Bay would benefit from the conversion. The conversion of salt ponds back to tidal habitat would result in a net increase of over 100,000 wintering, migratory birds supported by the restored tidal habitats.</p> <p>Conclusions/Discussion Restoration of the salt ponds to tidal habitats would be strongly beneficial to endemic species and migrants dependent on the Pacific Flyway.</p>	
Summary Statement Attempting to forecast the effects of wetland conversion on wintering birds	
Help Received Mother helped design board. Father helped with establishing data collection procedures, with data collection, and with editing the paper	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Jennifer E. Walker	Project Number S1914
Project Title Housefly Chemoreceptors and Their Response to Various Concentrations of Sugars	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To determine whether the concentrations of sugar solutions have a correlation to the occurrence of labial projection in houseflies, and whether the fly's reaction to different sugars vary.</p> <p>Methods/Materials 10.0%, 1.00%, 0.10%, 0.01%, and 0.001% solutions of glucose, sucrose, and fructose were prepared. 20 house flies were bonded to the wooden end of fresh applicator sticks using rubber cement. 10 lumps of clay were placed down the middle of a plastic tray, and 10 down the middle of a second tray. The applicator sticks bound to the flies' backs were each balanced on a piece of clay. A wet paper towel was then placed on each tray. The applicator sticks were adjusted so that the legs of each fly gently rested upon the paper towel. Random selection of the numbered flies and sugar concentration variables continued until each fly had come into contact with each different solution once, and the reaction was recorded.</p> <p>Results The only instances in which there were significant differences in data compared to the water control, were 10% solutions. Out of those, 10% Sucrose displayed the most dramatic difference.</p> <p>Conclusions/Discussion . Higher concentrations of sugar, when contacted with the tarsi, did indeed prove to have higher instances of labial projection. In addition, results between the different sugars proved to have a notable difference. Expanding upon that, one can also note that the chemoreceptors were perhaps not as sensitive as previously suspected. Also, the data supports the conclusion that the flies were more sensitive to sucrose than either glucose or fructose. As in all experiments, this one contained limitations. It is possible that the experiment simply needed more repetitions in order to produce accurate results. Additionally, the act of moving the fly to the solution could disrupt it from its activities, and induce unusual responses. Additionally, it is possible that the range of concentrations was not vast enough to capture trends in the results.</p>	
Summary Statement The correlation between sugar type, sugar concentration, and the occurrence of labial projection.	
Help Received Used lab equipment at University of California Riverside under the supervision of Dr. Gregory Walker	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Genevieve Y. Williams	Project Number S1915
Project Title Distribution of Argentine Ants: Effects of Abiotic Factors and Human Disturbance on the Palos Verdes Peninsula	
Abstract Objectives/Goals The Argentine ant, <i>Linepithema humile</i> , has spread worldwide, often decimating native ant species and other arthropod species. Numerous investigations have shown biotic aspects that contribute to the Argentine's success, such as its ability to exploit resources, but fewer and somewhat contradictory studies have been made of abiotic or non-biological conditions that limit the Argentine's distribution. This study investigated the abiotic factors—light, temperature, relative humidity, soil moisture, and soil temperature in three habitat areas on the Palos Verdes Peninsula, non-developed, semi-developed, and fully-developed. Methods/Materials Experiment I—Sugar baits were set out when Argentines were observed. Abiotic factors, human disturbance levels, and ant abundance were measured after two hours. Twenty tests in each of three habitat areas were conducted. Experiment II—A 3 x 3 grid, spanning 8100 square feet, was set out three times in each of the three habitat areas. Each square in the grid was visually searched for Argentines, and results were recorded. Results Analysis of the factors where Argentines were established suggest that the Argentine prefers moderate air and soil temperatures, and dry soils with high relative humidity. Disturbance, especially in the form of human-installed water sources, and non-native plants appear to attract the Argentine. The most popular habitat area was the semi-developed, with human-installed water sources and non-native plants. Conclusions/Discussion The results of my two experiments shed light on why the Argentine favors the Mediterranean coastal regions, characterized by low soil moistures and high relative humidities. Moreover, analogous to following a natural riverbed as shown in some studies, could be the Argentine's inclination to establish by human-installed water sources such as sprinklers and irrigation systems found along dry coastal regions. In conclusion, learning about the ranges of preferred abiotic factors that influence Argentine distribution provides an understanding that could lead to preventing the continued encroachment of an ecologically destructive, invasive species.	
Summary Statement My research on how abiotic factors and human disturbance affected the distribution of Argentine ants suggests an approach to controlling the number one urban, suburban, and rural pest in California.	
Help Received Mother helped in transportation to experimental sites.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Zarah E. Zohlman	Project Number S1916
Project Title Testing the Adaptive Behavior of Joining Colonies in the Argentine Ant, an Exotic Species in California	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals A balance in ant species is kept because different ant colonies fight and kill off each other when together, being of different ant species or the same ant species. For some reason, Argentine ants in California have developed a mutation where they no longer fight among other Argentine ant colonies, resulting in an overpopulation of the species and a disturbance of the ecosystem. My project is to investigate the possibility of these ants not only tolerating each other's colonies, but possibly able to actually join colonies, resulting in a strength in numbers that allows them to better fight their enemies and assists in food gathering.</p> <p>Methods/Materials First, a local Argentine ant colony was located and then, over thirty miles away, another Argentine ant colony was located. Ants from the distant colony (experimental group), were collected and transported to the local colony. One foreign ant at a time (15 total), was placed near the trail and observed to see if they joined the trail. 15 ants from the local ant trail (control group) were collected, and after several hours reintroduced, one at a time, to their own trail at a distance from where they were collected. Observed to see if they joined the trail.</p> <p>Results After being placed onto the ant trail, 100% of the Argentine ants in the control group, and 100% of the ants in the experimental group followed the trail. The existing ants on the trail accepted these invasive ants onto their trail.</p> <p>Conclusions/Discussion Most ants of the same species have their own territory for each colony and will fight over it. Argentine ants in California do not fight each other over territory. Scientists hypothesized this is due to a change in their "chemical odor recognition" and they all smell the same to each other. If this is the case, I hypothesized that not only will they tolerate each other, but they would actually be unable to distinguish between each other's colonies, resulting in a joining of colonies when intermingling occurs in territories. My experiment confirmed the introduced ants could not distinguish that they were not on the trail of a different colony and joined into and were accepted by the other colony.</p>	
Summary Statement As Argentine ants in California have developed a mutation where they no longer recognize each other as different, I investigated the possibility that the ants could actually be joining colonies.	
Help Received My mom driving to obtain experimental ants, my dad taking photographs, Liz Gil, from whose home I obtained experimental ants, and John, of Truly Nolan Pest Control, for confirming both sets of ants were in fact Argentine	