



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Cindy Adrian; Jimmy Goode	Project Number S1401
Project Title The Amazing Spider Web	
Objectives/Goals To figure out what stresses on spiders changed web strength and web production.	
Abstract Methods/Materials We took twenty-four spiders and split them them up into four groups of six for three weeks. We put one group in the dark, one in the light, one group had an altered diet, and the last group was the control. Then we tested the web strength with paper clips (placing clips on a thread of web till it broke). Each group was fed six crickets. The Dark Group: The spiders were left in the dark for the duration of the project. They were fed crickets. The Light Group: They had a 10 watt aquarium light on them for the duration of the project. They were fed crickets. The Diet Group: We took 0.5 grams of a Centrum vitamin and mixed it with 15.8 grams of water, we then dipped live crickets in them for the spiders to eat. The had a normal day and night light cycle. The Control Group: This group was left alone, they had a normal cricket diet and day and night light cycles. After the three weeks we used a pair of tweezers, swirled it in a single web, took a thread and tested its strength by placing paper clips (each 0.4 grams) on them till it broke. We repeated this three times for each group. Materials used: Twenty-four spiders, several dozen crickets, 10 watt light, Centrum vitamin, water, four cages, paper clips (0.4 g each), toilet paper rolls, straws, tweezers, and electronic weight scale.	
Results Light Group was weakest and held an average of 4 paper clips. The Dark Group was strongest and held an average of 13.3 paper clips. The Diet Group was second weakest andheld and average of 4.3 paper clips. The Control Group was the second strongest with an average of 6.6 paper clips.	
Conclusions/Discussion	
Summary Statement Using different stresses on spiders to see the outcome of their web producing and web strength.	
Help Received Dr. Sigrid Reinsch; helped take photos with her equipment at her lab	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Elysse M. Applebaum	Project Number S1402
Project Title The Telltale Heart: The Effect of Various Stimulants on the Heart Rate of Daphnia magna	
Objectives/Goals Problem Statement: Which stimulant will initially raise the heart rate of Daphnia the most, and which will stimulant will raise heart rates the most over time: nicotine, caffeine, or Ritalin? Hypothesis: I think that the Ritalin will affect the heart rate the most, since it is a controlled substance and therefore is probably the most potent.	
Abstract Methods/Materials Materials: 12 250 mL beakers, 1 Wards set of large Daphnia magna for 35 students, 1 Bag of Scotts Sphagnum Peat Moss, 6 Slides with depressions and glass slide covers, 1 Container Ritalin pills, 1 Compound bifocal microscope, 1 Container of Roti-Rich Liquid Invertebrate Food, 12 Pipettes, 1 Rite Aid Extra Strength Stay Awake! (caffeine pills), 1 Carton of Marlboro Filter Cigarettes (nicotine), Hot tap water/pot/stovetop, 1 Filter Procedure: A. Fill 12 250-mL beakers with 6 mL peat moss. Add 200 mL hot tap water. Allow solution to stagnate overnight. Designate 3 beakers each for caffeine, nicotine, Ritalin, and the control. B. Add 5-10 Daphnia to each beaker. Add one drop of Roti-Rich Food to each beaker 3 times a week. C. Crush caffeine pills and Ritalin and add 10 mg, 100 mg, respectively, to 1 L water to make a 10 ppm, 100 ppm, and solution. Make a tea out of the cigarettes, and boil off the hydrocarbons and filter the brew. Then add 300 and 3 mL, respectively, to 300 mL containers of water to create 100,000 and 10,000 ppm (the nicotine is not likely as concentrated as the pills). D. Observe Daphnia from each solution under the microscope prior to adding the stimulants and record it in the data. Count the heartbeat for 10 seconds and multiply by 6 for beats/minute. Add one drop of the nicotine, caffeine, or Ritalin solution, observe the change in heart rate, and record it in the data. Add 10 mL of the higher concentration to 1 beaker, 20 mL to the second and 15 mL of the lower concentration solution to 2 beakers for each respective test group. Measure the heart rates again after 24 hours.	
Results Results: Initially Ritalin raised the heart rate the most, but after 24 hours the beakers with the nicotine/tobacco brew still had high, consistent heart rate elevation.	
Conclusions/Discussion Conclusions: Ritalin will raise the heart rate the most initially, but a nicotine/tobacco brew (e.g. cigarettes) will stimulate the heart rate most during extended exposure.	
Summary Statement Observe how different concentrations of the stimulants caffeine, nicotine, and Ritalin affect the heart rate of Daphnia upon initial exposure and 24 hours later.	
Help Received Mr. Paul Hunt and Christine Yang provided advice/equipment; Dad (Dr. Jay Applebaum) provided the microscope, wrangled the Daphnia, took digital photographs, obtained Ritalin; Mom purchased cigarettes and caffeine pills; Dad and my sisters Dana and Nicole timed 10-sec intervals on timer while I counted	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Amanda G. Berry	Project Number S1403
Project Title What Is the Optimal Dose of NaHCO(3) in a Bupivacaine Intrathecal Labor Anesthetic? Preparing for a Clinical Trial	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The chemical properties of the local anesthetic bupivacaine (a weak base), the physiology of NaHCO₃ in the CSF and the clinical literature all suggest adding bicarbonate to the cerebral spinal fluid (CSF) concurrent with the administration of intrathecal bupivacaine will significantly increase the duration of the anesthetic, an important advantage for labor analgesia. The objective of the project is to estimate the dose of NaHCO(3) needed to be used in a clinical study to answer the question, can NaHCO(3) significantly increase the duration of analgesia in an intrathecal bupivacaine anesthetic.</p> <p>Methods/Materials The relevant CSF volume was estimated to be 20mls and the optimal ph was assumed to be 7.45. The Henderson Hasselbalch equation predicts the unionized form of bupivacaine (the active form) will increase by 37% if the pH is raised from the normal CSF pH of 7.3 to 7.45. Using a synthetic CSF and a pH adjusted CSF a pH titration assay using a blood gas analyzer was done with 8.4% NaHCO(3).</p> <p>Results The volume of NaHCO(3) required to raise the CSF pH to 7.45 was .175ml and .17ml respectively.</p> <p>Conclusions/Discussion These volumes can be used as a starting point for a clinical trial where analgesia duration and CSF pH changes can be measured.</p>	
Summary Statement What is the optimal volume of 8.4% NaHCO(3) to be added to the subachnoid space to test the hypothesis: can NaHCO(3) be used to increase the duration of analgesia in an intrathecal bupivacaine anesthetic used for labor.	
Help Received I used the lab equipment at Salinas Valley Memorial Hospital and consulted with the Pathology, Neurology, and Anesthesia departments.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Sara A. Bryant	Project Number S1404
Project Title Regulation of Receptor Expression by Thyroid Hormone and Methoprene Acid	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to determine the affects of Methoprene acid exposure on 3T3 cells. The objective is to expose the two hormones, T3 and Methoprene Acid, to the 3T3 cells (Mouse fibroblasts) and determine if the receptors are actually expressed, and if the two hormones alter the expression of these receptors.</p> <p>Methods/Materials Cell Culture-3T3 cells were grown in culture medium with serum at 370C. Cells were removed from the flask with trypsin and counted with a hemacytometer. The same number of cells were plated into each well of a 24-well tissue culture plate. After 24 hours, the test solutions were added to each well (10⁻⁷ M MA and 10⁻⁴ M T3.</p> <p>cDNA Synthesis:</p> <ol style="list-style-type: none">1. Detach cells and wash once with cold PBS buffer.2. Count the number of cells using a hemacytometer.3. Add ice-cold Cell Lysis II Buffer, mix, and incubate for ten minutes4. Add DNase5. Incubate at for 15 minutes.6. Inactivate the DNase7. Heat Denaturation of the RNA template8. Reverse Transcribe RNA<ol style="list-style-type: none">a. Assemble mixture in microfuge tube then mix gentlyb. Heat for 3 Minutesc. Place reaction on ice for 1 min; centrifuge briefly and place back on ice.d. Add the remaining RT reagents, then mix gently ande. Incubate for 15-60 minutesf. Incubate for 10 min to inactivate the reverse transcriptase.g. Store reaction at -20(C <p>PCR Amplification and Gel Electrophoresis</p> <p>Results Unexposed 3T3 cells express RXRg at detectable levels by using PCR. Unexposed 3T3 cells do not</p>	
Summary Statement the regulation of receptor expression by two hormones: Thyroid Hormone and Methoprene Acid	
Help Received Father helped teach techniques, Dr's in laboratory helped teach techniques and lab manners.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Alicea Cock- Esteb	Project Number S1405
Project Title The Effect of Different Levels of Cigarette Smoke on the Wet and Dry Mass and Quality of Growth of Radish Plants	
Objectives/Goals My experiment was conducted primarily to experience first hand the effects of cigarette smoke as well as possible types of pollution, such as car exhaust, on plants.	
Abstract Methods/Materials In order to set up the experiment, I put together three small greenhouses, that each housed 25 plants, one for each level of the independent variable. They were exposed to cigarette smoke as follows: no cigarette exposure, exposure to one cigarette of smoke every other day, and exposure to one cigarette of smoke every day. Every day I used a rating system to find the qualitative value for every single plant. After the experiment I recorded the wet mass of every plant. I dried the plants for 96 hours and measured the dry mass of all of the plants.	
Results By finding the median of the qualitative data and using an ANOVA test I determined that the plants with exposure to cigarette smoke every day statistically were less healthy than the plants that were exposed every other day. The plants that were not exposed to smoke at all had a median ranking of four points, the plants exposed to smoke every other day had a median ranking of three points, and the plants exposed to smoke every day had a median ranking of one point. I looked at the mean of the wet mass of the plants (Plant A- 0.269 g, Plant B- 0.166 g, Plant C- 0.136 g), and the results the Analysis of Variance inferential test on the dry mass, (Plant A- 0.036 g, Plant B- 0.035 g, Plant C- 0.020). When conducted, the results allowed me to accept my research hypothesis with a 99.99% confidence level.	
Conclusions/Discussion This experiment was conducted to determine if cigarette smoke has an effect on plant growth. By collecting and testing the qualitative ranking, wet mass, and the dry mass after fourteen days, it was statistically concluded there was a difference between the results of each of the levels of the independent variable. The plants with one burned cigarette every day were worst off in terms of growth while the plants exposed to no cigarettes at all were the best well off. This is true due to the particles of the smoke invading in the plants and blocking the nutrients from entering the plants correctly. Smoke does affect the growth and mass of plants.	
Summary Statement I tested the exposure of different levels of cigarette smoke on the growth and health of plants.	
Help Received My advisor, Millie Hackworth, and my sister, Hillary Emer, both helped edit my write-up. My father, Richard Esteb, purchased the materials.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Daniel T. Doyle	Project Number S1406
Project Title The Caffeine Craze	
Abstract Objectives/Goals My objective was to learn if caffeine consumption has an effect on a person's typing speed and accuracy. Methods/Materials Materials used in my project include 7 2-liter bottles of Diet Coke, 7 2-liter bottles of Caffeine-Free Diet Coke, 50 16-oz. disposable plastic cups, computers and keyboards, 10 floppy disks, 2 sample pages for typing tests, and a stopwatch. For the testing of my subjects, I first gave all 50 subjects a preliminary, 2-minute typing test. 25 test subjects then drank 16-oz. of Diet Coke (experimental group), and 25 other test subjects drank 16-oz. of Caffeine-Free Diet Coke (control group). Each subject was told to consume the beverage in less than 3 minutes, and they then waited approximately 30 minutes. After the waiting period, test subjects were given another 2-minute typing test (of a different page so as not to learn the selection), and analysis of these results then followed. Results The average increase in words per minute of the control group was 2.28 words per minute, whereas the average increase in the experimental group was 9.2 words per minute. On average the experimental group increased their speed by 6.92 words per minute more than the control group. The accuracy of the experimental group decreased by 1.33% more than that of the control group, but these numbers do not provide definitive results. These results pertain to my objective in supporting half my hypothesis that caffeine consumption does have an effect on a person's typing speed, but does not support the other half of my hypothesis that caffeine consumption has an effect on a person's typing accuracy. Conclusions/Discussion The consumption of caffeine moderately increases the number of words per minutes typed, but has a minimal effect on the number of errors typed. This conclusion supports half of my hypothesis. This information expands our knowledge of the category subject in that it indicates that caffeine can be used effectively as an aid to increase typing productivity.	
Summary Statement My project was to determine if caffeine consumption has an effect on a person's typing speed and accuracy.	
Help Received Mother helped in research and testing.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Christine Haas	Project Number S1407
Project Title Buckeye Battles On: Effects of a Natural Toxin on Mosquito Larvae	
Objectives/Goals The purpose of this experiment was to determine the effects of a natural toxin derived from buckeye seeds on mosquito larvae. I live in Wonder Valley where mosquitoes are a health threat (West Nile Virus, Canine Heartworm, etc.) and there is no mosquito abatement. The residents don't like using chemicals to eliminate the mosquitoes because of the livestock roaming the open range. I wanted to find a "natural" solution to our problem. My hypothesis was that each of strength of the buckeye toxin would have some effect on mosquito larvae, even the 6.25%. It also stated that the LC50 will be between the range of 25% and 12.5%.	
Abstract I used buckeye seeds because it's native to Wonder Valley. The livestock tends to leave them alone. After creating the buckeye toxin, I measured different strengths for two experiments. I used four containers for each strength and the control. I placed ten mosquito larvae in each container.	
Methods/Materials I used buckeye seeds because it's native to Wonder Valley. The livestock tends to leave them alone. After creating the buckeye toxin, I measured different strengths for two experiments. I used four containers for each strength and the control. I placed ten mosquito larvae in each container.	
Results Experiment #1 The 50%, 75%, 100% toxin had the same effects. I reached total kill on day one. The 25% toxin was less effective. It took four days to reach total kill. By day four, 12.5% of the larvae in the control had died. Experiment #2 It took two days for the 50% to reach total kill. It took five days for the 25% to reach total kill. The 12.5% reached total kill on day five. The 6.25% was the least effective. By day seven, it had killed 92.5%. By day seven, 17.5% of the larvae had died in the control. My LC50 as of day one was 18.9%, day two 10.1% and day three 6.9%.	
Conclusions/Discussion I believe the use of buckeye seeds in vernal pools could be helpful to Wonder Valley residents by eliminating or reducing the population of disease carrying mosquitoes.	
Summary Statement My project was on the effects of a natural toxin derived from buckeye seeds on mosquito larvae.	
Help Received Used lab equipment at Bio Research under the supervision of Dr. Reed Kirkland, and Mother helped assemble board.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Tanzib Hossain	Project Number S1408
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Project Title Strychnine Antagonism of Glycine Receptors Expressed in Xenopus laevis Oocytes

Objectives/Goals Alcohol, the major drug abused in the United States today, affects over 18 million people and is the leading cause of accidental deaths in the 15-24 year age group. Its effects on the body are well known, but how those effects are mediated is a mystery. Glycine has been found to be a main player in alcohol responsiveness in the spinal cord. It has been previously observed that increased atmospheric pressure has an inhibitory effect on alcohol response on glycine receptors. The purpose of my project is to establish a control mechanism for testing under pressure to show that when pressure inhibits ethanol responses at these receptors it is not actually altering the way glycine binds to the receptor or any other baseline receptor function. This shows that the data that is obtained in other pressure experiments are valid and not caused by pressure changing the physiology of the receptors themselves.	Abstract
Methods/Materials Experiments were conducted with hyperbaric two-electrode voltage clamps using the Xenopus expression system, which monitors the current flow through the Glycine receptors. Oocytes expressing alpha 1 homomeric Glycine receptors are clamped at #70mV and tested with EC10 concentrations of Glycine in the absence and presence of 50 nM and 100 nM Strychnine, which works by competitively antagonizing the effects of Glycine, at control and experimental atmospheric conditions.	
Results Strychnine caused a concentration dependent antagonism of Glycine receptor function. The 50 nM concentration of Strychnine antagonized the Glycine effect to 41.3±5.4% (n=8) of the EC10 Glycine response and the 100 nM concentration of Strychnine antagonized the Glycine effect to 24.8±6.2% (n=4) of the EC10 Glycine response. The two concentrations of Strychnine were then tested at air (1 ATA) and pressure (12 ATA) conditions. The results showed that 50 nM Strychnine antagonized the Glycine effect to 47.0±2.4% (n=3) and 48.1±0.5% (n=3) of the EC10 Glycine response at air and pressure respectively and 100 nM Strychnine antagonized the Glycine effect to 18.6±0.2% (n=2) and 19.2±0.8% (n=2) of the EC10 Glycine response at air and pressure respectively.	
Conclusions/Discussion The data shows that pressure does not have an effect on Strychnine binding on the Glycine receptor, therefore not actually altering the physiology of the receptor itself, which means that pressure can help find the binding site of alcohol.	

Summary Statement I am showing that pressure doesn't alter Glycine receptor function, which means that we can use pressure to help us find the binding site of alcohol in the central nervous system because pressure data is reliable.

Help Received Used lab equipment at the University of Southern California under the supervision of Dr. Daryl Davies and Dr. Ronald Alkana



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Jan M. Humphrey	Project Number S1409
Project Title Drosophila melanogaster RADIATE Results	
Abstract Objectives/Goals Having studied, for two years, mutant genes and characteristics that resulted from mutation, I have become curious about the causes of mutations. Various forms of radiation and accumulation of exposure to that radiation, have varying capability of causing genetic changes. For my third year study, it was my desire to study the effects of radiation, from a common source within most homes, to which people are frequently exposed. My study was designed to observe the effect of radiation from repeated exposure to television, on reproduction, genetics and frequency of recombination in <i>Drosophila melanogaster</i> . Given three linked loci, yellow body (y), a rough eye known as echinus (ec), and cut wings (ct), what is the effect of varying amounts of radiation, determined by distance from the source of radiation, on the reproduction, genetics, and the frequency of recombination in <i>Drosophila melanogaster</i> . Methods/Materials To test my hypothesis, crosses were made between phenotypically different <i>Drosophila</i> in front of a running television, data was recorded, calculations were made, and conclusions were stated. Results <i>Drosophila</i> located 6 inches from the source of radiation demonstrated 100 % fatality, 12 inches from the source of radiation demonstrated 100 % sterility, 18 inches from the source of radiation demonstrated genetic mutation, and 24 inches from the source of radiation had no observable effects. Conclusions/Discussion Through experimentation and observation, my data and conclusions disprove my hypothesis. Radiation from television was adequate to demonstrate observable effects on reproduction, genetics and the frequency of recombination in <i>Drosophila melanogaster</i> .	
Summary Statement This project studied the effect of varying amounts of radiation, determined by distance from the source of radiation, on the reproduction and genetics of <i>Drosophila melanogaster</i> .	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Erina Ishida; Maithreyi Raman	Project Number S1410
Project Title Rusted for Life?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of the project is to determine the effectiveness of various substances on the plant rust (phragmidium) in corn, beans, and morning glories. The substances, used for experimentation are beta carotene, vitamin B, and Vitamin K.</p> <p>Methods/Materials 5 morning glories, 5 beans, 5 corns, plant rust carcinogen, Beta Carotene plant supplement, Plantex (c) Vitamin B, Plantex (c) Vitamin K, Leeches soil.</p> <ol style="list-style-type: none">1. Attain 5 different seed packages for each of the following 3 plants.2. Plant the morning glory, corn and bean seeds on the ground in leeches soil, (5 feet apart). Leeches Soil (malnourished) works best to ensure proper results3. Water and grow the plants everyday to ensure survival.4. Wait till the plant grows 8 in. before proceeding experiment.5. Take the leaves of a rust-infected rose and apply it to the plants by direct application of the leaf to the plant. <p>REMEMBER: 2 of each of the 4 plants is to be controls. Control 1 is to have rust whereas Control 2 is to be kept away from the rust.</p> <ol style="list-style-type: none">6. Discard the leaves of the rust infected rose. Ensure that the Control 2 plants do not have ANY rust in them before proceeding.7. Wait for the symptoms of the rust disease to appear. Symptoms include yellow or red circular spots (app. 1/8 inch), unhealthy appearances, as well leaf spots8. Put beta carotene on 1 of each plant: morning glory, beans and corn. Do not apply anything any substance to Control 1 & 2.9. Repeat the previous step, this time using Vitamin B instead of beta carotene. Then repeat step 7, this time using Vitamin K instead of beta carotene. Observe and Record changes, if any, in the symptoms of the rust infected plants. Also, compare the controls for proper analysis. <p>Results The results attained from the experiment show that Beta Carotene (Vitamin A) helps assist all three of the plants grow better from the deterioration of the rust. Vitamin B help prevent the death of the rust in the corn much more efficiently than in the morning glory or the bean plants. Lastly, Vitamin K, although did help the rust subside slightly, did not work extremely well in the prevention of the rust but rather worked in the regeneration of the plant after the death of the rust.</p>	
Summary Statement Our project is designed to test effectiveness of various substances (Beta-Carotene, Vitamin B, Vitamin K) on rust in plants.	
Help Received Mr. Carl Babb (our science teacher) helped with procedure.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Haesue Jo	Project Number S1411
Project Title Because You're Worth It?	
Abstract Objectives/Goals The purpose of this experiment was to show that hair dye is damaging. The experiment was performed in order to demonstrate the weakening powers of dying one's hair. Methods/Materials The procedures which were followed include collecting hair samples, dying the hair, and measuring the width and strength of the hair samples. Three types of hair were taken and dyed three times using the same hair dye. Samples of hair after each hair dying session were kept as controls. Using a special microscope connected to a computer, the hairs' widths were measured. To test the strength of the hair, the hair was taped to two ring stands and a paperclip was hung by the hair with the point bending out. Washers of various weights were added to the paperclip until the hair snapped and however many weights the hair could hold showed how strong it was. The hair physically changed width-wise by getting thinner. Results My hypothesis that the thinnest hair would be most affected was incorrect. All the hair did get thinner and weaker. The thickest of the hair samples was most affected. Conclusions/Discussion In conclusion, the hair did get weaker by getting both thinner and weaker in strength. The thicker your hair is, the more it will be affected. Your hair is most damaged after the second dye because the first dye is just a one time thing and by the third time, the hair is so fried up, there is not really much more damage to be done.	
Summary Statement My project is about the effects of hair dye on different types of hair and the amount of times the hair is dyed.	
Help Received Sister drove me to Walgreens to buy glue, gloves, hair dye, and other supplies; Teacher provided with washers (weights) and ringstands; Mother drove me to hair salon to get some hair; Great Clips gave me some hair; Used computer/microscope at Oak Grove High School	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Marwa Kaisey	Project Number S1412
Project Title Brittlestar Bioluminescence: An Indicator of the Toxicity of the San Diego Bay	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The San Diego Bay's sediment and seawater are contaminated to levels that can be toxic to marine organisms. This study focuses on metal contamination and sublethal toxicity in organisms exposed to materials from the mouth and the back of the bay.</p> <p>Methods/Materials The brittlestar <i>Amphipholis squamata</i> was chosen as the model organism because of its ability to produce visible light. The intensity of this bioluminescence was used as an indicator of the organism's health; the brighter the light produced, the healthier the organism, and vice versa. Sediment and seawater were collected from different sites in the San Diego Bay and placed in a series of aquaria which contained the brittlestars.</p> <p>Results Metals accumulated and bioluminescence decreased in the organisms over the experimental period of six weeks. Although there is a greater concentration of metals in the back of the bay, the organisms placed in aquaria with sediment and seawater from the mouth of the bay showed the only significant decrease in bioluminescence.</p> <p>Conclusions/Discussion This discrepancy is due to the bioavailability of toxins; the metals in the mouth of the bay are more available than those at the back, which are adsorbed onto sediment particles (the back is more turbid). Furthermore, neurotoxicity, not general toxicity, was observed, and it was found that the sediment and seawater treatment, not the seawater treatment alone, is toxic.</p>	
Summary Statement This study focuses on metal contamination and sublethal toxicity in the San Diego Bay using the bioluminescence of brittlestars as a bioindicator of the toxicity of the bay's water and sediment.	
Help Received Project performed with the mentorship (and lab equipment) of Dr. Dimitri Deheyn of the Marine Biology Research Division of the Scripps Institution of Oceanography	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Terri N. King	Project Number S1413
Project Title Fungal Prevention and the Light Spectrum	
Objectives/Goals The Objective of this experiment is to discover if the growth of fungus can be retarded following to exposure to various colors of light.	
Abstract Methods/Materials The medium, bread, yields the test subject-Rhizopus Stolonifier; Zygomycota- that eventually growth to have a diameter of eight centimeter. Each of the subjects should be equal in size, shape, age and condition. Six filters with the colors: blue, red, yellow, green, black and transparent, are used to expose the fungus to specific lights. (This is to allow circulation of air to the mold) Place one teaspoon of water (in the form of eye-droplets) onto each sample Cover each sample with designated color filter. The Maytag Gemini cooking oven is use on all subjects simultaneously to control temperature (60 Degrees Fahrenheit) , humidity and degree of light~(40 watts). Placed in oven for 120 hours. Used Millimeter grid to measure growth every 12 hours.	
Results The extent to which the fungus grew, as well as the rate at which it grew, was moderated by the specific light. Under the yellow light, the mold sporangiophores growth was induced at a fast rate while it began to lose speed when required to grow sporangiophores. The Red lights halted the growth of the mold temporarily in comparison with the other molds. The full-spectral light allowed the mold to grow exponentially at a fast rate. The green light was temporarily halted during the first stage but formed sporangiophores rapidly. The blue light stimulated the growth of hyphae stems while limiting the germination and sexual reproduction of the mold. The mold under no light failed to reproduce during the trial.	
Conclusions/Discussion Through this experiment, I have observed that the various rays of light stimulate the growth of the fungus during different cycles of the growth cycle, thus slowing the process of growth. This can be seen in the sporadic rate of growth in various lights during various periods. The theory of colored light as a means of reducing the rate of mold growth may, in the future, be utilized by constructors of offices servicing the public, such as schools and hospitals, which must condense the spread of all maladies that induce sickness.	
Summary Statement This project measures the affect of various spectral lights on the growth of Fungus.	
Help Received Mother for transportation, Equipment from science and math coordinator at Upland Highschool; David Allen, Equipment from Edna Lee King, Academic and visual mentorship from Mr. Steve Levy, Academic mentorship from Dr. Aubrey King, Academic mentorship from Terry W. Hill, Ph.D., directorial	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Maren S. Le Va	Project Number S1414
Project Title Tardigrades and Lichen and Their Relationship to Vehicle/Industrial Emissions	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Because lichen and tardigrades are believed to detect the amount of pollutants in the air, I took lichen samples from trees in areas known to be heavily polluted and in areas known to be especially pollution free in order to test this theory. My hypothesis was that (1) there would be a direct correlation between the number of tardigrades per lichen sample and the percent of lichen cover on each tree, and (2) that there would be less lichen found with fewer tardigrades in polluted areas than in nonpolluted areas.</p> <p>Methods/Materials Lichen samples were collected from trees in known polluted and nonpolluted areas, using 100-circle grid to measure lichen cover on North-, East-, South- and West-facing surfaces. Of each sample, .1 oz of lichen was hydrated in 1 oz distilled water for 3 hours. Each lichen sample was then removed and excess water carefully squeezed back into bowl. Heavy materials sank to bottom. Water from top was removed with pipette, remainder pipetted into small petri dishes and observed under microscope, and number of tardigrades from each sample recorded.</p> <p>Results From my previous experiment, I determined that there was a 67-77% chance that the samples from the nonpolluted and polluted areas were not from the same population. However, as a result of my relatively small sample size, this was not a high enough percentage to completely support my hypothesis. Therefore I am in the process of repeating the experiment using a greater number of samples, and at this point do not have all of my results.</p> <p>Conclusions/Discussion From the information I have gathered thus far, I have determined that air pollution does have an effect on lichen and tardigrades.</p>	
Summary Statement My project is about proving or disproving that vehicle and industrial emissions have a direct effect on the numbers of tardigrades found in lichen.	
Help Received Mother drove me to various collection sites.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Christopher T. Lynch	Project Number S1415
Project Title The Effect of the Hormone Estradiol on the Thermo-Tolerance of Caenorhabditis elegans	
Abstract Objectives/Goals The purpose of my project was to investigate if <i>C. elegans</i> nematodes may be used as a bioassay to determine the health of an ecosystem. The human hormone estradiol is a common environmental water pollutant, and it was hypothesized that exposure to this contaminant would cause the nematodes to develop heat-shock proteins and survive longer under stress. Methods/Materials <i>C. elegans</i> nematode worms were grown from eggs to adults in 20 deg. C conditions, exposed to 10 uM and 10 nM concentrations of estradiol, and compared to control. Additionally, a strain known as TJ1052 was tested, which has a mutation that extends longevity in heat-shock conditions. Standard heat shock was conducted by transferring the worms into 35 deg. C incubators, then observing them under a microscope to check for survival. Results After 10 hours, the fraction of worms alive was not significantly different for either 10 uM ($p>0.06$) or 10 nM ($p>0.036$) estradiol compared to control, and was significantly less than the longevity of the TJ1052 strain ($p<0.03$). The viability of the nematodes was assessed by a novel mechanism using a green fluorescent nucleic acid stain (SYTOX). Conclusions/Discussion While my results showed no significant correlation between estradiol exposure and thermo-tolerance, a new method for evaluating vitality of nematode worms was tested using a fluorescent stain (SYTOX) that accumulated inside the dead worms. This new technique should save researchers significant time in future experiments.	
Summary Statement This project investigates <i>C. elegans</i> thermo-tolerance as a bioassay for xenobiotic environmental contaminants, and also describes a new method to assess nematode longevity by fluorescent microscopy.	
Help Received Summer lab internship at the Buck Institute. Standard nematode culture and handling procedures were explained to me by members of my lab. Assistance with growing worms to adult size, as this is a time consuming process and only so many worm transfers can be done at once by one person.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Henry L. Marr	Project Number S1416
Project Title Glucose as a Teratogen Affecting Cranial Neural Crest Migration in the Developing Chick Embryo	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Since infants of diabetic mothers are five times as likely as the normal population to be born with a birth defect, this project aims to determine if glucose itself plays a role in these malformations. If glucose does play a role, the goal is to examine how glucose is able to bring about these defects.</p> <p>Methods/Materials Fertilized chick eggs were incubated until proper stages were reached (stages 4, 7, or 8; Hamburger and Hamilton, 1955). Over 350 embryos were used in each control/experimental stage. Embryos were cultured either in vitro (stage 4) or in vivo (stages 7 and 8) and then subjected to varying amounts of glucose or sucrose (the control) through use of a Picospritzer. For studies involving uPA inhibition, a 1mM solution of Amiloride was added. Cultures were incubated for a further 24 hours to 7 days and then fixed in 4% Paraformaldehyde. Immunohistochemistry was performed on stage 4 embryos to label for the gene Hnk-1. Older embryos were examined visually using a dissection microscope.</p> <p>Results Embryos subjected to a 1.08M solution of glucose showed cardiovascular and craniofacial defects. 57% of embryos developing in 0.36M glucose showed some sort of craniofacial defects in contrast to the 8% in the control. A dominant craniofacial defect shown was open neural tubes. Inhibition of uPA showed dark labeling down the midline of the embryo suggesting that neural crest cells stayed premigratory. For stage 4 embryos, only 4% showed neural tube closure in contrast to the 100% closure rate of control embryos.</p> <p>Conclusions/Discussion Cardiovascular defects are significant in that these defects are seen in other teratogens. Also, results show that as glucose concentrations increase, so does the likelihood that an embryo will develop some sort of a defect. I had hypothesized that glucose is able to inhibit the migratory abilities of neural crest which brings about the defects and the results indicate that this hypothesis is valid. Inhibiting uPA allowed me to examine effects of neural crest inhibition and results suggest that embryos subjected to glucose do indeed have non-migratory crest. It is widely known that diabetics have a higher chance of giving birth to a defective child, but glucose (at higher than normal concentrations) has never been classified as a teratogen. This study initiates more studies hopefully leading to glucose being added to the list of known teratogens.</p>	
Summary Statement My project shows that glucose at higher than normal concentrations prevents the migratory abilities of neural crest cells which in turn brings about the developmental defects that are so much more common among infants of diabetic mothers.	
Help Received Dr. Mark A.J. Selleck at the USC Keck School of Medicine offered guidance, lab funding, and equipment; Mr. Duane Nichols at Alhambra High School watched over the project as a whole; My parents helped with transportation to and from my lab.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Marie-Josée S. Mont-Reynaud	Project Number S1417
Project Title Comparing Effects of 3 Non-Myeloablative Conditioning Regimens for Bone Marrow Transplantation on Mice w/ Bcell Lymphoma	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Allogeneic bone marrow transplantation (BMT) can cure patients with hematological diseases who are not curable by other treatments. Non-myeloablative conditioning before allogeneic BMT aims to decrease toxicity for the recipient and leads to the coexistence of host and donor blood cells. Non-myeloablative BMT is generally performed with additional cellular treatment (adoptive immunotransfer). Because little is known about the effects of non-myeloablative BMT on tumor reduction, we investigated three conditioning regimens in mice with BCL1 lymphoma. This study was designed to determine which conditioning regimen would be most suitable for use in future adoptive immunotransfer experiments.</p> <p>Methods/Materials Balb/c mice were inoculated with BCL1-gfp/luc tumor cells one week prior to conditioning. Three non-myeloablative conditioning regimens were used (aCD40L/TBI, TLI/ATS, Flu/TBI/Cy), followed by allogeneic BMT from C57BL/6 donor mice. Experiments determined the effects these regimens had on weight loss, tumor reduction, chimerism and survival. Tumor burden was assessed by bioluminescence (quantifying light emission from luciferase transfected tumor cells). Chimerism was measured by FACS.</p> <p>Results All conditioning regimens were able to achieve mixed chimerism. While in the Flu/TBI/Cy and TLI/ATS groups achieved 30% mixed chimerism 2 weeks after BMT, the animals treated with aCD40L/TBI regimen needed 4 weeks to achieve similar levels of mixed chimerism. Engraftment with mixed chimerism was stable in the TLI/ATS and aCD40L/TBI groups (> 180 days), while mixed chimerism was lost in the Flu/TBI/Cy group after 7 weeks. The Flu/TBI/Cy regimen was most effective in inducing a long lasting remission. Animals treated with TLI/ATS relapsed immediately after BMT. aCD40L/TBI treated animals experienced no disease relief. All mice treated with Flu/TBI/Cy survived throughout the observation period while BCL1 controls did not.</p> <p>Conclusions/Discussion Non-myeloablative conditioning regimens are expected to induce low toxicity with regard to weight loss, achieve mixed chimerism and have little impact on tumor reduction. The three non-myeloablative conditioning regimens yielded surprisingly different effects on weight loss, tumor reduction, chimerism and survival. Because of these differences, further studies will be performed with each of these regimens to see if they also affect the outcome of additional cellular treatment.</p>	
Summary Statement This study compared the effects of three different kinds of a special low-toxicity preparatory procedure for allogeneic bone marrow transplantation in a murine tumor model using bioluminescence imaging.	
Help Received used lab equipment at Stanford University under the supervision of Dr. Schimmelpfennig	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Alison M. Morales	Project Number S1418
Project Title Neuroprotective Efficacy of Therapeutic Progestins: Implications for Alzheimer's Disease	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine whether progestins synergize or antagonize the protective action of estrogen on hippocampal cell viability.</p> <p>Methods/Materials Hippocampal neurons were treated with steroids: 17 Beta Estradiol (a form of estrogen) and Progesterone, Norethindrone Acetate and Medroxyprogesterone Acetate (which are progestins) at a concentration of 10 ng/ml to test the neuroprotective effects of Hormone Replacement Therapy on neuronal growth and survival. The toxicity for the survival and protection experiments will be induced by high concentrations of glutamate. The number of intact cells are evaluated under a microscope and analyzed with the BioQuant imaging system. Indicators of cell death and survival including LDH and Calcein AM will be measured from the medium. Flourescent intensities using these assays were measured using a microplate reader and spectrophotometer, respectively. The extensity of damaged DNA in the neurons will be measured using the TUNEL reaction mixture with a flourescent microscope.</p> <p>Results Results of these experiments revealed differences in cell viability using different techniques. Using the Survival Studies technique, Calcein AM and TUNEL assays with Medroxyprogesterone Acetate there was a significant potentiation of cell death induced by excitotoxic glutamate. The LDH technique further revealed there were no significant differences in cell viability between the three progestin-treated neurons.</p> <p>Conclusions/Discussion The data suggests that under excitotoxic conditions, certain progestins induced neuroprotection while others do not. The results have important implications for the effective design of Hormone Replacement Therapy in maintaining cognitive functions and preventing Alzheimer's Disease.</p>	
Summary Statement My research focuses on the use of Hormone Replacement Therapy, which includes estrogen and progestin, as a preventative measure against Alzheimer's Disease.	
Help Received Used lab equipment under the supervision Dr. Roberta Diaz Brinton, USC.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Gail Moraru; Anna Winsemius	Project Number S1419
Project Title Like Water off a Duck's Back	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to observe the affects of crude oil on bird feathers, and then to wash the feathers, making a comparison between the effectiveness of a soap and a detergent for cleaning. Our hypothesis was that the crude oil would ruin the feathers hydrophobic properties, and that detergent would clean the feathers better than soap.</p> <p>Methods/Materials We collected feathers from the beach, pairing each feather with one of the same size and weight. We then applied oil to the pairs, observing the affects it had on the feathers. Then we cleaned one feather from each pair with soap, and the other with detergent in a series of tubs containing pre-determined ratios of the cleaning agent and water.</p> <p>Results Crude oil separated the barbs and barbules of the feathers, destroying the feathers' hydrophobic characteristics. Detergent cleaned the feathers more effectively.</p> <p>Conclusions/Discussion Our hypothesis was correct. Detergent is more effective for this procedure. Oil spills affect birds everywhere, with devastating results. Procedures to clean the birds must be taken in order to preserve their lives.</p>	
Summary Statement We observed the affects of crude oil on bird feathers, and compared the effectiveness of soaps and detergents for cleaning the oiled feathers.	
Help Received Crude oil recieved from Uncle	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Kingshuk K. Mukherjee	Project Number S1420
Project Title The Effect of Water Pollution on the Development of Bullfrog Tadpoles	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My objective is to determine if the pollutants in Lake Perris water are safe for the metamorphosis of bullfrog tadpoles.</p> <p>Methods/Materials The subjects were 61 bullfrog tadpoles. Five groups of tadpoles were tested, all with different ratios of pond water to lake water. Pond water was the control and was bought from a commercial laboratory supplies. To hasten metamorphosis four drops of thyroxine solution were added to each container. The outcome would be determined by mortality rate and growth rate of the tadpoles.</p> <p>Results The groups that achieved the lowest death rates and the highest growth rates were the tadpoles that were in the pond water. The tadpoles in the lake Perris water showed signs of growth retardation and eventually all died.</p> <p>Conclusions/Discussion My conclusion is that the pollutants in Lake Perris retard the growth and development of bullfrog tadpoles. I was able to witness a 100% mortality rate in the tadpoles that were in the Lake Perris water.</p>	
Summary Statement Lake Perris water pollutants are not conducive to the growth and metamorphosis of bullfrog tadpoles	
Help Received Father supervised the project, mother helped with the decorations on the display board.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Robert E. Norton	Project Number S1421
Project Title Auxins That Kill	
Objectives/Goals The objective is to find the effect of different solutions of auxin on three species of monocots and three species of dicots. Specifically, I will be observing seedlings.	
Abstract Methods/Materials I tested the dicots fava, carrot, and radish, and the monocots corn, wheatgrass, and rye. Each species has their own tray, each tray with 4 sections, and each section has 10 seeds. Each of the 3 sections are sprayed with different solutions of auxin in; 1:100, 1:1000; 1:10,000, and the fourth is sprayed with tap water as the control. Section one of all the plants was sprayed with the 1:100 solution, section two of all the plants was sprayed with the 1:1,000 solution, section three was sprayed with the 1:10,000, section four was the control sprayed with water.	
Results All species eac had a different response to the auxin, 1:100 solution hurt that fava beans while the 1:1,000 and 1:10,000 concentrations stayed relatively equal to the control. The auxin solution 1:100 and 1:1,000 damaged the carrot seeds while solution 1:10,000 growth was almost parallel to the control. None of the radish seeds responded severely negatively to the auxin solution however solution 1:10,000 did help elongate the seeds while solution 1:100 and 1:1,000 were relatively the same. The auxin did not severely effect the monocots in either experiment.	
Conclusions/Discussion Auxins are usually used to grow seedless fruit and act as herbicides on dicots in monocot crops. Some of the auxin solutions did act as a herbicide toward the dicots however some also did elongate the dicots species. This may potently mean that some auxin solutions could be used to help dicots and are not appropriate to be used as herbicides on dicots.	
Summary Statement I observed the growth rate and effect of auxins on monocots and dicots.	
Help Received Sunny LeMoine helped me edit my project	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Shirin I. Pillay	Project Number S1422
Project Title Examination of Regeneration in Mammalian Auditory Hair Cells	
Abstract Objectives/Goals Many animals, excepting mammals, can regenerate sensory auditory cells (hair cells). The objective of this project examined various concentrations of retinoic acid on the potential generation of hair cells in transgenic mice cochleae. Methods/Materials Tissue culture was collected, placed in-vitro with varying concentrations of 1×10^{-8} mM retinoic acid, and incubated at high humidity. Photos were taken for both initial and secondary cell location and population. The experiment was repeated to establish a base survival population for control conditions and each concentration of retinoic acid. A comparison on the effect of retinoic acid between segmented portions of the cochlea was also done. Results Most of the Green Fluorescent Protein-expressing cells had migrated out of the cochlear epithelium. Those cells within the cochlear epithelium were found to be large GFP-expressing masses, as opposed to individual cells. However, it was found that within the basal portion of the cochlea, a higher number of cells survived with respect to the retinoic acid concentration. A two-fold population increase in the hair cell survival was noted when comparing retinoic acid concentrations of 0.5 ul and 5 ul, supporting that retinoic acid encourages survival of sensory cells within the cochlear basal segment. Conclusions/Discussion Previous studies had indicated the presence of retinoic acid during avian and reptilian hair cell regeneration. Under the introduction of retinoic acid, the number of hair cells within the basal segment of mice cochlea survived at a rate of 15% with 5 ul retinoic acid, as opposed to 4% survival under control conditions. Though the results do not explicitly support the hypothesis of regeneration, it does support retinoic acid having a beneficial effect on the survival rate of the cells.	
Summary Statement This project examines a potential regenerator of the cochlear auditory hair cells, which, if found, would eliminate the need for hearing aids.	
Help Received Used lab and equipment at House Ear Institute under supervision of Dr. Patricia White	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Nicole L. Sheaffer	Project Number S1423
Project Title Effects of Aluminum on Leaf Consumption in Porcellio laevis	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I wanted to determine that higher concentrations of aluminum in leaves has a negative correlation to the consumption of those leaves.</p> <p>Methods/Materials I used an oven to dry the leaves and I then added 10 ml of aluminum solution and distilled water to each cluster of 0.10 g of leaves. Then I determined how the aluminum affected the consumption by counting the fecal pellets.</p> <p>Results My data supported my hypothesis with the exception of a "spike" in the leaves that contained 1,000 micrograms of aluminum.</p> <p>Conclusions/Discussion The "spike" in the 1,000 microgram concentration led me to believe that a trace amount of aluminum is either wanted or needed by the sowbugs.</p>	
Summary Statement I put different concentrations of aluminum into Bougainvillea leaves and tested the consumption of the leaves in Porcellio laevis (sowbugs) in an attempt to determine if aluminum affects the consumption rate of the sowbugs.	
Help Received Mr. Nordell helped me to collect the leaves and bugs, and to help me mix the aluminum solution; Sister helped to count the fecal pellets for one of the trials while I was away.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Shannon E. Smith	Project Number S1424
Project Title The Use of Compounds from Serratia marcescens in Fungal Inhibition	
Abstract Objectives/Goals The objective was to find if biologically active compounds isolated from Serratia marcescens compromise the integrity of Candida albicans and Pythium ultimum membranes and cause the loss of potassium, therefore inhibiting the growth of these fungi. Methods/Materials Cultures of MSU-97 S. marcescens were grown on plates and plugs of P. ultimum were added to the plates. The zone of clearing was noted. During a second experiment, C. albicans were grown and colony forming units (CFU) were measured using a spectrometer and calculated into CFU. C. albicans was tested against yeast extract peptone dextrose medium, used to culture S. marcescens MSU-97, a methanol control, and compounds eluted from the solid phase extraction cartridges with 50% and 75% methanol were concentrated 500-fold. In a third experiment, cells of C. albicans were treated with the extracts, and the loss of potassium into the external solution was measured. Results Yeast extract peptone dextrose medium, used to culture S. marcescens MSU-97, caused a 27% decrease in growth of the fungus C. albicans, compared to a 23% decrease in a methanol control. When compounds eluted from the solid phase extraction cartridges with 50% methanol were concentrated 500-fold, the number of CFU of C. albicans were reduced by 50%. Compounds eluted with 75% methanol were concentrated 500-fold and reduced CFU by 70%. Separately, cells of C. albicans were treated with the four extracts, and loss of potassium ions into the external solution was measured to determine if inhibition of growth was related to loss of cell membrane integrity. Treatment of C. albicans with a partially purified fraction from S. marcescens promoted the release of potassium ions from the C. albicans cells. The culture released .65mg/L of potassium, while killed cells released 1.16mg/L. The methanol control released .72mg/L of potassium while the serratamolide released .93mg/L. The 50% fraction released 1.05mg/L of potassium, while the 75% fraction released only .72mg/L. Also, when S. marcescens was plated using another fungi, P. ultimum, a zone of clearing was observed and noted as inhibition of growth. Conclusions/Discussion Results showed that while compounds in S. marcescens inhibit growth of C. albicans, the mode of action is different for each fraction of the compounds. S. marcescens also inhibited the growth of P. ultimum.	
Summary Statement My project is about whether S. marcescens compounds inhibit growth in fungi shown by the zone of clearing and number of colony forming units, and whether the mode of action is damage to cell membrane integrity shown by released potassium.	
Help Received Used lab equipment at University of San Diego under supervision of Dr. Steven Morrison	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Arjun A. Suri	Project Number S1425
Project Title The Anti-Oxidative Effects of Curcumin on Memory Curves of Planaria: A Model for the Treatment of Alzheimer's Disease	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Curcuma longa has been known as an anti-biotic and anti-inflammatory agent in Ayurvedic medicine for 3000 years. Derived from the herb, turmeric, it is now being discovered as an anti-oxidative agent 300 times stronger than Vitamin E. Curcumin has been proven in many cases to suppress tumor-growth; meanwhile, demographic statistics show that South Asian populations have the lowest rates of Alzheimers. The objective of my study is to determine whether curcumin delays the degradation of neurons, or neural apoptopsis, demonstrated by the decline in the conditioned response of planaria, using this as a model for the pathology of neurodegenerative diseases, such as Alzheimers. My hypothesis states that there will be a direct, dose-related improvement in the retention of memory of the planaria.</p> <p>Methods/Materials In my first experiment, I created 6 concentrations of curcumin and placed 20 planaria in each concentration: 100, 250, 500, 1000 and 2000 ppm (parts per million). After removing planaria with genetic predispositions to swim in one direction, I conditioned them to turn left in a T-maze through use of an electric shock. I measured this sustained response over a seven day period. I repeated the experiment with lower dosages, including 25, 50, 100, and 200 ppm concentrations.</p> <p>Results The results show a steady dose-related response in lower doses of curcumin, from 25 ppm to 200 ppm concentrations. The 500 ppm group outperformed the control group, although higher doses negatively affected the planaria. The linear regression done on experiment 2 shows a very high correlation between concentration and memory retained, with a correlation coefficient of .97. Also, the Two-sample T-Test suggests that the results are statistically significant.</p> <p>Conclusions/Discussion The plausible mechanism to explain my results suggests that curcumin acts as a scavenger of free radicals and oxidants that lead to the deterioration of neurons, a pathology postulated to occur in Alzheimers and other neurodegenerative conditions. This study suggests that curcumin may be used as a compound for the treatment of Alzheimers disease, possibly more effective than Ibuprofen, the leading anti-inflammatory agent, as evidenced by its ability to delay the process of memory loss in planaria. Curcumin may be studied as either a preventative or delaying treatment of Alzheimers disease through future studies conducted on elderly populations.</p>	
Summary Statement The objective of my study is to determine whether curcumin improves memory curves in planaria, using this as a model for the degradation of the nervous system in the pathology of neurodegenerative diseases, such as Alzheimers disease.	
Help Received Mr. Garabedian assisted in purchasing the planaria and providing laboratory equipment for my experiment; Manik Suri provided access to the Harvard database for my research; Dr. Hiremath at Harvard University gave me advice in choosing a species for my study.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Erik W. Toh	Project Number S1426
Project Title Antiviral Activities of Phyllanthus niruri and Phyllanthus urinaria: Treating Hepatitis B with Herbal Medicine	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Hepatitis B is one of the major diseases inflicting the human population. Conventional treatment with interferon-alpha is very expensive and has many serious side effects. Alternative herbal medicine using extracts of Phyllanthus niruri (amarus) and Phyllanthus urinaria has been reported to be effective against hepatitis B and other viral infections. The purpose of this study is to quantitatively determine the antiviral effect of these herbs in a well defined in vitro system.</p> <p>Methods/Materials Antiviral activity induced by the herbal extract was measured as inhibition of the cytopathic effect (CPE) which normally results from infection of untreated MDBK cells with vesicular stomatitis virus (VSV). Aqueous extract of P. urinaria (prepared from dried herbs) and P. niruri were serially titrated and their activities were compared to a positive control, interferon-alpha2b.</p> <p>Results Pretreatment of MDBK cells with interferon-alpha2b, as expected, inhibited the CPE from VSV infection dose-dependently. The extract of P. niruri produced a concentration-dependent antiviral activity at dilutions 1:2560 to 1:160. Maximal activity (70% inhibition of CPE) was found at 1:160 dilution. The extract of P. urinaria was less effective; the highest tolerable concentration (1:80 dilution) produced a 28% inhibition of CPE.</p> <p>Conclusions/Discussion A cell-based assay has been developed to examine the antiviral effect of herbal extracts from the genus Phyllanthus. Aqueous extracts of P. niruri and P. urinaria protect MDBK cells from viral infection. In addition, they do not display cytotoxicity in uninfected normal cells. These findings support clinical studies by others that regular intake of these herbal supplements may be beneficial for chronic hepatitis B patients.</p>	
Summary Statement The aqueous extract of Phyllanthus niruri and Phyllanthus urinaria inhibits the cytopathic effect (CPE) that results from infection of MDBK cells with vesicular stomatitis virus (VSV).	
Help Received Used cell culture reagents and lab facilities at Phage Biotechnology Corp (Tustin, CA) under the supervision of Dr. Wu. Father purchased Chanca Piedra (aqueous extract of P. niruri; Raintree Nutrition, TX) and dried bulk P. urinaria (Tropilab, Suriname).	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Sarah E. Trumble	Project Number S1427
Project Title It Doesn't Take a Rocket Scientist	
Abstract Objectives/Goals My objective was to determine what effect, if any, perchlorate would have on Humpback fly larvae. Methods/Materials Four petri dishes were filled with a food mixture containing water and diet flakes. Four others contained water, diet flakes, and 500 ug/g perchlorate. The last four contained water, diet flakes and 2000 ug/g perchlorate. Ten larvae were placed in each petri dish and observed. Size and date of pupation were recorded. Results The larvae exposed to 500 ug/g perchlorate grew larger than those in the control, but those exposed to 2000 ug/g were visibly stunted. Pupation, however, took longer for all the larvae exposed to perchlorate. Conclusions/Discussion This project showed that larvae exposed to perchlorate take longer to mature, but size will vary, depending on the amount of exposure. Humpback flies help to decompose plant material, especially lettuce. Lettuce fields in California have recently been contaminated by perchlorate thanks to irrigation water from the Colorado Aquaduct. This leads to the conclusion that Humpback fly populations will be adversely affected and unable to decompose the proper amount of plant material, tilting nature's balance. This experiment does not bode well for humans, either. Perchlorate has been found in taps all over California, and also affects human's growth and metabolism - especially unborn children.	
Summary Statement This project is about the effect of perchlorate on humpback fly larvae.	
Help Received Used lab equipment at UCR under supervision and with the assistance of Dr. John Trumble.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Joshua C. Williams	Project Number S1428
Project Title No Pain with Gain	
Abstract Objectives/Goals To see if aspirin would have an affect on the development of mealworms. Methods/Materials Aspirin will have an affect on the development of mealworms. Results Mid-concentration of aspirin had an overall higher percentage of survivors. Conclusions/Discussion Aspirin did help out in some ways.	
Summary Statement To feed mealworms a high, medium, and low concentration of aspirin and see what effects take place.	
Help Received Dr. Robert Kirk and Mr. Mark Timm	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) LaRena M. Woods	Project Number S1429
Project Title The Effects of Allylamine in Building Resistance in Drosophila	
Abstract Objectives/Goals The chemical allylamine oxidizes in the <i>Drosophila melanogaster</i> body by an amine oxidase function producing acrolein. Then acrolein, by bindings on its electrophilic sites, can react with the flies' DNA resulting in mutagenicity or react with protein causing a loss of protein function. The goal of this project was to expose generations of <i>D. melanogaster</i> to allylamine to determine if a loss of genetic function will cause the flies to become resistant to allylamine. Methods/Materials Many generations of the flies were exposed to different concentrations of allylamine through culture mediums. Then generations taken from the control group and first round concentrations of 1mM and 2mM of allylamine were tested separately in second round allylamine concentrations of 0mM, 2mM and 4mM. After 24 days, the flies were counted and the results between the first round concentrations and second round concentrations were compared. Results It was hypothesized that if several generations of the flies were exposed to allylamine in its culture medium, they would develop a loss of amine oxidase function and an increased resistance to the allylamine. The data and statistical analyses indicated that there was a significant relationship between first round concentrations and the survival rate of the flies after being exposed to second round concentrations. Furthermore, the flies that had been previously exposed to first round concentrations of the allylamine survived in greater numbers, with a significantly greater mean, than did those in the control group that were not exposed to allylamine. These data suggest that the flies developed some resistance and loss of amine oxidase function. Conclusions/Discussion The overall results of this experiment lead to the conclusion that <i>Drosophila melanogaster</i> did build a resistance to allylamine when many generations were exposed to it in culture medium. They also indicate that this resistance is the result of a loss of amine oxidase function, which is favorable to its survival.	
Summary Statement This project explores the ability of <i>Drosophila melanogaster</i> to adapt to the potentially negative impacts of allylamine by exposing numerous generations of the flies to various concentrations of allylamine and observing their survival rate.	
Help Received Used lab space and some equipment at The Scripps Research Institute under the supervision of graduate student, Warren Lewis.	



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Katelyn A. Yoder	Project Number S1499
Project Title E. coli Resistance to Ampicillin	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this study was to test the resistance of E.coli to Ampicillin through the process of transformation in the DNA. The hypothesis of this pharmacology experiment identifies that if transformation in DNA of the E.coli exists due to exposure to a low (10mg/ml), medium (37.5mg/ml) and high (75mg/ml) dosages of Ampicillin, the E. coli bacterium would become resistant to the antibiotic Ampicillin within 3 generations.</p> <p>Methods/Materials Through testing procedures, I tested the E.coli bacterium in Ampicillin culture to find out if change in the DNA structure would take place within three generations. Culturing E.coli in Ampicillin strengths of 10mg/ml, 37.5mg/ml and 75mg/ml the resistance of growing the E.coli bacterium was charted. Five trial plates tested all three strengths of Ampicillin, along with a control group in the 1st generation. Multiple large colonies of growth of E.coli from the 10mg/ml in the 1st generation were plucked and cultured on the 2nd generation 5 trials in each strength of Ampicillin. Small and spotted colonies of E. coli growth were plucked from the 37.5mg/ml 2nd generation and was cultured in the 3rd generation, which had 3 trials each of 37.5mg/ml and 75mg/ml strengths.</p> <p>Results The 1st generation results indicated that E.coli grew abundantly in multiple large colonies in all 5 trials of 10mg/ml strength of Ampicillin in the 1st generation. The results indicate that the E.coli grew abundantly in the 37.5mg/ml by the 2nd generation, as small and spotted colonies of E.coli were grown on all 5 trial plates. A further test revealed that in the 75mg/ml strength of Ampicillin the E.coli grew abundantly in small colonies by the 3rd generation in all 3 trials plates.</p> <p>Conclusions/Discussion In conclusion the data supports my hypothesis in that E.coli will come resistant to Ampicillin within 3 generations by transformation of the DNA. Importance of this study indicates that to avoid transformation of DNA in bacterium it is important to kill the bacterium with a proper dose of antibiotics the first time it is treated so the bacterium does not become resistant to antibiotics through DNA transformation in future generations. In further studies I would like to grow the Ampicillin resistant E.coli bacterium again and then try other antibiotics on this "superbug" strain to see which one kills it completely.</p>	
Summary Statement DNA in E.coli changes and becomes resistant to the Ampicillin antibiotic through the process of transformation.	
Help Received Mother helped with typing; Used lab equipment at University X under the supervision of lab assistant P. Meyer	