



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Muchang Bahng	Project Number J1501
Project Title How Do Different Types of Sweeteners Affect Yeast Growth?	
Abstract Objectives/Goals The objective of this experiment is to find out how different kinds of sweeteners may affect yeast growth. Methods/Materials Ten doughs with different kinds of sweeteners and two doughs for control were made. The doughs were put into jars and sealed. The height of the doughs were recorded after one hour and two hours. Each experiment was repeated 3 times. Results The average height (in cm) of glucose is 13.0; fructose 13.2; D-(+)-galactose 10.8; sucrose 12.3; D-(+)-maltose 10.3; lactose 10.5; saccharin 8.6; aspartame 10.9; honey 11.8; maple syrup 13.1; control 1 10.7 and control 2 10.9. Conclusions/Discussion The results suggest that glucose, fructose, and maple syrup are the best kinds of sweeteners for yeast fermentation while artificial sweeteners, D-(+)-galactose, and lactose are not good for yeast fermentation.	
Summary Statement This project is about observing the growth of yeast when it is fed with different types of sweeteners.	
Help Received Father helped me with research	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Dante J. Basile	Project Number J1502
Project Title Bacterial Populations Collected from Fast-Food Restaurant Surfaces	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project was designed to assess the bacterial populations found on commonly handled surfaces of fast-food restaurants. It was hypothesized that the bathroom floors would most likely exhibit the greatest bacterial colony populations.</p> <p>Methods/Materials Six restaurants were visited, and five surfaces were sampled at each location to determine which surface exhibited the greatest average bacterial population. At each of the six restaurants, the bathroom floor, bathroom soap dispenser, entrance door handle, table, and chair were sampled with a sterile cotton tip applicator. Nutrient Agar 1.5 % was inoculated with the samples collected. After five days, the resulting colonies on each petrie dish were counted, and the average bacterial colony count of each surface was calculated.</p> <p>Results The average surface bacterial colony counts ranked the sampled surfaces in the following order from greatest to lowest population: bathroom floor, chair, bathroom soap dispenser, entrance handle, and table top.</p> <p>Conclusions/Discussion The fast-food restaurant bathroom floors and chairs harbored the greatest danger of exposure of bacteria to patrons. In contrast, the restaurant table top surfaces and entrance handles were less likely to expose patrons to bacteria. Of the surfaces sampled and cultured, two produced notable colonies that appear to be bacteria of the potentially pathogenic Clostridium genus. Microscopic examination of the cultured colony revealed the presence of bacilli with endospores. The morphology of these bacteria was consistent with Clostridium. Thioglycollate liquid media is an optimal medium for Clostridium. Accordingly, the possible Clostridium bacteria were introduced into the thioglycollate media. The bacteria flourished in the thioglycollate medium without the formation of endospores. This corroborated the gross microscopic identification. These basic tests demonstrated that fast-food restaurant surfaces may promote potentially dangerous bacteria.</p>	
Summary Statement Five surfaces of six fast-food restaurants were sampled for the presence of bacteria.	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Kevin L. Bryan	Project Number J1503
Project Title How Much CO(2) Does Yeast Make Using Different Carbohydrates?	
Abstract Objectives/Goals With all other growth conditions remaining the same, if I change a yeast's carbohydrate source, I expect to see more or less CO ₂ depending on how well the yeast use that carbohydrate source. Methods/Materials I divided a liquid culture of Champagne yeast into smaller bottles and added different carbohydrate sources to the different bottles. I capped the bottles with balloons to catch the CO ₂ made. I also added enzymes to some of the carbohydrate sources to help break them down for the yeast. I measured the CO ₂ using water displacement. Results My experiment showed that with some simple carbohydrates, dextrose and sucrose, yeast made 190 ml and 140 ml of CO ₂ . Some complex sources of carbohydrate, such as corn, rice, and soybeans, made much less CO ₂ . I found that if I added the enzyme alpha amylase, I could make some carbohydrates sources, like corn, easier for yeast to use and increasing the CO ₂ made. I also found that the simple carbohydrate, lactose, could be used better if I added the enzyme lactase. Conclusions/Discussion I met many of my objectives. I supported my hypothesis by showing that, in general, yeast have a more difficult time using complex carbohydrates than simple carbohydrates. I was also able to show that yeast could be helped in growth by adding enzymes to break down the carbohydrates.	
Summary Statement I used different carbohydrate sources to see which helped yeast to grow and make more CO ₂ .	
Help Received My teacher, Ms. Markel, guided me through the science fair process. My parents guided me in the safe use of the kitchen as my lab and helped proofread my work.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Daniel Chayes	Project Number J1504
Project Title How to Clean Your Brush to Destroy Your Mouth Mush	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my experiment is to determine which method of cleaning a toothbrush gets rid of the most bacterial content on the brush: hot water, hydrogen peroxide, salt water, UV cleaner, no-heat dry dishwasher cycle, or high heat dishwasher cycle. Each method will be tested with two toothbrushes. It is hypothesized that the UV cleaner will destroy the most bacteria.</p> <p>Methods/Materials A person brushes their teeth and makes sure that saliva remains on ten toothbrushes, even if that means submerging the bristles of the toothbrush into a cup of saliva. Toothbrushes are then laid flat for two days in a warm area. Then, cotton swabs are used to transfer bacteria from each brush to ten different petri dishes. Each pair of toothbrushes is cleaned in methods listed above and again, a swab is used to transfer bacteria to ten new petri dishes. Petri dishes sit in an incubator for three days. Data is recorded and analyzed.</p> <p>Results After I put all the petri dishes in the incubator with a temperature of 95 degrees Fahrenheit, I observed that small dots appeared about 24 hours later, but they were not large enough to count until 48 hours and after that, they grew slightly larger, but no new colonies appeared. I repeated the UV cleaner a second time in case of a malfunction. I also repeated the dishwasher on high heat instead of a no-heat dry cycle. I used the Promega Colony Counter (PCC) app, but I noticed it did not portray accurately the amount of bacteria. The program allowed me to mark additional colonies and erase false ones, and so I tried to make the count as accurate as possible. All photos were taken at 48 hours.</p> <p>Conclusions/Discussion The high heat dishwasher cycle, hydrogen peroxide, and boiling water proved to be the most effective at killing bacteria. The results with the hot water from the dishwasher and from the cup were quite definitive: virtually all bacteria was destroyed. The methods that did not use hot water, which were salt water, the UV cleaner, and a non-heated dishwasher cycle, were not effective in destroying bacteria. The hydrogen peroxide was also very effective as a means to destroy most bacteria. The hypothesis which stated that the UV cleaner would be most effective was incorrect.</p>	
Summary Statement My project determines which of 5 methods of cleaning a toothbrush is most effective at destroying bacteria on the brush.	
Help Received Mother guided me while I worked with petri dishes. Mother helped in proper disposal of petri dishes.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Hannah M. Crousore	Project Number J1505
Project Title Local Lagoons: Comparison of Lichen Populations in Coastal Sage Scrub	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I chose to study lichens in the Coastal Sage Scrub Community of Northern San Diego county lagoons because lichens are very important to our Earth, 8% of our Earths solid surface is covered by lichens. Lichens are biological indicators of change in our ecosystem and air quality. My goal was to see if there was a difference in the kinds of lichens found in each location I explored and to see if there was any kind of difference in the number of lichen species documented at each lagoon.</p> <p>Methods/Materials I visited three local lagoons. I documented each lichen species I encountered on a log form I created. I photographed the lichen and measured the distance from the highway using a laser rangefinder. I also measured the width of the lichens using digital calipers and recorded the soil temperature, air temperature, and light conditions.</p> <p>Results At one location, Agua Hadonia, I found only three species of crustose lichen; at the other two lagoons, I had found two or three categories of lichen, crustose, foliose, and fruticose. For example, at Batiquitos, the number of crustose species observed was twelve and the number of foliose species was two. At San Elijo, the number of crustose species observed was eight, the number of foliose species observed was two, and the fruticose species was two. All lichens at all three lagoons were found on trees or bark, or boulders.</p> <p>Conclusions/Discussion To conclude, 81.5% of the lichens I encountered from the three lagoons were crustose, 13.2% of the lichens discovered were foliose, and only 5.3% of the lichens found in all three lagoons were fruticose. I documented lichen species present in the Coastal Sage Scrub community at three local lagoons.</p>	
Summary Statement My project compares lichen populations in the lagoons in the coastal sage scrub of northern San Diego county.	
Help Received My mother and father drove me to the lagoons so I could collect my data.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Joshua B. Duquette	Project Number J1506
Project Title How Does Salinity Influence the Survivability of Freshwater Paramecia aurelius?	
Abstract Objectives/Goals My project was done to determine if a rise in the salinity of the environment that Paramecia Aurelius lives in would impact the number of original Paramecia in a major way. Methods/Materials A colony of Paramecia was grown from a starter culture and salt solutions were created at salinity levels similar to the ocean's. The Paramecia from the colony were placed into petri dishes in equal amounts and the salt solutions were added at different percentages. 16 different groups were tested and observed with a four hundred power microscope. Results Salinity has a major impact on the number of original Paramecia. However, my data determined that normal ocean salinity levels are not capable of killing all Paramecia. In addition, the remaining Paramecia were capable of repopulating. Conclusions/Discussion My conclusion is that higher salinity levels majorly influence the survivability of freshwater Paramecia Aurelius. However, some Paramecia are capable of withstanding high salinity and are capable of repopulating the culture. This suggests that Paramecia may be able to withstand and influx of salt within their environment.	
Summary Statement My project is a study on how salinity influences the survivability of fresh water Paramecia Aurelius.	
Help Received Father helped with calculations and purchasing materials; John Wood helped with preparation for presentation	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Alyssa B. Gehlmann	Project Number J1507
Project Title Bacteria in Milk, Less Is Best	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine which type of milk has the most bacteria; soy, pasteurized, or raw. I think raw milk has the most bacteria, then pasteurized milk and soy milk.</p> <p>Methods/Materials Each type of milk was poured into two test tubes, one as the control, the other the test sample with methylene blue added. The milk in the test tubes was heated to 98 degrees Fahrenheit and maintained at that temperature for eight hours. The heat was then turned off and the milk in the test tubes was allowed to cool to room temperature. From the start of the heating of the milk in the test tubes, the test tubes were examined every fifteen minutes for two hours, and then every hour up to nine hours of elapsed time. After 9 more hours, the test tubes were examined every hour up to 26 hours of elapsed time. The observations were recorded as they were observed.</p> <p>Results The raw milk began to change when ½ hour to 3 hours had elapsed, and had the most significant change after the heat was turned off. The pasteurized milk began to change after 1-4 hours, and displayed some change. The soy milk did not change until after 6 hours had elapsed, and did not change much over the 26 hour time frame of the experiment.</p> <p>Conclusions/Discussion My hypothesis was correct; the raw milk had the most bacteria, then the pasteurized milk. The soy milk had the least amount. The soy milk had the least bacteria because it is made from soybeans. Pasteurized milk and raw milk are from cows, and cows develop more diseases because they are living animals. The pasteurized milk goes through a pasteurization process which kills much of the bacteria in it. The raw milk does not receive any special treatment. Bacteria grow best between 80 degrees and 98 degrees Fahrenheit. This explains why the raw milk had the most significant bacteria growth as it cooled from 98 degrees to room temperature (about 70 degrees Fahrenheit).</p> <p>People need to know how to store milk and when it is safe to consume it. If a person is concerned about bacteria content it is helpful to be aware of the bacteria content between the different types of milk.</p>	
Summary Statement The comparison of the growth of bacteria in three types of milk; soy, pasteurized and raw.	
Help Received father helped supervise and obtain materials, mother took pictures, teachers helped stay on track, help with editing report, and designing graph.	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Mckenna N. Grayson	Project Number J1508
Project Title Introducing Algae	
Objectives/Goals My hypothesis is that if fertilizers high in nitrogen and phosphorus are added to pond water, then the sample with the highest percentage of fertilizer will cause the most amount of algae growth in the water.	
Abstract	
Methods/Materials Prepare 15 glass jars with varying levels of fertilizer as follows: 5 jars with pond water, 5 jars with pond water and 50ml of fertilizer, 5 jars with pond water and 100ml fertilizer. Add 10 ml of algae sample to each jar. Place all samples in the Hydrofarm plastic tray with vented dome under the EnviroGrow Fluorescent grow light (24 hours/day). Observe the growth of the algae every 3 days for a 3 week time period. At the end of the test period, measure the amount of algae growth by evaluating the total dissolved solids with a TDS test meter and by evaluation of the dry weight of the filtered algae using a Flinn Scientific Inc. scale.	
Results As predicted, the test results show that if fertilizers high in nitrogen, phosphate and potassium are added to pond water then the sample with the highest percentage of fertilizer will cause the most amount of algae growth. After allowing three sets of samples to grow algae in a controlled environment for 21 days I found that the control sample of pond water without fertilizer, had algae growth that weighed the least at an average of 0.152g. The sample with 50 ml fertilizer added resulted in algae growth that weighed 0.254 g. The third variable containing 100 ml fertilizer grew the most algae weighing an average of 0.378 grams, more than twice the level of the pond water without fertilizer.	
Conclusions/Discussion As my hypothesis suggest, the pond water with the most fertilizer grew the most algae. These results are important to know and supported by my research on the topic. Fertilizer usage has many benefits including helping farmers grow bigger crops and individuals grow more beautiful flowers and greener grass. The same fertilizer entering streams, ponds and lakes as run-off can result in an overgrowth of algae or algae blooms that are unhealthy and damaging to the ecosystem.	
Summary Statement To determine if the amount of fertilizer added to pond water will impact the amount of algae growth.	
Help Received I received help from several people. My dad helped me get the water from the pond and prepare the samples with me. My mom helped me get the supplies and weigh the samples. My teacher, Mrs. Oggiano let me borrow a scientific scale and helped teach me how to properly complete my science fair	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Gianna A. Guzman	Project Number J1509
Project Title Growing a Soil Menagerie	
Objectives/Goals My objective was to find out what different types of organisms grow in different environments and whether they prefer light or darkness.	
Abstract	
Methods/Materials Materials used were: mud, sand, and water collected from the beach and a creek, slim soda bottles, rubber bands, saran wrap, desk lamp, LED flashlight. Procedure: I collected mud from the Laguna Canyon Creek and sand from Laguna Beach, as well as water from both locations. I put the samples into empty water bottles to be used as Winogradsky columns. I placed two of the bottles (one with sand and one with mud) directly in the sunlight during the day and under a desk lamp during the night. Two other bottles have remained in the dark. These bottles have been sitting for about 14 weeks.	
Results The soil samples began to grow different types of organisms throughout the 14 week period.	
Conclusions/Discussion My conclusion is that the majority of the organisms that grew in the creek mud did not thrive in the beach sand and that they prefer the sunlight.	
Summary Statement My project is about the different microbe colonies found in different environments and how do they react to light and darkness.	
Help Received My mother helped me by driving me to the different sites to collect samples, type the report, and collecting and prepping supplies.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Nathan R. Howard	Project Number J1510
Project Title Kitchens vs. Bathrooms: A Study about Bacteria	
Abstract Objectives/Goals My project was to determine if bathroom counters exposed to fecal matter and urine would have more bacteria than kitchens exposed to food-born bacteria. I believe bathroom counters will have more bacteria due to the small particles of fecal matter and urine contained in the water that splashes unseen out of a toilet when flushing. Methods/Materials Twenty agar plates and twenty cotton swabs were used in this experiment. Surfaces in bathrooms and kitchens in three houses were used for samples. One house was used for a control. The people living in the three houses were unaware that they had been selected for samples, so they would not be tempted to clean the surfaces in the sample areas. The control house did clean the surfaces before swabbing. A bathroom and kitchen surface at the same location in each house were swabbed three times using a different agar plate for a total of 18 samples. Two samples were taken at the same locations in the control house. Bacteria colonies were counted after seven days. Results From my results, I found out that in a common house, a kitchen counter appears to have more bacteria than a bathroom counter. This claim may not be valid, because my two house cats treated two of the agar plates as toys, and they were compromised. One was found well after the time in which data was recorded. Conclusions/Discussion My results may show that bathroom counters and kitchen counters cannot be considered dirtier than each other, but that they may contain different types of bacteria. The different types of bacteria might release more or less water during reproduction or other functions which create a humid environment in the agar dish causing the bacteria to multiply faster.	
Summary Statement Airborne droplets from toilets should make bathroom counters dirtier than kitchen counters.	
Help Received I dictated parts of the report for my mother to type.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Sage L. Liem	Project Number J1511
Project Title Temperature Brew-Ha-Ha: Monitoring Kombucha SCOBY Growth at Different Temperatures	
Abstract Objectives/Goals To evaluate the optimal temperature at which to grow a kombucha SCOBY. I hypothesized that a higher temperature within the range recommended by many kombucha brewers would be a more suitable environment, because most bacteria and yeasts have a higher metabolism at higher temperatures. Methods/Materials The manner in which I tested this hypothesis involved using aquarium heaters with thermostats to keep the SCOBYs at consistent temperatures. Since the recommended temperature is between 65°-85°F, the four temperatures I chose for brewing the kombucha were 70°F, 76°F, 82°F and Room Temperature. I weighed each SCOBY before the ferment, and then observed the changes over the course of one week. Results After a week of brewing, I re-weighed them. The results were definitive. At room temperature, the SCOBY grew 29 grams. At 70°F it grew 48 grams; at 76°F, growth was 57 grams; and at 82°F, the SCOBY grew 73 grams. Conclusions/Discussion From this data, I concluded that my hypothesis was correct, but I was unable to establish an optimal temperature. So, I decided to repeat the experiment at higher temperatures to determine the temperature where the SCOBY's health starts to decline. These experiments are currently in progress and will be complete at the time of the fair.	
Summary Statement My project's purpose is to observe the effects of temperature on kombucha SCOBY growth and determine an optimal temperature at which to grow a SCOBY.	
Help Received A friend donated her starter SCOBY and my parents purchased the equipment.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Gregory M. Martin	Project Number J1512
Project Title Increasing Lipid Yields in <i>Chlorella vulgaris</i> through Natural Nitrogen Depletion	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective was to increase the lipid per cell of <i>Chlorella vulgaris</i> through natural nitrogen depletion by 130% compared to the control.</p> <p>Methods/Materials A sample of <i>Chlorella vulgaris</i> was grown in a homemade photo-bioreactor over two 10 day trials. Cultures in both trials were grown in a vitamin enriched BBM media with varying amounts of nitrogen. The cultures were sampled and those samples were tested for cell counts, using a hemocytometer and microscope, and lipid content, using Nile red dye and a fluorescence assay. Graphs were made for each trial showing cells per mL, lipid indicated by AFUs, AFU per million cells, and the increase in lipid per cell over the 100% nitrogen control.</p> <p>Results The lipid per cell increased immensely in the cultures grown in 20%, 10% and 0% nitrogen levels. The highest value was 500% of the control, on day 10 in trial #2 by the 0% culture. This overshoot the hypothesis of 130% by almost 4 fold. The 20% culture had the highest overall lipid in trial #2. This culture balanced cell numbers and the amount of lipid per cell.</p> <p>Conclusions/Discussion The data supported the hypothesis very strongly. The cultures depleted the nitrogen naturally in their media and significant lipid per cell increases were achieved. Cultures started with high nitrogen had the highest cell counts. Cultures started with limited nitrogen yielded the most lipid over a 10 day trial, because they balanced cell count and lipid per cell.</p>	
Summary Statement My project tests the effectiveness of Natural Nitrogen Depletion on <i>Chlorella vulgaris</i> .	
Help Received Mother: Found the equipment, taught lab techniques, helped in planning the assay and editing the paper. Father: Got lab equipment running, built the bio reactor and helped edit the paper. Elaine Gillium: Helped refine the topic for my project and helped edit the paper.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Ella Q. Michaels	Project Number J1513
Project Title The Effect of Antioxidants on H(2)O(2)'s Ability to Kill Saccharomyces cerevisiae Yeast	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This experiment examined the ability of four antioxidants (vitamin C, alpha-lipoic acid, coenzyme Q-10, and selenium) to dampen the harmful effects of hydrogen peroxide on Saccharomyces Cerevisiae yeast.</p> <p>Methods/Materials In four different dosages (5mcLs, 20mcLs, 40mcLs, & 80mcLs) each antioxidant was added to a solution of sterile YPD Media, sterilized yeast culture, and hydrogen peroxide. The antioxidant solutions were incubated for 24 hours. They were then diluted, plated, and their optical density was recorded by a spectrophotometer (Beckman DU640). The plates were incubated for as long as it took for colonies to be visible and easily counted (44 hours). Results were recorded and compared to controls for analysis.</p> <p>Results All four antioxidants and corresponding dosages had a positive impact on yeast growth compared to the hydrogen peroxide control. Vitamin C was most effective followed by alpha-lipoic acid, coenzyme Q-10, and finally selenium. The least effective tube, 5mcLs of selenium, still increased yeast growth by 149.2% and the most effective, 40mcLs of vitamin C, increased yeast growth by 4057.1%, which was on par with the positive yeast control.</p> <p>Conclusions/Discussion My hypothesis, which looked at the order in which the antioxidants would begin working, proved incorrect (in this test) as they all began working at the same time. Results showed that the antioxidant power of vitamin C far exceeded that of the other substances tested. I noted that in all of the antioxidants except CoQ-10, the highest dosage, 80mcLs, was not the most effective. The most likely explanation for this occurrence is that the antioxidant had reached its maximum level of effectiveness and had begun to bring some harm to the yeast (an overdose situation).</p>	
Summary Statement I tested the effect of four antioxidants on hydrogen peroxide's ability to kill Saccharomyces cerevisiae yeast.	
Help Received Dad got supplies and ran solutions through a spectrophotometer at work (as under those 18 weren't allowed)	



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

Name(s) Charles M. Pasternak	Project Number J1514
Project Title The Dirty Secret about Grocery Store Misters	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Multi-state outbreaks of E. coli have been reported over the past few years due to consuming raw or unwashed vegetables. The objective of this study was to determine if the water from grocery store misters could possibly be a contributing factor in contaminating our vegetables with E. coli and other total coliform bacteria. I will compare the test results from the grocery store water misters to raw water from Lake Cachuma in Santa Barbara before it is treated at Cater Treatment Plant.</p> <p>Methods/Materials The IDEXX Quanti-Tray/2000 and Colilert-18 system was used to detect 1 to 2,419 colony forming units of E. coli and total coliform per 100 mL samples of water from 9 grocery store misters. The controls were Santa Barbara City tap water, positive E. coli and negative pseudomonas. After an 18-hour incubation period, MPN determination is made by counting the Quanti-Tray's 49 large and 48 small wells that have turned yellow for total coliform and then the result is taken from the Quanti-Tray/2000 MPN Table. The yellow wells that fluoresce under UV light are positive for E. coli.</p> <p>Results The results of the current study suggest, after testing nine grocery stores, four of the stores' misters tested positive for total coliform. The Most Probable Number of coliform was Market A at 2419.2, Market C at 214.2, Market D at 307.6 and Market J 21.1. None of the water samples contained E. coli. The raw untreated water from Lake Cachuma had significantly less coliform at 30 MPN and tested positive for E. coli at 4 MPN.</p> <p>Conclusions/Discussion Testing the water from grocery store misters supported the objective of discovering a high rate of total coliform in four out of the nine stores' water misters. This may have been attributed to improper cleaning of supply lines, contamination of hands or sneezing on the misters. Raising public awareness that grocery store misters may be an attributing factor to bacteria on our food is of concern. Ongoing future studies is suggested.</p>	
Summary Statement I tested water from grocery store misters to determine if our raw vegetables are being contaminated with total coliform and E. coli	
Help Received Gaylen Fair, Laboratory Analyst from City of Santa Barbara Public Works Department and mother provided transportation	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Emma L. Payne	Project Number J1515
Project Title Is Global Warming Algae Forming? The Effect of Temperature on Spirulina Growth Rate	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The rising temperatures associated with global warming are a cause of great concern. Carbon dioxide is building up in the atmosphere. To reduce the amount of CO₂ in the atmosphere, we need something to take it away. Algae sequesters carbon dioxide. The objective of my experiment was to determine what temperature algae grows the best in. This experiment seeks to determine if algae growth is increased when grown in a warmer temperature.</p> <p>Methods/Materials In my experiment, test tubes containing an algae culture were heated to temperatures ranging from room temperature to 40°C. This was accomplished by preparing test tubes with different numbers of windings of thin magnet wire. The test tubes were then wired in series so that a constant electrical current flowed through each. In this way, the power (heating) for each test tube was systematically varied. Daily photographs were taken of all the test tubes. These images were subsequently analyzed with an image processing program to extract density as a function of time. In this experiment, I assumed the algae population is proportional to the color density.</p> <p>Results My results showed that the test tube heated to an intermediate temperature (28°C) had the greatest color density change, meaning it had the highest algae growth rate. Temperatures on either side of this value demonstrated less color density change.</p> <p>Conclusions/Discussion In the end I learned that algae grows best at a moderately elevated temperature. The result suggests increased carbon consumption can be expected from global algae population as both a result and a mitigation of global warming. However the experiment also showed that this is only true if colony temperatures remain below 30°C.</p>	
Summary Statement Spirulina algae growth rate was studied as a function of temperature, and intermediate temperatures showed the highest growth rate.	
Help Received Mr. Wright (my science teacher), and Mr. Nestlerode (my science fair advisor), and my Dad	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Tess S. Robertson-Neel	Project Number J1516
Project Title Toothbrush Location Bacteria Experiment: Where Should You Store Your Toothbrush?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Toothbrushes in the bathroom come into contact with many contaminants, including mold, toilet spray, human germs and dust. The objective of this project is to determine which toothbrush storage location in the home (cup, holder, drawer, sink counter, medicine cabinet) is exposed to the most bacteria in the course of regular use.</p> <p>Methods/Materials 5 agar-filled Petri dishes, 5 sterile cotton swabs, 5 Equaline brand toothbrushes, one homemade incubator. Use each toothbrush once with the same toothpaste and in the same mouth. Place toothbrushes in designated locations and leave them there for 72-hour period under normal use conditions. Track bathroom use patterns in log. Collect samples from each toothbrush and place samples in Petri dishes under uniform light and heat conditions. Measure bacterial growth in Petri dishes after 72-hour period.</p> <p>Results The greatest amount of bacterial growth was found in the sample from the toothbrush left directly on the bathroom sink counter, followed by the amount of bacteria found on the toothbrushes stored in the bathroom drawer and medicine cabinet.</p> <p>Conclusions/Discussion Because of its proximity to the toilet, the toothbrush on the counter was exposed to bacteria carried by toilet plumes created by repeated flushings during the test period. Research suggests that droplet bacterial nuclei can stay afloat in the air long after a toilet has been flushed. The results of this toothbrush experiment suggest that time and frequency of exposure influences the amount of bacterial growth.</p>	
Summary Statement This project tests the bacterial growth on toothbrushes stored in various bathroom locations, asking whether storage impacts bacterial growth and potentially our health.	
Help Received Parents helped type report, helped secure materials (toothbrushes and agar-filled Petri dishes) and helped student learn how to take samples.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Maya R. Wilson	Project Number J1517
Project Title Thermotherapy: A Hot Solution to Keep Your Produce Fresh	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Thousands of pounds of produce are thrown away each day due to molding. The objective of this experiment is to determine if thermotherapy, the process of immersing produce in hot (but not boiling) water, increases its shelf life by killing mold spores, thus delaying molding and keeping the produce edible longer. I wanted to find the best thermotherapy time/temperature combination to keep produce mold-free for as long as possible.</p> <p>Methods/Materials I tested the effects of thermotherapy on five types of produce: blueberries, blackberries, raspberries, lettuce, and small sweet peppers. To determine the best time/temperature combination for each type of produce, I immersed them into three different water temperatures: 110°F, 130°F, and 150°F, for two different amounts of time: 30 seconds and 120 seconds.</p> <p>Results Based on my experiments, the best Thermotherapy temperature/time combinations to delay mold are: Blackberries 150°F @ 120 seconds Raspberries 150°F @ 120 seconds Sweet peppers 130°F @ 120 seconds Blueberries 130°F @ 120 seconds Lettuce 110°F @ 120 seconds</p> <p>Conclusions/Discussion My initial hypothesis that thermotherapy will improve the shelf life of produce by killing mold spores and delaying the molding process proved to be correct. However my specific hypotheses regarding the best temperature/times were not accurate. In testing all five types of produce, the longer immersion time (120 seconds) did significantly better than the shorter immersion time (30 seconds). The lettuce did better in cooler temperatures (110°F) while blackberries, raspberries, blueberries and sweet peppers did better in warmer temperatures (130°F to 150°F). I believe the lettuce needed the cooler temperature because at higher temperatures it wilted badly. The blueberries and sweet peppers, despite being smoother and thicker-skinned than the raspberries and the blackberries, stayed fresh longer using a cooler temperature (130°). The blackberries and raspberries needed the highest temperatures to prevent mold growth; this might be because they have softer/bumpier surfaces and they need warmer water to penetrate the surface. From my research, I learned that thermotherapy has been used by commercial growers for many years, but the public knows little about it. I hope my project will increase public awareness and give new insight into the best time/temperature</p>	
Summary Statement The objective of this experiment is to determine if thermotherapy, the process of immersing produce in hot (but not boiling) water, increases its shelf life by killing mold spores, thus delaying molding and keeping the produce edible longer	
Help Received mother bought materials and helped with editing and board.	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Danielle M. Zamorano	Project Number J1518
Project Title Who Let the Germs Out?	
Abstract Objectives/Goals The objective of this experiment was to find whether the inside or the outside of bathroom door handles had more bacteria. Methods/Materials I swabbed the inside and outside of each door handle four times up and down at three separate restaurant bathrooms. My materials were forty petri dishes filled with agar, forty sterilized Q-tips, distilled water, forty micro test tubes, ziploc bags, an incubator, gloves and graph paper. Results The result of my experiment was that overall, In-N-Out Burger had the most amount of bacteria of the three restaurants tested. The petri dishes from all three restaurants showed more bacteria growth for the inside door handles than the outside door handles. Conclusions/Discussion My hypothesis was that there would be more bacteria on the outside door handles than the inside door handles because people wash their hands before leaving a restroom. This hypothesis was proven incorrect. With the information from my research collected from this experiment we can teach people about the importance of hand washing, also we can inform people of the need to wash your hands both before and after using public bathrooms. From doing this project I have learned that many germs can be transferred from surface to surface and that we need to be more aware of the dangers of getting sick from touching these surfaces.	
Summary Statement This project was to test whether there is more bacteria on the inside or outside of door handles at public restrooms.	
Help Received My father help me calculate percentages and my mom drove me to the restaurants	



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Courtney A. Zohn	Project Number J1519
Project Title Dirty Money	
Objectives/Goals To test for Escherichia Coli on quarters from around the United States, and some foreign countries.	
Abstract Methods/Materials Using the 3M petrifilm, pipette (10ml and 1ml), pipetter, incubator, gloves, sterile bag, quarter, vortex, test tube, stomacher 400 circulator, 3M presser, coin count sheet, buffered peptone water solution, and a sharpie, the testing can be done. 1. Collect the quarters in a sterile bag 2. Label all of the petrifilm with the quarter code 3. Using the 10ml pipette and pipetter, take 10ml of the solution and place in each sterile bag 4. Take the sterile bags and place in the stomacher for 30 seconds at 300 beats per minute 5. Place 1ml of solution from sterile bag into the test tube, and another 1ml, from the same bag, onto petrifilm 6. Spread the solution around the petrifilm with a 3M presser 7. Put solution in the test tube onto the vortex for five seconds 8. Plate onto the petrifilm using the pipette and pipetter 9. Place in the incubator for 48 hours at 37 Celsius 10. Read the samples and record results	
Results The results concluded that 0% of the quarters tested had traces of E. Coli. There was no trace of the bacterium, E. Coli on the quarters tested, which means that Americans do have relatively clean hands when exchanging quarters. There were a few exceptions where unidentifiable bacteria, or coliforms, were found on the petrifilm. Citizens can be reassured that the money is safe to handle. Americans do a great job on washing their hands, which is important when handling money.	
Conclusions/Discussion The results proved the experimenter's hypothesis wrong, due to the fact that there was no E. Coli on the quarters. However, some of the petrifilm contained coliforms, showing that there were some unidentified bacteria on the coins. This shows that people transfer bacteria onto quarters, and then go back into circulation to infect more people.	
Summary Statement To see if E. Coli can be transferred when handling quarters that are constantly exchanged.	
Help Received Used lab equipment and learned plating procedures at the Jack in the Box Innovation Center under the supervision of Reggie Benitz	