



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Natalie M. Barnett	Project Number S1101
Project Title Turning the Tides on Marine Pollutants: Surface Pollutant Effect on Acidification	
<div><div>Objectives/Goals The objective is to observe the effects of hard, surface pollutants on aquatic plants ability to photosynthesize and ocean acidification.</div><div>Methods/Materials Goldfish and aquatic ferns were placed in different marine environments, some including pollutants, others not, to see how pH could be altered. Clear plastic and Styrofoam were used to cover the surface of the tank including the aquatic plants and fish, in separate trials. Fish and plants were tested alone and together with no pollutants. Each trial was carried out in sunlight for twelve hours through out the day.</div><div>Results The greatest change in pH occurred with fish alone in the testing tank and no plants present, on average there was a drop from 8.10 to 5.33. With plants alone, the pH did not change significantly. When fish and plants were added to the test tank, the pH dropped from a high of 8.04 to 7.18, which was statistically significant when compared to fish alone. The pH drop with Styrofoam on the surface was not significantly different from fish alone. The pH drop with plastic on the surface was significantly different from fish alone with a drop of 1.27 in pH.</div><div>Conclusions/Discussion Results conclude that pH levels drop as a result of cellular respiration in fish. This drop is lessened when live plants are added to the tank and the exposure to sunlight so that photosynthesis can occur. Blocking sunlight by the addition of hard pollutants on the surface of the water led to a decrease in ability of plants to photosynthesize and convert CO(2) to oxygen. This resulted in a greater decrease in pH. Plastic pieces resulted in a lower change in pH compared to Styrofoam likely because sunlight was not blocked to the same degree.</div></div>	
Summary Statement The focus is to study how anthropogenic pollutants can affect ocean acidification.	
Help Received Mother helped putting board together; father helped with collecting data; brother helped maintain fish/plants.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Xavier Brookes; Amanda Hunt	Project Number S1102
Project Title Variation in Biogenic Sand along the Western Beaches of Okinawa, Japan	
Abstract Objectives/Goals Does the leeway coastal sand of Okinawa, Japan, along the East China Sea, transport from north to south due to the Black Current and other surface water processes? This experiment should prove that sand moves from north to south along the leeway coast due to the local surface currents which would greatly affect the coastal and marine ecology of the tropical, fringing reef island. Methods/Materials Seven sands were collected from isolated beaches along the western coastline. Each collection of sand was passed through several sized sieves. The mass of the different granule sizes were calculated on a digital balance to understand distribution of grain size and sorting. An average of 120 grains and fragments of each sand were meticulously inspected and researched by microscope to include: texture (sphericity, clastic, variation, shape, roundness); biogenic content (general taxonomy). Hydrochloric acid was used to dissolve and measure / inspect composition (biogenic, lithic fragments, human particles) . Results The texture of sand grains were inconsistent; though lithic fragments and major biogenic particles tended to be more angular in the south, with no real pattern for sphericity. Of the biogenic structures observed, there was a lack of diatoms and planktonic foraminifera, all of which were benthic. Spicules were present in many beaches, with little to no correlation between them. There was no observable correlation between the compositions of lithic fragments either. According to the histogram of each beach, there is a high leptokurtic peak in all sands except Bottle G , which was different on many counts including a manganese coated surface concluding it must be a paleo sand. Conclusions/Discussion The presence of fragile biogenic structures; lack of planktonic organisms; bathymetry; soft coral striations; lack of similar texture, composition, grain size, and sorting account for the determination that the motility is controlled by tidal motions. This means there is an absence of surface currents affirming the lack of motility on Okinawa's leeway shoreline, disproves the original hypothesis, showing that sand does not move north to south, but rather moved by tides with little net sand deposition.	
Summary Statement Sand motility related to the ecology of a tropical fringing reef island.	
Help Received Lab materials and initial mentoring from John-Henry Cottrell, a teacher at San Jacinto High School. Consulted Dr. W. B. Leatham, sedimentology professor at CSUSB, on gaps of knowledge and result clarifications.	



CALIFORNIA STATE SCIENCE FAIR

2015 PROJECT SUMMARY

Name(s) Danielle M. Cadena	Project Number S1103
Project Title What about the Little Guys? A Study on the Effects of Acid Rain on Agricultural Soil Bacteria	
Objectives/Goals My objective was to see how acid rain will affect soil bacterial communities in agricultural soil.	
Abstract Methods/Materials I cut two plastic 250 mL graduated cylinders down to 7 ½ in. to create my soil containers. I got my soil samples by using the soil core sampling method. I used a lead pipe and hammered it into the farm's soil. Then I pushed the soil bottom to top into the soil container using a wood dowel. I created the acid rain by diluting 1.0 M H ₂ SO ₄ with distilled water until I got a pH of 4.3. I simulated rain by transferring 15 mL of acid rain into the soil containers using a pipette. I swabbed for bacteria populations before the rain, 1 hour after the rain, 4 hours after the rain, 24 hours after the rain, and 48 hours after the rain. After the plates had been in the incubator for 24 hours, I counted the colonies and number of species on the plate.	
Results In the Mahoney Blueberry Farm soil sample, the largest decrease was 31%. In the DB Specialty Farms soil sample, the largest decrease was 48%. In Mahoney Blueberry Farm, the chi-square value for 1 hour after the rain was 0.08703665 (99.91% confidence); for 4 hours after the rain it was 0.00115743 (99.99% confidence); for 24 hours after the rain it was 0.003514491 (99.99% confidence); for 48 hours after the rain it was 0.03101345 (99.97% confidence). In DB Specialty Farms, the chi-square value for 1 hour after the rain was 0.00083156 (99.99% confidence); for 4 hours after the rain it was 3.06323x10 ⁻¹⁰ (99.99% confidence); for 24 hours after the rain it was 2.575x10 ⁻⁶ (99.99% confidence); for 48 hours after the rain it was 4.54373x10 ⁻⁵ (99.99% confidence). A bacteria, I believe to be Azobacter, was found to be in both farms. In Mahoney Blueberry Farm, its population decreased the most by 95%. In DB Specialty Farms, it decreased the most by 65%.	
Conclusions/Discussion The acid rain depleted populations and disrupted species diversity levels in the soil up to 24 hours after the rain. Population levels returned 48 hours after the rain because most of the acid had reached the bottom of the soil. Azobacter, a nitrifying bacteria, showed very little resistance to the acid rain. Nitrifying bacteria provide usable nitrogen for plants, which they use as nutrients or fertilizers and without them this process could not occur. The effects acid rain could have on just the soil community could be reflected in the plants themselves through their growth and health.	
Summary Statement The Effects of Acid Rain on Agricultural Soil Bacteria	
Help Received Participant in Summer Science Institute at Allan Hancock College	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Emily A. Chaffin	Project Number S1104
Project Title What's in Your Water? How Urbanization Impacts Water Quality	
<div><div>Objectives/Goals This study seeks to determine a possible relationship between urbanized land and water quality in three streams in Santa Cruz County. Studies have shown that there is a strong correlation between the proportion of urbanized land in a watershed and the quality of the stream.</div><div>Methods/Materials Branciforte Creek, Arana Gulch Creek, and the San Lorenzo River, each in Santa Cruz County, were sampled. Each watershed was divided into an upper, middle, and lower section based on the surface water drainage area for that sample site. Proportion of urbanized land was calculated on ArcGIS using a Land Cover raster and evaluating classes 21-24 (Booth, Mitchell, & Redlands, 2001). Water temperature, turbidity, conductivity, pH, dissolved oxygen, and air temperature were examined at each site every other month from August 2013 to August 2014.</div><div>Results Correlation tests revealed that dissolved oxygen, water temperature, and conductivity had the highest relationship with proportion of urbanized land. Each variable had an r-value above 0.44. T-tests showed that the results were not statistically significant. The standard deviation of the residuals was found for each variable and showed that pH and dissolved oxygen resulted in the most accurate line of regression, each prediction being within at least 0.49% of the actual value.</div><div>Conclusions/Discussion Healthy water is the source of life. It is necessary to sustain aquatic, human, and environmental existence. However, today, according to the USEPA (2000), "over 13,000 km of streams and rivers in the United States are impaired by urbanization" (As cited by Paul & Meyer, 2002). This study supports this effect in the streams in Santa Cruz County. Future areas to study include additional variables such as examining effect of rainfall, salinity, nitrogen, and phosphorus levels, analyzing fecal coliforms and macroinvertebrates, testing for correlations between variables used, additional streams and sample sites, and sampling for a longer period of time.</div></div>	
Summary Statement This study seeks to determine a possible relationship between the proportion of urbanized land and water quality in three different streams in Santa Cruz County.	
Help Received Chloe Gordon: driver, Debie Chirco-Macdonald: Coastal Watershed Council connection, John Laird: interview, Jasper Billings: advisor, Jen Slaughter: understanding water quality using SCEHS materials, John Binnert: statistics assistance, Jonathan Felis: assistance on ArcGIS.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Annette Chang; Daisy Chen	Project Number S1105
Project Title A Multimethod Analysis and Spatial Predictive Modeling of Bacterial Dynamics in Newport Bay	
<div><div>Objectives/Goals Our project enumerates and identifies trends in coliform and enterococcus bacteria levels throughout Newport Bay and its surrounding watershed using multiple methods assessed for practical use. In addition we utilize a computational modeling approach to predict the spatial dynamics of bacterial distribution over short time scales that may help identify possible sources of contamination and assist management decisions.</div><div>Methods/Materials Field sampling trips were conducted during July/Aug 2014 and Feb/Mar 2015 to collect water samples. Approximately 150 water samples were collected from approximately 10 locations throughout the Newport Bay Watershed which were analyzed for total coliform, E. coli, and bacteroidetes and enterococci bacteria counts. Four different methods (Viable Plate Count, Colilert-18 Assay, Fluorescent Particle Counter, Quantitative PCR) were employed for indicator bacteria enumeration. Data from these methods were correlated to a spatial model produced via the 3D hydrodynamic model ELCOM-CAEDYM.</div><div>Results Marine water sites showed low bacterial counts with an average total coliform MPN of 7.9 in August, and these contrasted highly with freshwater inland locations that had an average 5265 MPN. Among all locations, the part of San Diego Creek near Irvine Ranch Water District consistently displayed the highest levels while the Dog Beach at the mouth of the Santa Ana River displayed only low to moderate coliform and enterococci counts. Quantitative PCR indicated much higher quantities of Bacteroides specimens than Enterococci in all samples.</div><div>Conclusions/Discussion Our results generally confirmed our postulated sources of bacterial input, with some exceptions, and reflected a relatively well-mixed, dynamic bay system. Freshwater drainage from the marshes around the Upper Newport Bay and Irvine Ranch Water District had the highest consistent levels, while saline locations had reliably low concentrations. ELCOM-CAEDYM modeling indicated spatial, temporal, and seasonal changes in bacterial concentration dynamics. Overall, this study presents a comprehensive view of the distribution and quantity of common indicator bacteria in the Newport Bay watershed based on specific inputs, with implications for public health in the region.</div></div>	
Summary Statement Our project identified trends in coliform and enterococci bacteria levels throughout Newport Bay and developed a computational modeling approach to predict the spatial dynamics of bacterial distribution over time.	
Help Received Used lab equipment at UCI Lander Lab under the supervision of Dr. Felix Grun.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Kevin S. Chang	Project Number S1106
Project Title The Effects of Different Chemicals on Sea Grass Microbial Communities in Winogradsky Columns	
Objectives/Goals Sea grasses are one of the most important parts of the ocean ecosystem, providing both shelter and nutrients to all marine life. These sea grasses are also home to a community of microbes which work and interact with the sea grasses. This project, which is partnered with the UC Davis Seagrass Microbiome Project at Bodega Bay, tests how different chemicals would affect the seagrass microbial communities, specifically that of the species <i>Zostera Marina</i> . The effects of different chemicals will be tested with winogradsky columns and the number of colors that result in the columns. The hypothesis is that if the additional chemicals are added to the columns, the number of colors will increase in the winogradsky columns over time because the chemicals will encourage growth of certain microbes.	
Abstract Methods/Materials Winogradsky columns were used to test the effects of the chemicals since they allow a clear visual way to culture microorganisms with different metabolism strategies. The mixture inside the columns has chemicals that contain elements like carbon, nitrogen, and sulfur. The experimental columns will have the additional ammonium acetate, elemental sulfur, and seagrass. A control was also added without any additional chemicals. These columns were tested starting in October 2014 using water around seagrass beds to obtain the seagrass microbes.	
Results The results show that the seagrass columns had less microbial growth than the ammonium acetate and elemental sulfur columns since seagrass columns only had 1.6 average colors compared to 5.2 and 6.6 average colors of the sulfur and ammonium columns respectively in March. It was observed that the total number of colors increased and many of the microbe populations changed over time in the columns. The columns are still providing more data and experiment is currently being developed to provide new types of data.	
Conclusions/Discussion There was evidence to support the hypothesis since the averages of the number of colors in the experimental columns were generally higher than the control columns average of 2.8 colors. However, sources of error from the subjective color counting method and other human measuring error and blunders are sources of error in the project. Overall, researching the effects of chemicals on seagrass microbiomes greatly contributes to our understanding of crucial seagrass communities.	
Summary Statement The project tests the effects of chemicals on microbes from ocean sea grasses communities.	
Help Received Researchers at the UC Davis Bodega Marine lab like Jenna Lang helped set up and build the Winogradsky columns and Mrs. Dixon helped develop the research focus questions and provided advice on the project.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Lilit Danelyan; Siranush Martirosyan; Bianca Mirza	Project Number S1107
Project Title How Do the Characteristics of Ingested Plastic Correlate with the Native Diet of the Phoebastria immutabilis?	
<div><div>Objectives/Goals The objective of the project was to find a correlation between the plastic ingested by the Phoebastria immutabilis species and their native diet of squid, fish eggs, and crustaceans.</div><div>Methods/Materials Seven bolus samples were dried and dissected using forceps. The contents of the samples were categorized and analyzed by weight, color, size, and shape.</div><div>Results After analysis, the results showed that white plastic fragments were the most common color and clear plastic fragments was the second most common found in the boluses. Plastic fragments averaging 5 millimeters and 6 millimeters in length were the most present. Clear, glassy nurdles (plastic pellets used in industrial plastic making) averaging 4.75 centimeters in size were also found in three of the bolus samples.</div><div>Conclusions/Discussion Based on the results, the fragments were of similar colors and sizes to the Laysans' natural diet. The blue and green fragments were 13 millimeters in size on average and had a similar range of colors as the crustaceans. The blue and green fragments were consumed because they resembled the crustaceans found on the beaches of Midway. The clear plastic fragments were similar to the color and glassy looking exterior of the cranchiidae. Also, the buoyancy of the plastic fragments allowed the plastic to float to the surface of the water. Since the Laysan are surface eaters, the birds skimmed the surface of the water and collected the plastic debris along with anything else at the surface. The nurdles were consumed because they resembled flying fish eggs. The nurdles were an average of 4.75 millimeters in size, falling into the range of 4 to 10 millimeters in size of the flying fish eggs. The nurdles were of a clear color and round in shape similar to the fish eggs. Since the flying fish lay their eggs on objects on the surface of the water, then the floating nurdles were mistaken for fish eggs and consumed. There was no solid correlation found between the foam and line and the natural diet of the birds.</div></div>	
Summary Statement The central focus of the project was to find a correlation between plastic ingested by the Phoebastria immutabilis and their native diet of squid, flying fish eggs, and crustaceans based on color, size and shape.	
Help Received	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Gabrielle A. Evey	Project Number S1108
Project Title Paper Toilet Seat Covers: Health Necessity or Environmental Detriment?	
Objectives/Goals A study was previously conducted to identify the bacterial strains on public toilet seats. The data indicated that the bacteria on toilet seats are largely normal skin flora, including Staphylococcus species. Due to the low infection risk, paper toilet seat covers are not a public health necessity. This project aims to measure the number of people who use paper toilet seat covers in public restrooms and how much these products increase the amount of paper waste entering the sewage stream. 50 percent of people surveyed will report using paper toilet seat covers, and these products will increase the amount of paper waste in each toilet flush by 75 percent.	
Abstract Trials were conducted at public restrooms to document the percentage of people that used paper toilet seat covers, as well as the number of toilet paper sheets used per flush. Paper toilet seat covers and sheets of one-ply toilet paper were measured on a gram scale. These masses were used to calculate the number of toilet paper sheets equivalent to one paper toilet seat cover. That value and the average amount of toilet paper used per flush were used to calculate the percent increase in paper waste entering the waste stream.	
Methods/Materials Trials were conducted at public restrooms to document the percentage of people that used paper toilet seat covers, as well as the number of toilet paper sheets used per flush. Paper toilet seat covers and sheets of one-ply toilet paper were measured on a gram scale. These masses were used to calculate the number of toilet paper sheets equivalent to one paper toilet seat cover. That value and the average amount of toilet paper used per flush were used to calculate the percent increase in paper waste entering the waste stream.	
Results 51 percent of persons surveyed used a paper toilet seat cover and toilet paper sheet usage averaged 14 sheets per toilet flush. One toilet seat cover is equal to approximately seven sheets of toilet paper. Therefore, use of a toilet seat cover increases the amount of paper products entering the waste system by 50 percent.	
Conclusions/Discussion The high percentage of persons using these products makes the applications of this project relevant to water conservation. An additional study was conducted to determine the amount of water retained by paper toilet seat covers. The result of this study indicated paper toilet seat covers require 8 ounces of water, or 4 percent of the total water in a toilet flush, to be moved through the sewage stream. Based on this 8 ounce figure, the University of California system is wasting enough water with paper toilet seat covers to fill 5 Olympic sized pools, suggesting these products are a detriment to the environment.	
Summary Statement Paper toilet seat covers are not a health necessity due to low bacterial risks, and the water waste caused in the sewage system makes them an environmental detriment.	
Help Received Previous bacterial research conducted at Edwards AFB Medical Clinic	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Kimberly Fuentes; Martin Liu; Zoe Parcels	Project Number S1109
Project Title Cigarette Butt Accumulation and Mitigation in the City of Santa Monica	
Abstract Objectives/Goals The purpose of the present study is to evaluate the accumulation rate of cigarette butt pollution at different location and time frames and to assess the effectiveness of city pollution management efforts in the city of Santa Monica. Methods/Materials Seven streets with high foot traffic were surveyed over a one year period using a 2 meter belt transect on the edge of the curb. The data were collected once a week on a set day for four consecutive weeks, once per season. Printed maps and a photo geo-tagging system, were used to mark the location of cigarette butts; hot-spots were defined as >25 cig./m ² . Recorded butts were collected to avoid recounting during the following collection. Results The results indicate that Broadway has the highest abundance (0.84 cig./m ²)($p<0.0001$) In the short term (1 week) while Arizona has the highest abundance on the long term (2 months). The 3rd Street Promenade had the lowest count for both time frames. Hotspots were found to not re-occur at the same location. When compared to Winter (lowest cig. count), the Spring collection yielded the highest number of cigarette collected ($p<0.0001$) followed by Summer ($p<0.0001$) while Autumn yielded a statistically insignificant difference ($p=0.7949$). 69% of cigarette butts were found in the street while 31% were found on the sidewalk. Conclusions/Discussion The data suggest that not enough maintenance efforts are allocated to Arizona. The low abundance of cigarettes on the 3rd street Promenade may be explained by the smoking ban and constant maintenance in place there. The non-reoccurrence of hotspots suggests that placing cigarette disposal units would be ineffective. The high numbers in the Spring collection may be explained by the influx of tourist, as it was performed in late Spring, during the beginning of Summer vacation. The study suggests that there is a long term accumulation effect, suggesting that the mitigation efforts from the city are not completely effective The high percentage of cigarette butts found in the street is possibly due to the tendency of business owners to sweep leaves in front of their business into the street as well as the ability of breeze to displace cigarette butts from sidewalks into streets but not vice-versa.	
Summary Statement The present study locates cigarette butt pollution on different time frames and appraises the effectiveness of the City of Santa Monica in mitigating this issue.	
Help Received Santa Monica High School students helped with collection, Dr. Belin advised us with analysing the data	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Huws Y. Landsberger	Project Number S1110
Project Title The Effect of Temperature on Salt Marsh Plant Growth	
Objectives/Goals The objective of this study was to analyze the effects of temperature on salt marsh plant growth and cover. The study's one-sided hypothesis states that an increase in temperature will cause a decrease in plant cover, a prediction based on historical and current geographical locations of salt marshes in the United States.	
Abstract Methods/Materials For our experiment, measurements in the Cabrillo Salt Marsh were made every other week for four months. To assure reliable data, measurements were taken only during low tides and from two specific regions. A transect, quadrat, and thermometer were used: a transect measured out the test areas, a quadrat quantified cover, and the temperature of soil was recorded every meter.	
Results Linear regression tests were applied to determine the significance of findings. Pickleweed, a nesting plant for an endangered bird and several other species, presented a strong negative correlation to temperature, with p-values of 0.0214 and 0.0091 for the two areas at an alpha of 0.05, confirming the hypothesized relationship. However, other plants, such as cordgrass, yielded insignificant results and supported the null hypothesis of temperature having no effect on plant cover.	
Conclusions/Discussion Salt marshes, once common on the west coast, are shrinking and disappearing at an alarming rate. This study supports the conclusion that as temperatures rise, some important plant populations will diminish and endanger species: climate change imperils our salt marsh environments.	
Summary Statement Data was recorded and statistical tests were carried out in order to understand the relationship between salt marsh plant growth and temperature.	
Help Received Approval to test in salt marsh and tools to do so given by the Cabrillo Marine Aquarium, along with help in identifying plant species. Supervised by Dr. Kiersten Darrow.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Michael S. McFarland	Project Number S1111
Project Title The Potential Impact of Hyperion Treatment Plant's Chlorinated Effluent and West Basin Brine on Marine Organisms	
Abstract Objectives/Goals In the fall of 2015, Hyperion Treatment Plant (HTP) will divert its effluent from the 5-Mile Outfall to the 1-Mile Outfall, leading to an increase in bacterial levels at local beaches. In order to control the bacterial levels on local beaches, HTP will be discharging its effluent dosed with 3 ppm chlorine. In addition to this, West Basin Municipal Water District will be discharging excess brine leftover from its water reclamation processes at the plant. This study tests whether the increase in concentration of HTP effluent, chlorine, and West Basin brine in various combinations will have an adverse effect on the marine organisms in the area near the terminus of the 1-Mile Outfall. Methods/Materials Two different tests were conducted in order to determine the potential impact that the diversion will have. Seawater collected from the from the NRG power plant in Redondo Beach, California, a 24 hour-flow-weighted composite sample of HTP effluent, and a sample of West Basin brine were used in the chronic toxicity tests. Four treatments were then prepared; effluent, effluent + chlorine, effluent + brine, and effluent + brine + chlorine. The bladelike sporophylls of the giant kelp <i>Macrocystis pyrifera</i> were induced to sporulate. Spores were then collected and placed into the four experimental treatments. The spores were allowed to develop and the number of nongerminated and germinated spores along with germination tube length was observed and analyzed. In the second set of experiments, red abalone were spawned and the resulting fertilized eggs were allowed to develop in each of the four treatments. The number of normal and abnormally developed eggs was then observed and recorded. Results I hypothesized that the HTP effluent alone and in various combinations with chlorine, and West Basin brine will have a significant adverse effect on the giant kelp's percent germination and germ tube length and the larval development of the red abalone. The results indicated that kelp spores showed no observable effect when exposed to any of the four treatments. However, the red abalone showed a significant effect when developed in the 7.14% HTP effluent concentration, chlorine, and West Basin brine with the HTP effluent concentration having the greatest single effect. Conclusions/Discussion Although the red abalone chronic toxicity test showed the HTP effluent concentration having the greatest single effect, it is also important to understand the effect that the West Basin brine had on the red abalone. At only 0.029% concentration, the West Basin brine still had an adverse effect on the red abalone. In our Summary Statement The potential impact that Hyperion Treatment Plant's diversion from the 5-Mile Outfall to the 1-Mile Outfall in the fall of 2015 will have on the marine organisms. Help Received Dr. Masahiro Dojiri, PhD, Hyperion EMD, was my mentor for this project and allowed me to use the lab at Hyperion Treatment Plant.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Leo J. McGrath	Project Number S1112
Project Title Best Time to Breathe? Changes in Air Quality Due to Different Factors in an Urban Area	
Objectives/Goals My objective in this project was to find patterns in the changes in CO, NO(2), and particulate matter levels due to time and weather in my local area. In particular, I was looking for patterns in the variables that were constantly changing and the correlation between these variables. In terms of time and weather I was looking at time of day, day of week, temperature, and humidity.	
Abstract Methods/Materials For data collection, I used an Arduino Uno, a Grove shield and several Grove sensors to create a small air quality station. I then made a program that would run all the sensors and collect their data. The station was placed outside, and could measure the levels of CO, NO(2), and particulate matter in the air, as well as the temperature and humidity. This station was connected to a computer that recorded the data every minute. For data analysis, that data was transferred into Excel. In Excel I put the data into graphs so that I could find the patterns I was looking for. I also looked for averages and correlations.	
Results As for results, the gases see-sawed predictably during the day. Surprisingly, the particulate matter didn't vary during the day in any predictable way, but rather built up during the week and dropped off on the weekends and holidays. The particulate matter had much more variation than the gases. When answering this question, I realized that it wasn't well stated because time is not an easily distinguishable variable in changes in air quality. Trying to focus on time as a single variable is more difficult than I expected. This is because I couldn't easily separate time from confounding weather variables. Meanwhile, in terms of the correlations, I found that there is very little correlation between the gases and particulate matter. Also, there was a strong correlation between the gases and the humidity. Unlike the gases, there was essentially no correlation between particulate matter and humidity. In conclusion, the lower the humidity the lower the levels of gases, but the particulate matter could be higher or lower.	
Conclusions/Discussion In conclusion, both the gases and the particulate matter are affected by changes in time and weather, but in different ways. Gases tend to see-saw predictably throughout the day, while particulate matter builds up during the week and drops off during the weekend. Finally, these time-based patterns can be temporarily overwhelmed by weather variables.	
Summary Statement My project looks at the patterns in the changes in CO, NO(2), and particulate matter levels due to weather and time.	
Help Received My dad helped teach me the basics of programming and how to use more complicated parts of Excel.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Natachi M. Onwudiwe	Project Number S1113
Project Title How Does Proximity to the Pacific Ocean Affect the Conductivity of the Los Angeles River?	
<div><div>Objectives/Goals The objective of this project is to determine how proximity to the Pacific Ocean affects the conductivity of the Los Angeles (L.A.) River in order to subsequently analyze its possible impact on native species in future investigations.</div><div>Methods/Materials Water samples were collected from seventeen sites spaced three miles apart along the L.A. River's 51 mile course from its source in Canoga Park, California to its estuary in Long Beach, California. A total of 34 samples were collected on two days spaced two weeks apart and tested for conductivity using an EC meter.</div><div>Results There was no statistical difference in the conductivity of the individual sites on the L.A. River except at the source and estuary. The average conductivity at the source, about 51 miles from the Pacific Ocean, was 50% higher than the average for the entire river, most likely due to increased debris flow from equestrian activity along one of the source creeks. Backwash from the Pacific Ocean very likely caused the conductivity at the estuary, beginning approximately three miles from the Pacific Ocean, to be at least 94% higher than the river's average. The data shows the river remains freshwater throughout most of its course.</div><div>Conclusions/Discussion Conductivity measures how easily electricity flows through a substance and is an indicator of the amount of dissolved salts present. Contrary to the predicted result, the conductivity of the L.A. River remains within the range of freshwater, though on the higher end of the range. The river thus can support native ecosystems and urban revitalization projects based on them.</div></div>	
Summary Statement In this investigation, the effect of the proximity to the Pacific Ocean on the conductivity of the Los Angeles was examined in order to subsequently analyze its possible impact on native species in future investigations.	
Help Received Father helped with purchase of project material and transportation to sample collection sites.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Yana D. Petri	Project Number S1114
Project Title Modeling CMIP5 Projected Climate Change Impacts on Global Chiropteran Species-Range Shifts under RCP Emission Scenarios	
Objectives/Goals The IPCC estimates that a 2-3C mean temperature rise would critically endanger 25% of the species. While projecting habitat shifts of terrestrial mammals is vital for mitigation policies, studies addressing this topic are rare due to modeling complexity/uncertainty. If Chiroptera (bats) are used as bioindicators, calculations could be simplified and help identify potential zoonotic disease (e.g. Ebola) hotspots. The goal of the project was to model, using MaxEnt, the present (1950-2000) global Chiroptera distribution and compare the resultant occurrence probabilities to those generated under RCP2.6 (low emissions) and RCP8.5 (high emissions) future scenarios (2061-80). Greatest niche area reduction was expected to occur under RCP8.5.	
Abstract Methods/Materials Bat records were downloaded from GBIF and cleaned in MySQL and ArcMap10. Present (1950-2000) and future (2061-80, under RCP2.6 and RCP8.5) climate data for BIO1 (annual mean temp), BIO4 (temp seasonal), BIO6 (min temp of the coldest month), BIO15 (rainfall seasonal), and BIO17 (rainfall of driest quarter) was obtained as ESRI GRID files from WorldClim. Future data was created using an average of 3 CMIP5 models. Species records, environmental layers were imported to MaxEnt and global maps of probabilities of bat occurrences in the present and future were generated.	
Results In the present and future periods, probability of bat occurrence was low in the temperate and frigid zones (northern Canada, Alaska, Greenland, Russia) and high in the tropics. Niche isolines moved up under both scenarios, but the greatest northern shift occurred under RCP8.5, which exhibited the greatest decrease in bat habitat area. Bat distribution under RCP2.6 changed little compared to that of the present. Based on the regularized training gain statistic, BIO6 (min temp of the coldest month) had the highest % contribution to the model. Analysis of AUC/Omission statistics for the present and future indicated that models had a better than random performance.	
Conclusions/Discussion The hypothesis that the greatest bat habitat reduction would occur under high-emissions RCP8.5 scenario was supported, suggesting that this policy would induce similar global shifts in the niche of terrestrial mammals. Models were deemed statistically significant and potentially useful for ecologists, policy makers, and epidemiologists.	
Summary Statement The effects of climate mitigation policies RCP2.6 and 8.5 on 2061-80 global bat habitat were modeled with MaxEnt, bringing attention to the need in reducing GHG emissions in order to prevent the extinction of numerous terrestrial mammals.	
Help Received Teacher and mentor Renee Fallon provided advice and support. Modeling was conducted at home using open-source GBIF, WorldClim, and CMIP5 data.	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Elise J. Rio	Project Number S1115
Project Title Study on the Effect of the Environment on Brain Coral Fluorescence: A Tool for Early Coral Diagnosis	
<div><div>Objectives/Goals<p>Around the world, the environment is threatened by human pollution. Scientists are facing the problem of diagnosing corals before they become completely diseased. This study observes the effect of the water environment on brain coral fluorescence and the degradation of corals from the fluorescence view point. Fluorescence could be used as a tool for early, noninvasive coral diagnosis.</p></div><div>Abstract</div><div>Methods/Materials<p>Requires scuba diving equipment, Fluorescence photography equipment, Panasonic GH2 with a yellow filter, format micro 4/3, 45 millimeter lenses, Underwater strobe, GoPro with micro and yellow lenses. Four Brain Corals in decaying conditions and environment, four healthy Brain Corals in a protected and clean area.</p><p>1. Identification of fluorescent specimen and suitable marine environment to conduct the experiment. 2. Environment dive to record information on the four corals in the healthy and degrading environments through lots of pictures for later grid analysis 3. Night dive to photograph and record fluorescence of corals in optimal and degrading environments through lots of fluorescence pictures for grid analysis</p></div><div>Results<p>Based off grids on pictures the corals in the degrading environment all showed fluorescence under 50%. The corals in the healthy environment usually had fluorescence over 80%, but some had started to show slight degradation in fluorescence: 83% fluorescence in coral 2. There was an overall direct correlation between the healthiness of the environment and the brightness of the corals under fluorescent lighting.</p></div><div>Conclusions/Discussion<p>The Philippines was a good place to conduct the project because there were healthy sites in front of the resort and polluted ones by local villages. My results showed a correlation between environment health and brightness of the corals however the corals that appeared healthy on the surface, in a healthy environment were showing early signs of fluorescence degradation, especially around the polyps. I concluded that corals used fluorescence as a means of attracting micro organisms for food. Corals that appeared healthy were in fact dying due to bad water conditions destroying their food supplies. Coral fluorescence can be used as a way for scientists to conduct non invasive diagnoses of corals early and better understand how pollution is affecting coral reefs worldwide to take early action in protecting coral reefs.</p></div></div>	
Summary Statement <p>Finding a way to diagnose disease in coral reefs early using noninvasive fluorescent techniques</p>	
Help Received <p>Parents were scuba diving buddies, dive master helped to find the right corals during the dives, family friend who worked as a coral specialist in Australia inspired me to come up with the idea</p>	



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Jessica A. Schager	Project Number S1116
Project Title Nurdles and Ports	
Objectives/Goals The purpose of my project was to determine if the amount of nurdles found on the shoreline could be affected by the distance from a port. Nurdles are the raw form of plastic products and are found in small, lightweight pellets. The site closest to the port seems the most likely to have the largest amount of nurdles since they could be easily spilled during transportation.	
Abstract Methods/Materials Three different sites on the south side of the Long Beach port were chosen to conduct nurdles counts in five trials. A measuring tape was used to mark off a 60 centimeter square in the sand. Nurdles were collected using a sifter and counted from that square. The average of the trials were taken for each site and compared to one another.	
Results My results show from the three sites I went to, the site farthest from the port had the largest amount of nurdles. In contrast, the site closest to the port had the least amount of nurdles on the shoreline.	
Conclusions/Discussion The amount of nurdles I found on the shore supports the idea that nurdles are not necessarily concentrated at ports since there was not a correlation. Ports are protected by a wall to prevent large waves from entering the port. The currents may have greater impact on the amount of nurdles which may explain why there were more nurdles outside of the protected port. This is important because by knowing ports are not a main source of nurdle spills helps to narrow down where the real problems occur during the transportation of nurdles.	
Summary Statement My project addresses the issue of whether or not there is a concentration of manufactured plastic pellets at ports due to the presence cargo ships that potentially transporting them.	
Help Received Mother drove me to sites.	