Abstract: Science and Engineering Fair of Houston

1164

Soundtrack to Growth

Alexis Xiao, Anna Yang

Spring Branch ISD/Spring Branch Academic Institute

Category:

Earth and Environmental Sciences

The purpose of the experiment was to find the length of music's effect on marigold growth. The scientific question of this experiment was which length of music would be better for marigolds. The hypothesis was that if a marigold is exposed to 15 minutes of music, then it will grow the best. To do the experiment you first need the experiment tools, soil, pots the same size, and marigold seeds. First you need to fill all 25 pots with the same amount of soil then separate them into 5 groups. Expose them to the 5 different music lengths: 0, 1, 15, 30, and 60 minutes. Take notes and repeat. Then take notes on which group grew better.

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[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

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[ ] yes [X] no

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Abstract: Science and Engineering Fair of Houston

1165

Paper Towel Wars

Aarohi Dar

Private/THE HONOR ROLL SCHOOL - MS

Category:

Earth and Environmental Sciences

America uses over 13 billion pounds of paper towels each year, making our country the highest users of paper towels. Paper towels are used every day, but which brand is the best at absorbing spills and staying strong? This experiment tests Bounty, Viva, Brawny, Sparkle, Ultra, and Field & Future to see which paper towel is the most absorbent, strongest, and best value for money. Does cheaper necessarily mean you end up spending less? Does plant-based or eco-friendly necessarily mean that it's better for the environment. This experiment is all about discovering what product truly works best based on objective and repeated tests. Sometimes expensive means you get more value for your product. Sometimes it does not. This teaches us to think critically about how a product is used and what value beyond the prices we see or the adjectives used to describe a product.

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Abstract: Science and Engineering Fair of Houston

1166

Bread Mold Be Gone

Michael Martin

Conroe ISD /Knox Junior High

Category:

Earth and Environmental Sciences

Bread Mold Be Gone by Michael Martin This project is to help determine what affects the growth of mold on bread. I experimented using several different variables. My hypothesis was that salt water will slow down the mold of bread more than just water alone. I put every bread in the same room so that the temperature and humidity was controlled. Each slice of bread was put in its own zip lock baggie. I also had 2 baggies of each of the following: plain bread as a control variable, orange juice soaked bread, salt water soaked bread, water soaked bread, vegetable oil soaked bread, and vinegar soaked bread. The first to get mold was the orange juice soaked bread on day 3. On day 4, both the water soaked bread and the salt water soaked bread had mold. On day 5, the vegetable oil soaked bread had mold. The plain bread developed mold on day 6. Even after 9 days, the vinegar bread didn't have mold. I concluded that the best at preventing mold was the vinegar as it was the only bread to not develop mold before the plain bread. It makes sense as vinegar is scientifically an acid and should therefore slow the growth of mold.

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Abstract: Science and Engineering Fair of Houston

1167

The Effects of Salt, Acid, and Insecticides on Radish Plant Health

Sanaa Narasimhan

Private/ST. JOHN'S SCHOOL

Category:

Earth and Environmental Sciences

The purpose of the project is to discover which everyday substances (salt, acid, insecticide) have the largest impact on plant health. With this knowledge, farmers will be more educated about the effects these substances have on their crops. Then, they can take actions to prevent the most detrimental substance from reaching their plants. The concentrations of the substances were chosen to best mimic the concentrations found in road salts, acid rain, and normal applications of insecticide. A wide variety of data was collected to assess the overall health of the radish plants. The data included height of plant (including root), area of largest leaf, number of true leaves, number of broken plants, Dark Green Color Index (DGCI), wet weight, and number of plants germinated. Radish plants were chosen because they germinate quickly, are inexpensive, and are easy to maintain. After the treatments, the planters were observed every day to record the germination counts. Then, after 24 days, the plants were removed, and the data was recorded. The hypothesis was supported because plants treated with salt had the smallest median leaf area of 1.74cm², the lowest median DGCI of 0.4625, the lowest number of plants with true leaves (6 plants), and the largest number of broken plants (5 plants). The height of plants was not a reliable predictor of plant health. Review of journal articles indicated that plant height varies due to competition, stress, and energy drains. It can be concluded that salt, compared to acid and insecticides, had the highest impact on plant health.

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Abstract: Science and Engineering Fair of Houston

1168

Soil types vs Plant growth

Oscar Meza-Aguilar

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Earth and Environmental Sciences

The purpose of this project was to find out or to determine how different soil types such as sand clay and loam affect the growth of a pinto bean's plant growth over the course of two weeks. Based off my research, soil texture affects drainage, nutrient availability, and the overall development of the plant. I hypothesized that pinto bean plants that grow in loam would grow the most because loam has a perfect set of particle size, nutrients and drainage compared to other soil types. To test my hypothesis, I planted two pinto bean seeds in each three different pots, each pot containing 300 mL of their soil type which in this case was sand, clay and loam. All pots received the same amount of sunlight, 100 mL of water each time I watered, and the same pot size. Plant growth was recorded every two to one day(s) for fourteen days. At the end of the experiment, the results showed clear differences between soil types, plants grown in loam had the greatest growth, reaching 15.4 cm by the end of the experiment. While several other plants such as clay, grew only 8.3 cm while the sand soil type only grew 6.5 cm. The data I've gathered supports my hypothesis and show that loam is the best soil to use due to its great drainage and nutrients.

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Abstract: Science and Engineering Fair of Houston

1169

Effect of Rock Type on the pH of Soil due to Carbon Dioxide Absorption

Arina Banerji

Private/ST. JOHN'S SCHOOL

Category:

Earth and Environmental Sciences

Carbon capture and sequestration (CCS) is a strategy for reducing atmospheric carbon dioxide (CO_2) by storing it in geological formations. The effectiveness of CCS depends on the ability of different rock types to chemically bind and retain CO_2. This study investigated how rock type influences soil pH, using pH as an indicator of carbon dioxide absorption. Five different rock types- crushed basalt, limestone, chalk, gypsum, and granite- were each mixed with potting soil in sealed containers, with potting soil alone used as a control. Carbonated water served as a consistent CO_2 source. All samples contained equal masses of soil and rock and were maintained at room temperature. Soil pH was measured after 1 hour, 12 hours, and 24 hours using pH strips. Results showed that basalt-treated soil maintained the lowest pH values over time, indicating the greatest retention of carbon dioxide. Basalt samples exhibited an average pH increase of 0.8 over 24 hours, compared to larger increases observed in limestone, chalk, granite, and soil-only samples. The control group showed the greatest pH increase, suggesting minimal CO_2 sequestration. Gypsum showed moderate effectiveness but maintained a higher overall pH than basalt. These findings support the hypothesis that rocks containing both calcium and magnesium are more effective at sequestering carbon dioxide through the formation of stable carbonate minerals. This study suggests that basalt may be a suitable material for long-term geological carbon sequestration and highlights the importance of rock composition in CCS applications.

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Abstract: Science and Engineering Fair of Houston

1170

Plants aren't JUST food…?

Emily Maximo

Alief ISD/Holub MS

Category:

Earth and Environmental Sciences

We all know that plants help us in many different ways, some of the most known ways being by creating oxygen, or food, but did you know that plants can also keep us safe? Well it's true, plants such as almost any type of hibiscus, daylilies, junipers, aronias, catmints, and vinca vines, help prevent soil erosion. Now you may be asking yourself, what is soil erosion? Because this question was repeated in my head throughout this whole experiment, and I would hate to leave you in suspense. Soil erosion is a process where the upper layer of soil is removed and transported by natural forces, this sometimes leads to the extensive amounts of soil contaminating our water. Now onto my experiment, after somewhat extensive research I found that daylilies, and tropical hibiscuses are the prettiest plants that are also able to prevent soil erosion, so I choose them as the main subject of my experiment, and attempted to recreate the conditions that they might face in the wild, then i ran my three trials by pouring exactly 55oz of water for every trial, after letting them soak off I collected the water and compared the quantities and color as seen in my data table and pictures.

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APPROVED 2026 sefh SCIENTIFIC REVIEW COMMITTEE

Abstract: Science and Engineering Fair of Houston

1171

Decomposition Behavior of Cellulose, PLA-Blend, and Starch-Based Polymers Across Simulated Natural Environments

David Blazheski

Conroe ISD /McCullough Junior High

Category:

Earth and Environmental Sciences

Biodegradable plastics (BPs) are promoted as environmentally friendly alternatives to conventional plastics and as a potential solution to the plastic pollution crisis. However, most of them can only be processed in specialized facilities. The environmentally friendly decomposition of BPs depends strongly on suitable conditions. This study explored the decomposition behavior of three commonly used BPs—cellophane, PLA-blend, and starch-blend polymers—under six simulated environmental conditions, including soil moisture, ultraviolet (UV) exposure, and microbial activity. A total of 180 samples were tested, with measurements taken after 5 and 8 weeks. Decomposition was measured by mass loss and tensile strength reduction. Microscopic surface analysis was also done. The results showed that humid environments containing fungi produced the greatest degradation, particularly in PLA and starch-blend plastics. PLA samples exposed to yeast exhibited the highest mass and tensile strength loss, while starch-blend plastics showed the greatest reduction in tensile strength. Probiotic bacteria were also found to accelerate decomposition in some cases. My study shows that microbial activity plays an important role in the decomposition of biodegradable plastics under realistic environmental conditions. Further research on specific microbial treatments can help identify more environmentally and economically friendly ways to treat BPs.

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Abstract: Science and Engineering Fair of Houston

1172

HydroHero : Automatic Irrigation Management System (AIMS)

Armaan Meerasahib

Clear Creek ISD /Westbrook Intermediate School

Category:

Earth and Environmental Sciences

My project will be based on an automatic soil irrigation system that will automatically feed water to the plant once it has been detected to be dry. My project will have three Basil plants being manually watered, and three Basil plants being watered by the automated irrigation system. I will then allow these plants to grow to the best of their abilities using the specific watering system assigned to that plant. After the duration of seven days, I will examine the plants and observe which set of plants had grown the largest. The automatic irrigation system will run on a moisture sensor that will sense how moist the plant is, and once the plant drops below a 70% moisture level, it will feed a certain amount of water to the plant to regain its moisture. During the duration of testing everything had went well, and all of the plants were able to grow many sprouts and seedlings by the end of the seven days. In the end the observed/ visible data had shown that the manually watered plants had grown more efficient and better than the set of plants powered by the automatic irrigation management system.

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Abstract: Science and Engineering Fair of Houston

1173

Analyzing the Release of Microplastics in Synthetic versus Natural Fibers through Hand Agitation

Annie Zheng

Conroe ISD /McCullough Junior High

Category:

Earth and Environmental Sciences

This project investigated how different types of fabrics release microplastics when exposed to agitation in water. The purpose of the experiment was to determine whether synthetic textiles shed more microplastics than natural textiles, contributing to environmental pollution. To test this, samples of polyester, nylon, polypropylene, cotton, linen, and jute were agitated in water, and the released microplastics were collected through a filter, dried, and measured using a gravimetric analysis approach. The results showed that synthetic fabrics released the highest mass of microplastics, with polyester producing the greatest amount, followed by nylon and polypropylene. In contrast, natural fabrics such as cotton and linen released no measurable fibers, and dyed jute released only a small amount. These findings indicate that synthetic materials contribute significantly more to microplastic pollution than natural fibers. The experiment concludes that choosing natural fabrics may reduce microplastic release and lessen environmental impact.

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Abstract: Science and Engineering Fair of Houston

1174

Corrosion of different household metals

Sarina Mulepati

Conroe ISD /Knox Junior High

Category:

Earth and Environmental Sciences

Corrosion is everywhere. The purpose of this experiment is to find out which metal corrodes and leaches out the most among household metals. The hypothesis states that the metal that will corrode the most is Brass. The importance of this experiment is to show that common house metals do corrode and check for corrosion in the house to ensure one's safety. Each day the scientist noticed differences on the metal conditions. Most of them corroded relatively fast compared to other metals in the experiment. In this experiment, the scientist tested many different metals using the same concentration of salt water solution to find out the metal that corrodes the most. The scientist hypothesis was not supported. The most corrosive metal was Copper, then Zinc, Iron, Brass, Aluminum, and last but not the least was the Lead. The scientist's hypothesis is; if household metals are dipped in saltwater, then brass will corrode and leach out the most because it is made up of different metals. This shows the reasoning that the scientist's hypothesis is incorrect. This research will benefit the reader on learning about the corrosion of household metals and the outcomes of the corrosion. Then after seeing these results of how the metals corroded, people will start checking out their household items, appliances, etc for corrosion to check for any damages that can lead to serious safety hazards or any astronomical financial and environmental costs.

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Abstract: Science and Engineering Fair of Houston

1175

Acid in the Third Ward: A community water quality assessment of public Places in a low income neighborhood

Marley Smith

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Earth and Environmental Sciences

This project is investigating how common are microplastics in everyday tap water from different locations within the “Greater Third Ward of Houston Texas”. Microplastic are tiny particles that are 5 millimeters long that can come from large broken down plastic waste like synthetic clothing fibers,or personal care products.Since people drink, and use tap water daily this project is aiming to see overall water quality and possible microplastic contamination that may vary across the different areas of Third Ward.Learning this can help identify whether certain locations might have higher levels of pollutants than others In this current phase of my project, tap water that is collected from different areas around Third Ward and will be tested for key characteristics of water contamination like Ph,lead,and many others.The results from this stage will help establish a baseline picture of general water quality conditions in Third ward and will also help compare the different areas tested. Once contamination data is gathered and analyzed the project will expand into a more specific study that's focused on identifying microplastics with this approach, my project aims to compare differences between my locations and give an understanding on how environmental factors contribute to microplastic pollution in the community and also where you may live

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Abstract: Science and Engineering Fair of Houston

1176

Diving into the Flow: How Floods and Various Other Factors are Correlated

Xiaoyan Guo

Katy ISD/TAYS Junior High - MS

Category:

Earth and Environmental Sciences

In my project, I aimed to discover correlations between floods and various other factors. I had come to think that since moon phases can affect tides, there was a chance it could affect floods as well. And not to forget about the population. I first downloaded data from NOAA and the US population census. The USGS flood event from NOAA recorded 125,000 flood events over 35 years.Using Python notebook, I was able to filter and compile this data. With Geopandas, which is a python geolocation library, I loaded it into python and mapped out the coordinates from flood events using Shapely and matched them with zip codes from the census data. This was all done in order to assign a population to each flood event. With all of this I was able to create a correlation matrix displaying the relationships of each factor and each other. My results proved valuable, and allowed me to come to multiple conclusions, like how there is little correlation between any factors, but high populations actually see less events. My next steps in this would be to add more factors, limit/expand locations and time frames, and experiment with the filtering of data.

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Abstract: Science and Engineering Fair of Houston

1177

Predicting Eruptions

Samuel Adebo

Fort Bend ISD /Fort Settlement Middle School

Category:

Earth and Environmental Sciences

I will plant some plants in soil and add a healthy and consistent amount of water per day. For the test plants, I will add 1 eggshell to one, 2 eggshells to another, and 4 eggshells to the last. This will help me get a good idea, if the eggshells impact the growth of a plant, just about how much the eggshells help boost a plant's growth.

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Abstract: Science and Engineering Fair of Houston

1178

Frozen to Fresh: Studying Salt Rejection During Ice Crystallization

Michelle Ou

Conroe ISD /McCullough Junior High

Category:

Earth and Environmental Sciences

Water is abundant on Earth, but less than 1% is usable for human consumption. By utilizing the ocean as a vast source of feedwater, desalination technologies offer viable means of addressing the gap between global freshwater supply and demand. Freeze desalination (FD) is still in its research-stage, but it shows strong potential to overcome limitations of conventional desalination methods. Through studying salt rejection from ice crystallization, this project's goal is to find the optimal approach for temperature and ice separation to achieve the best results for FD in terms of time, energy consumption, costs, and freezing stages. In the first part of the experiment, two saltwater samples with salinities of 3.5%, were tested at multiple temperatures, with two ice separations within a single FD stage. It was found that higher freezing temperatures produced lower-salinity ice at identical volumes. Additionally, the salinity reduction rate (SRR), or the percentage of salt that has been removed, was calculated to have a 14.2% increase from -5°F to 15°F. In part two, samples were repeatedly frozen at 10°F and 15°F, with one ice separation per stage, until the ice reached the salinity of freshwater (0.05%). These results revealed that higher temperatures not only produce lower-salinity ice, but also require fewer freezing stages to complete the desalination process, which is significant because reducing the number of stages directly translates into higher recovery rate, and lower energy and time consumption. With further development and optimization for efficiency, these results demonstrate that freeze desalination has the potential to become an effective alternative to traditional desalination methods.

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Abstract: Science and Engineering Fair of Houston

1179

Pipes Bursting Under Cold Weather

Category:

Earth and Environmental Sciences

Reyansh Maheshwari, Ihsan Kanli, Logan Garcia

Harmony Public Schools - North District/Harmony School of Excellence-Houston

Frozen and burst pipes are a common problem during winter weather and can cause expensive home damage. This project investigated which insulation method is most effective at preventing pipes from freezing and cracking in cold conditions. Our research question was: which type of insulation best protects pipes during freezing temperatures? We hypothesized that insulated pipes would stay intact longer than a bare pipe because insulation slows heat loss, and we expected foam spray to perform best because it forms a sealed layer with fewer gaps. We tested four setups: a bare pipe as the control, a foam sleeve, fiberglass wrap, and foam spray insulation. Each pipe setup was filled with water and placed in the same freezer environment. Over time, we recorded temperature changes and observed whether each pipe remained intact or developed cracks. The results showed clear differences in performance between insulation types. The foam sleeve and fiberglass wrap reduced heat loss compared to the control, but both cracked before the foam spray. Foam spray remained intact for the entire experiment and continued cooling without failure, leading to the lowest overall average temperature because it stayed in the freezer the longest. These findings support our hypothesis and suggest that foam spray provides the strongest protection against pipe failure, likely because it forms a sealed layer around the pipe that reduces weak points. Overall, this project demonstrates that foam spray insulation can be a low-cost, effective method for preventing pipe damage during unexpected freezing temperatures, especially in regions such as the Southeastern United States.

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Abstract: Science and Engineering Fair of Houston

1180

Don't slip it's just oil!

Amira Brooks

Houston ISD/BCM Biotech Academy at Rusk - MS

Category:

Earth and Environmental Sciences

For my project i tested how oil reacts on different ground surfaces and which surface would be faster to clean up. I also investigated to see how it would affect the ground/environment. I learned that clay would be the best for the environment and faster to clean up because it does not absorb/sink as quickly as gravel or sand.

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APPROVED 2026 sefh SCIENTIFIC REVIEW COMMITTEE

Abstract: Science and Engineering Fair of Houston

1181

Eco-Friendly Clay Refrigerator

Category:

Earth and Environmental Sciences

Shaurya Narsareddygari

Fort Bend ISD /Fort Settlement Middle School

In this project, I will be building a basic refrigerator that uses no electricity, called a clay pot. A smaller clay pot is placed inside a large clay pot as the space in between is covered with wet sand. As the water in the wet sand evaporates through clay, it removes heat from the smaller pot causing the temperature to be cooler in the natural refrigerator. We can keep our food and drinks cold using this natural machine. It can also be clean as the food/drinks kept inside the fridge can be placed inside a cloth or an object to keep it clean and fresh. This refrigerator can help the society by reducing electricity and pollution, being affordable and keeping foods and drinks fresh compared to other refrigerators.

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Abstract: Science and Engineering Fair of Houston

1182

The Influence of ALAN on the Biological Rhythm of Helianthus Annuus

Jamie Theis

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Earth and Environmental Sciences

My project was to test if ALAN (Artificial Light At Night) affects the biological rhythm of a Helianthus annuus, primarily the photosynthesis, and causing it to believe that it's still the day, of a Helianthus annuus. I predicted that it would affect the biological rhythm by causing it to believe it's always day, which affects photosynthesis. I tested this by creating three separate groups of the same plant, and for each group, I gave them a certain amount of artificial light ranging from 12 hours to 24 hours and recorded the results. I found that based on these results, the plants with the most ALAN ended up actually growing better than plants with normal amounts of sunlight. Though theses results were unexpected, they can still pose a use, since there isn't much information on this subject, and plants are the foundation to our food web, so this could give us some insight to how our plants around the world could be affected, and if the plants were negatively affected, how could that been affecting the plants around the world?

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Abstract: Science and Engineering Fair of Houston

1183

Impact of filtration and reverse osmosis purification on tap water quality

Keshav Narkar

Houston ISD/Lanier - MS

Category:

Earth and Environmental Sciences

Background: Access to clean drinking water is essential for human health. Although municipal tap water meets safety standards, it may still contain dissolved minerals and trace chemical contaminants. Many households use filtration or reverse osmosis (RO) systems to improve water quality, but their effectiveness is not well understood. This study evaluated changes in tap water quality after filtration and RO purification. Methods: Three water types were analyzed: untreated tap water, water filtered using the Everydrop Ice & Water Filter for Refrigerator, and water purified using the Bluevua RO100ROPOT Countertop Water Filter. Three samples of each type were collected. Water quality was assessed using HYCHEK 21-in-1 drinking water testing kit measuring various metals, physical properties, inorganic and organic substances, all in parts per million, ppm, and pH. Parameters were compared using One-way ANOVA followed by Tukey's multiple comparison test using GraphPad Prism software. A p value of <0.05 was considered statistically significant. Results: RO purification significantly reduced total hardness compared to tap water. Zinc was detected in tap and filtered water but not in RO-purified water. Total alkalinity and carbonate were significantly lower in RO water than in tap and filtered water. RO purification reduced QAC and MPS concentrations relative to untreated tap water, but the filtration system did not. The pH values differed among treatments, with tap water having the highest pH (9.0), filtered water slightly lower (8.2), and RO-purified water closest to neutral (7.6). Conclusion: In summary, this study demonstrates that RO purification is more effective than standard filtration in reducing water hardness, alkalinity, and specific chemical contaminants such as zinc, QAC, and MPS, while also producing water with a more neutral pH.

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Abstract: Science and Engineering Fair of Houston

1184

Removing Microplastics and Purifying Water with Ferrofluid and Natural Methods

Hemanth Kodali

Conroe ISD /Knox Junior High

Category:

Earth and Environmental Sciences

Microplastic pollution is becoming a big problem and can harm both the environment and human health. This project tests a multistep system to remove microplastics from dirty water. First, a ferrofluid, which is a mixture of black iron oxide and vegetable oil, uses magnets to remove microplastic pieces out of the water. Then, natural filters such as activated charcoal and sand-gravel remove tiny residual particles. Finally, chlorine is added in order to make the water cleaner. An AI/ML program estimates the purity percentage of the water before and after the treatment by looking at pictures of the water. The effectiveness of the process is measured, and the results show that most microplastics are removed at the beginning with the ferrofluid and magnet. The rest of the cleaning is continued with the charcoal and sand-gravel filters, while chlorine does the final cleaning. Magnets used in addition to methods of filtration appear to be a decent way to cleanse the water of microplastics.

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Abstract: Science and Engineering Fair of Houston

1185

Occurrence of Microplastics in Water Sampled at Multiple Depths in the West Fork of the San Jacinto River

Anastasia Zabik

Private/Sacred Heart Catholic School - MS

Category:

Earth and Environmental Sciences

Microplastics are plastic particles 5 millimeters or less in diameter which are created when larger plastic items breakdown due to weathering and friction. Microplastics enter the environment through human activity, particularly in urban centers. This project investigated whether suspected microplastics occurred in water from the West Fork of the San Jacinto River and whether they occurred more frequently at certain depths. The hypothesis was that suspected microplastics would occur more frequently at the surface of the water than below the surface because small particles remain suspended due to flows in the river. Water samples were taken at three depths, the surface, 30.48 cm and 60.96 cm below the surface. To avoid contamination, metal and glass materials were used instead of plastic. Slides with 0.04mL of sample water were examined using a compound light microscope at 100x magnification. A consistent 2x3 grid scanning pattern was used, and suspected microplastics were determined using a visual acceptance criterion, which included colors, shapes and uniformity. Data was recorded in tables and analyzed using relative frequency and graphs. Suspected microplastics were observed in the river water samples. Microfibers were the only type of suspected microplastics identified; blue was the most common color. These results suggest that microplastics may be present in the West Fork of the San Jacinto River and downstream water systems, which is important because communities downstream use the water for municipal purposes. Further research should confirm polymer composition using spectroscopy and expand sampling to additional sites and riverbed sediment.

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Abstract: Science and Engineering Fair of Houston

1186

What is the Effect of Resource Partitioning on Interspecific Competition and Species Coexistence?

Aidan Cunningham, Andrew Xu

Spring Branch ISD/Spring Branch Academic Institute

Category:

Earth and Environmental Sciences

This science fair project strives to find the leading cause and therefore how to get rid of the decrease in biodiversity in the world. By studying multiple regions over a period of 25 years, the leading causes (agreeing with our hypothesis) were human caused. Meaning things such as factories, industrialization, and agriculture were all leading causes of the loss of biodiversity. The information from this project is meant to benefit the world and spread awareness to everyday people. That way we can slow the loss of biodiversity and improve the health of the planet.

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Abstract: Science and Engineering Fair of Houston

1187

Every breath you take, Every move you make; How does the area affect air quality

Eliana Arias

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Earth and Environmental Sciences

Pollution is caused by humans and by natural sources. Pollution has harmful or poisonous effects. Air pollution causes 6.5 million deaths each year globally and has been linked to cancer and lung diseases. This project looks at air quality at different outdoor locations. My hypothesis is that the air quality will be poor in places that create pollution. This is important because people may want to rethink where they live. Using an air quality monitor, I took measurements at different locations and created a bar graph of location vs air quality. My findings showed that the area does affect the air quality! It was interesting that the results did not agree with the research found on a Google search for "pollution in places where people live compared to where people work". My readings revealed that the public park had a higher Air Quality Index (AQI) level than the recycling plant and the disposal supply, so there might be other variables that are being measured in the Google search results. I recommend doing this study again and taking measurements at more places.

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Abstract: Science and Engineering Fair of Houston

1188

The Clear Solution

Dhir Gandhi

Clear Creek ISD /Brookside Intermediate School

Category:

Earth and Environmental Sciences

The world's current filtration systems are outdated when it comes to filtering microplastics from water. What is the most efficient, effective, and affordable method for removing microplastics? This study aimed to identify unique techniques by testing several independent variables: boiling, ferrofluid removal, activated carbon filtration, and the use of natural resources (Okra and fenugreek powder). The project also seeks to raise awareness of the microplastics issue and encourage further efforts toward an advanced comprehensive solution. A no-removal trial served as the control. The dependent variable was the quantifiable decrease in the number of microplastic particles. It was hypothesized that the ferrofluid method would yield the best performance. Experimental results partially supported the hypothesis. Both the ferrofluid removal method and the activated carbon filter achieved excellent success, eliminating all identified microplastics (0.00 microplastics per mL). In B1 (boiling), there were 9 microplastics, the lowest of the three; B2 had 12, the highest of the three, and B3 had 11 microplastics. The average of the B samples was approximately 11, and for the control, the average was 15 across 1 sample. The boiling method offered a slight reduction compared to the control group, resulting in an average of 0.22 microplastics per mL across three samples, versus 0.30 microplastics per mL for the control. Data for the Okra and Fenugreek removal were inconclusive due to the solution thickness. Overall, the findings demonstrate that both ferrofluid separation and activated carbon filtration are highly effective and affordable strategies to remove microplastics from water.

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Abstract: Science and Engineering Fair of Houston

1189

Coastal Defenses

Madeleine Moltimer

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Earth and Environmental Sciences

If you've been to the beach, have you seen the sea walls? Humans change the environment to fit their lifestyles and keep them safe. My project is to test how different barrier shapes affect a tsunami's speed and distance. A barrier's shape controls how much a tsunami slows down and where and how its energy is spread out. I tested three different shaped barriers (convex ,concave, and straight) to determine their effect on a tsunami's speed and distance. I created each barrier out of cardboard and tested each against various waves, conducting nine travels. I marked point A and point B, forty centimeters apart, to measure the distance of the wave. Through timing the water movement from point A and B, I measured the time. The convex barrier had the lowest average speed, which means it slowed the tsunami down the most. This showed that convex barriers are more effective than straight or concave barriers at decreasing how fast or how far a tsunami can travel. Because of this, convex barriers should help lower the amount of damage a real tsunami can cause on land.

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Abstract: Science and Engineering Fair of Houston

1190

Plastic Problems

Colby Smith

Clear Creek ISD /Brookside Intermediate School

Category:

Earth and Environmental Sciences

Have you ever wanted to try and break down microplastics? Microplastics is a harmful pollution in our soils and are damaging our bodies, so I wanted to find a way to break them down. I researched about breaking them down and questioned if worms can break down the microplastics. It turned out that yes, they do. The problem with this project is that microplastics are in our soils in our farms, that end up in the food we eat; and are damaging our bodies. So, I made three bins with different soils, and tested microplastics with a density test using canola oil before adding the worms to test if there are microplastics to start out that is needed to be broken down. Then, I put in worms and over a three-week period time frame, I scooped out soils one at a time into a mason jar, di the density test, recorded my observations on what I saw, and jotted it into my logbook, and my data graphs. The results ended up being that yes, the worms do break down microplastics in the soil, but they worked differently in each soil. The worms worked best in Compost, breaking it down the most. While the potting mix and topsoil were averagely close in results. So, inconclusion of this project is that yes, there is a way to break down microplastics in soil and can be used by having worms do it for you.

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Abstract: Science and Engineering Fair of Houston

1191

Effects of Acid Rain

Naimah Doss

Charter/SST - Champions College Prep - MS

Category:

Earth and Environmental Sciences

Acid rain is a form of pollution that occurs when sulfur dioxide and nitrogen oxides released into the atmosphere react with water, oxygen, and other chemicals to form acidic compounds. This study examines how acid rain affects both living (biotic) and nonliving (abiotic) components of the environment. Research shows that acid rain can damage soil, erode rocks, and create holes and craters in the ground over time. It also negatively impacts plants and animals by destroying habitats, weakening plant growth, and harming aquatic ecosystems. Through research and analysis, this project explains the causes of acid rain and provides examples of its environmental effects. Understanding the impact of acid rain is important because it can help people develop solutions to reduce pollution and protect ecosystems.

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Abstract: Science and Engineering Fair of Houston

1192

The Effect of Humidity, Temperature, and Airflow on Aerosol Trajectory: A Physical and VPython Analysis

Rudra Verma

Fort Bend ISD /Quail Valley Middle School

Category:

Earth and Environmental Sciences

By analyzing the movement of particles in the air, my project aims to help architects and engineers design better ventilation systems to improve indoor air quality by gathering data on aerosol droplets based on temperature, advection, and humidity. It uses both a physical and digital experiment. The physical experiment will consist of a fan, anemometer, spray bottle, water and dye solution, thermometer, and hygrometer. First, 500mL of tap water will be mixed with the neon green food color. The spray bottle, anemometer, hygrometer/thermometer, tape measure, and fan will be secured with packing tape to ensure consistent trials. Then, the temperature and humidity will be recorded and the bottle will be sprayed. The droplet that went the farthest will have its distance and the variables of temperature, humidity, and fan speed recorded. The surface will be wiped clean with a dry towel. These steps will be repeated for 25°C, 70%, low fan, and high fan variables. After the physical experiment, I will run the digital experiment in VPython 7.6.5 on Python 3.12.2. Once both sources of data have been collected, I will contrast them and see if they are similar or conflicting, telling me if my results are accurate or not. Finally, I will check if my hypothesis that 70% humidity would cause droplets to travel the least distance was correct.

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Abstract: Science and Engineering Fair of Houston

1193

Rocky Solution For Better Consumption

Derik Saloj

Alief ISD/Alief MS

Category:

Earth and Environmental Sciences

The purpose of this experiment was to find out which type of rock would make water more potable after being heated and boiled with it. The three types of rocks tested were limestone, gypsum, and breccia. The hypothesis was that limestone would make the water more safe for water consumption than the other two rocks. To test this, each rock was heated with bayou water until reaching boiling. The water quality was measured using dissolved oxygen (DO), pH, turbidity, and total dissolved solids (TDS). These measurements were used to calculate a Water Quality Index. The results showed that breccia had the highest water quality index (97.18), followed by gypsum (97.56), and then limestone (97.77). However, none of the rocks actually made the water more potable. The only measurement that changed was the dissolved oxygen parameter, which increased in all samples. Since the dissolved oxygen was already higher than the ideal value, this did not improve the water quality. Because of this, the hypothesis was not supported. This experiment shows that heating rocks can change some parts of water quality, but it does not necessarily make water safer to drink.

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Abstract: Science and Engineering Fair of Houston

1194

The Oxygenation of Ponds

Fiona Schottel

Clear Creek ISD /Seabrook Intermediate School

Category:

Earth and Environmental Sciences

Ponds are very important to ecosystems. They provide lots of elements for living things. But the plants in ponds don't just stay there, they also take up a pond's dissolved oxygen. When the Dissolved Oxygen (DO) levels are low, it makes it very hard for animals to survive in ponds. So, it's very important that ponds have oxygenating factors to increase DO. But what form or oxygenation will increase the DO level the most? Is it with a fountain, waterfall, pump, or an air stone? If different forms of oxygenation are tested, then air stones will work best. During this experiment 2 liters of water were put into 5 Tupperware dishes, and a different form of oxygenation was put in each one (except the control). Dissolved oxygen levels were taken, and forms of oxygenation were all turned on. After 7 hours the increase in DO was found. The summary data table shows that the form of oxygenation that increased the DO level the most on average was the low waterfall. An interesting thing about the data is that the air stones are made to increase DO in fish tanks, but air stones had one of the lowest DO levels! One area of improvement could be doing the same process but with more than 7 hours of time. This could help improve the experiment by showing a larger increase in DO. In the future, an experiment on how water temperature affects the amount of DO in the water could be tested. In conclusion, the hypothesis was wrong because the air stones didn't increase the water's DO level the most. It was the pump. A real-world use for this experiment is to help ponds stay healthy. Based upon the findings, if you own or want to own a pond, using a pump would be the best way to increase DO levels. Or you can use more than one form to increase the DO.

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Abstract: Science and Engineering Fair of Houston

1195

The Soot behind the Spark

Ximena Morales

Clear Creek ISD /Brookside Intermediate School

Category:

Earth and Environmental Sciences

Air pollution, a vast worldwide issue throughout history, is mainly recognized to only be an outside negative impact, but it is also commonly experienced in households or indoors. Air pollutants show detrimental impact on our health, where it can cause a variety of diseases, including asthma, lung cancer, and heart failure (Delgado, 2021). CO, an invisible and odorless pollutant, is a common origin of these symptoms. The purpose of this experiment was to determine which type of candle wax emits the most CO, and how candles can help produce air pollution in homes. To test this, six different types of unscented and colorless candle waxes were created into candles and burned at a rate of 5-15 minutes to test the amount of CO emitted using a carbon monoxide detector. The hypothesis of this experiment was, if the Paraffin wax candle is lit, then the Paraffin wax candle will produce the most amount of CO compared to the other 5 types of waxes. This was proven incorrect, for the results revealed that White wax produced the highest amount of CO indoors, which was 49 ppm. This result was due to the combination of multiple wax types found in White wax, increasing the ppm. In conclusion, the White wax candle emitted the highest CO. If this experiment were to be done again, testing multiple pollutants or candle scents on the ppm level would be beneficial to discovering more about indoor air pollution in candles.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

[ ] Human participants [ ] potentially hazardous biological agents

[ ] Vertebrate animals [ ] microorganisms [ ] rDNA [ ] tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.

[X] yes [ ] no

3. I/We worked or used equipment in a regulated research institution or industrial setting.

[ ] yes [X] no

4. This project is a continuation of previous research.

[ ] yes [X] no

5. My display board includes non-published photographs/visual depictions of humans (other than myself):

[X] yes [ ] no

6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.

[X] yes [ ] no

Abstract: Science and Engineering Fair of Houston

1196

A Magnetic Solution To A Microscopic Crisis

Prapti Patel

Fort Bend ISD /Fort Settlement Middle School

Category:

Earth and Environmental Sciences

Microplastics are tiny pieces of plastic that pollute oceans, rivers, and even drinking water. They are very difficult to remove because they are so small. The purpose of my project was to test whether ferrofluid, a magnetic liquid, could help collect microplastics from water so they can be removed with a magnet. To investigate this, I mixed microplastics with water and added a small amount of ferrofluid. Then I used different magnets to see if the ferrofluid would attach to the microplastics and pull them out of the water. I observed how much cleaner the water became after using the magnet. My results showed that the ferrofluid did stick to the microplastics, and the magnet was able to remove a noticeable amount of them from the water. Stronger magnets removed more microplastics than weaker ones. This experiment suggests that magnetic materials like ferrofluid might be a useful way to help reduce microplastic pollution. Although my project was small-scale, it shows how science and engineering can work together to create new solutions for environmental problems.

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Abstract: Science and Engineering Fair of Houston

1197

Banana sunscreen

Abner Mathew, Nilan Sivashankar

Stafford SMSD/Stafford STEM Magnet Academy

Category:

Earth and Environmental Sciences

This project explored the development of an eco-friendly sunscreen using banana peel extract (BPE) and zinc oxide (ZnO) nanoparticles, aiming to assess how BPE concentration affects SPF compared to commercial sunscreens. Motivated by NOAA data linking chemical sunscreens like oxybenzone to 14% of global coral reef loss from 2008 to 2024, the study sought a sustainable alternative that aligns with UN SDG 14. The hypothesis was that higher BPE concentrations would enhance SPF due to increased pectin and antioxidants stabilizing ZnO nanoparticles for better UV protection. Procedures involved drying and grinding banana peels, extracting BPE, synthesizing ZnO nanoparticles with varying BPE concentrations (2 mL, 5 mL, 8 mL), and testing with UV beads under a 302 nm UV-B lamp. Results showed SPF values of 18 (10 mL), 22 (15 mL), and 25 (20 mL) after 10, 15, and 20 minutes, respectively, outperforming some SPF 15-20 commercial products, with no harmful runoff observed. The hypothesis was supported, as higher BPE concentrations correlated with increased SPF, consistent with enhanced nanoparticle stability. Additional questions investigated extraction temperatures (122°F, 158°F, 197°F) and UV exposure durability (5-15 minutes), suggesting further research potential. This project demonstrates a cost-effective, middle school-accessible method to produce a reef-safe sunscreen, reducing ocean pollution while utilizing 120 million tons of annual banana peel waste.

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