Project 201 Category: ANIM

Amelia Magga 6th Grade Delta Middle School Teacher: Travis Richey

You Are What You Eat

Abstract:
This project tested chicken eggs. Chickens were fed different types of food for a time period. The data that was collected used color and size of the yokes.

Project 202 Category: BEHA

Caroline Langel 7th Grade Canterbury School Teacher: Joe Caldwell

True Colors of the Brain: The Stroop Effect

Abstract: No submission

Project 203 Category: BEHA

Aurora Nicholes 7th Grade Hibberd Intermediate School Teacher: Tiauna Washington

How does Question Wording Affect Memory?

Abstract:
The purpose of this study was to test whether leading questions affect a person's memory. Participants were shown a car accident and then were asked, how fast were the cars going when they ___ each other, using the word smashed into or contacted. Participants in the control condition were simply asked how fast the cars were going. They were also asked whether they saw broken glass. My hypothesis was that participants who heard the word "smashed" would report the highest speeds and would report having seen broken glass. My hypothesis was not supported. Participants in the control group had higher speed estimates than the others. Almost every participant, regardless of group, reported not seeing glass. The result shows that leading questions may not have an effect on people's recollection.

Elevator Pitch

Project 204 Category: BEHA

Penny Baker 7th Grade Saint Jude Elementary School Teacher: Kathleen Crick

Can Gaming Level Up Your Brain

Abstract:
Is gaming good for your brain or just a waste of time? I decided to test how playing video games more often can impact certain cognitive functions such as reaction time to find out. I wanted to see if my guess was right, which was that if you play more video games weekly, then your cognitive function skills will improve. To test this, I had 10 participants go to the Human Benchmark website and complete three types of tasks three times each and then compared the average scores for each group. I discovered that the Gamers (6+ weekly hours) performed noticeably better than the Non-Gamers (0-2 weekly hours) on the Reaction Time test. The data from the other two tests was inconclusive as both groups performed similarly. My project was only partially successful as there was only an important finding from one out of three tests, and my hypothesis wasn't really supported. My results were mostly reliable as almost all participants were the same age and completed the test at the same time of day. Next time, I would recruit more participants and find a better testing website as the Human Benchmark one has some issues.

Project 205 Category: BEHA

Rozlyn Davenport & Chloe Ness 7th Grade

Saint Jude Elementary School Teacher: Kathleen Crick

The Werewolf Theory

Abstract:
The importance of my project is to research and distinguish patterns in crime. Our hypothesis is; if there is a full moon– the homicide rate will stay at an average amount. We researched online for victims of homicide in Chicago, IL. We then compared them with the dates of full and new moons. I had found the average murders stayed the same, proving our hypothesis at the end of the project. I believe that my project was successful– the results were reliable, and the hypothesis was true.

Project 207 Category: BEHA

Bhrett Brogden 7th Grade Saint Mary School Teacher: Katie Duckworth

67 BPM

Abstract:
My science fair project is about how emotions affect a person's heart rate. The purpose of my project was to find out if people's heart rates change when they experience different emotions such as happiness, sadness, nervousness, or when they are lying.

My hypothesis was that a person's heart rate would go down when they are sad or unhappy and go up when they are happy or joyful. I also thought that a person's heart rate would increase if they were nervous or lying.

To test my hypothesis, I measured and recorded people's heart rates while asking them different questions or placing them in situations that could cause different emotions. I observed their heart rate and recorded whether it increased or decreased during each situation. I compared the heart rates to see if there were noticeable changes depending on the emotion.

The results showed that people's heart rates did change slightly depending on their emotions or when they felt nervous. In many cases, the heart rate increased when people felt nervous or uncomfortable. However, the changes were usually small.

In conclusion, my results suggest that emotions can affect heart rate, but the changes may not always be large. This project helped me learn more about how the body reacts to emotions and stress.

Project 208 Category: BEHA

Tatum Moss 6th Grade Summit Middle School Teacher: Jordan Leffler

Which Bathroom Stall is used most Frequently?

Abstract:
The purpose of my experiment was to determine which bathroom stall was used most frequently. If the bathroom stall is furthest away from the door, then more people will use it. According to the data, more people would use the last stall, or the one farthest from the door because it was on the end. In the beginning, I tried to use a paper pencil technique, which consisted of putting a tally sheet along with a pencil in all of the girls' bathrooms which was a

way that when people used that stall they would mark a tally. This did not work because it came to my attention that some people were putting multiple tally marks, writing all over the paper, and mostly just causing trouble. Instead of this I made a google form which most people were able to fill out, so it would graph the data for me, and simply make it easier. In conclusion, my hypothesis was supported because more people used the bathroom stall located on the end. This means, since 49.7 people used the last bathroom stall, with there being a total of 589 responses, 293 of them prefer the stall on the end.

Project 209 Category: BMED

Jayda Darkis & Georgia Miller 7th Grade

Greater FW YMCA Teacher: Amanda Kuhns

Glossy Lips

Abstract:
Comparing lip gloss for wearability and longevity

Project 210 Category: BMED

Jordyn Sayre 7th Grade Saint Mary School Teacher: Katie Duckworth

Herbal Essence

Abstract:
My science fair project tested whether herbal cleansing pads really remove toxins from the body and help with skin irritation. Many companies claim that these pads pull toxins out through the feet while you sleep. I wanted to test if the pads would actually help reduce redness, swelling, and irritation on my skin.

My hypothesis was that the herbal cleansing pads would relieve my skin irritations. I thought this would happen because the ingredients in the pads might calm redness and swelling and help fight bacteria or infection in the body.

To test my hypothesis, I applied one herbal cleansing pad to each foot every night for 6â€“8 hours for five days. During the experiment, I observed how my skin felt and looked each day. When I experienced skin irritation, I sometimes used small amounts of CeraVe moisturizer, Aquaphor, or steroid cream on the irritated areas. I paid attention to redness, swelling, and how my skin felt throughout the experiment.

After completing the experiment, I observed that my skin redness seemed calmer and I did not notice swelling in my legs or arms while using the cleansing pads. Based on my observations, I believe the cleansing pads helped improve my skin irritation. In conclusion, my hypothesis was supported because the pads appeared to reduce redness and discomfort while I used them.

Project 211 Category: BMED

Zoya Nur 6th Grade Woodside Middle School Teacher: Rachel Leone

Which facial mask yield the most hydration: collagen or omega-3?

Abstract:
This study was conducted to investigate whether collagen or omega 3 (flaxseed) would be more effective for skin hydration when applied in the form of a topical mask. I hypothesized that between the two, the flaxseed mask would be better at enhancing skin hydration. To determine the answer, I made both types of masks and then asked several test subjects to use them. I measured the pre- and post-treatment skin hydration levels for comparison along with having the participants take a survey afterwards. This led me to conclude that both face masks had their benefits, but the flaxseed mask did in fact hydrate the skin better because collagen molecules are too large to be absorbed by the skin while flaxseed mucilage is able to create lasting hydration. Additional studies like mine that investigate benefits of natural ingredients in their unadulterated form can help us establish which of them can be most helpful for our regular use.

Project 212 Category: BMED

Gauravi Meruva 8th Grade Woodside MS Teacher: Rachel Leone

Mobile AI Assistant for Alzheimers patients

Abstract:
Alzheimer's disease is a progressive neurological disorder affecting an estimated 55 million individuals worldwide, making it one of the most pressing public health challenges of our time. The central question this project addresses is: can a mobile application meaningfully support individuals living with Alzheimer's by compensating for memory loss and disorientation while keeping caretakers informed and connected? Despite the growing prevalence of Alzheimer's, there remains a significant gap in accessible, integrated technology solutions that serve both the care recipient and caretaker simultaneously within a single platform. To address this gap,

ASSIST was developed as a mobile care management application using Xcode, Apple's Vision framework for on-device machine learning, and Claude AI as a code generation assistant. The development process involved iterative prompt engineering to progressively build and refine the application's core functionality across multiple feature domains. The application was deployed to a physical iOS device and tested across real-world conditions to evaluate both functional accuracy and user experience. Facial recognition was assessed across multiple subjects and lighting conditions, while geofencing, scheduling, and alert systems were validated for reliability and responsiveness. The application integrates six core features: facial recognition, GPS-based geofencing and location monitoring, cross-device schedule synchronization, a daily scheduling system, a people-to-remember database, and an emergency SOS and direct-call interface. Testing yielded a facial recognition accuracy of approximately 90–95% with no critical errors identified in the application logic or user interface, confirming the system performs reliably under varied conditions. These results demonstrate that ASSIST met its desired goal as a functional, clinically relevant caregiving tool, representing a meaningful step toward improving independence and safety for individuals living with Alzheimer's disease and peace of mind for the caretakers who support them.

Project 213 Category: BMED

Aarav Pandey & Arjun Vegesana 6th Grade Woodside MS Teacher: Rachel Leone

Fast relief: which antacid is the MVP

Abstract:
Antacids are one of the most commonly used over-the-counter medicines in the United States, yet most people never stop to wonder how they actually work — or whether some work better than others. This project explores that question through a hands-on experiment comparing three different artificial antacids to determine which one neutralizes acid the fastest. To understand the experiment, it helps to know the difference between the two main categories of antacids. Natural antacids are substances found in nature that have acid-neutralizing properties, such as baking soda or calcium carbonate in its raw form. Artificial antacids, on the other hand, are commercially manufactured products — like Alka-Seltzer, Rolaid, TUMS, Gaviscon, or Mylanta— that combine multiple chemical compounds, often including natural neutralizing agents, to treat conditions like heartburn, acid indigestion, and upset stomach. These products are widely available and used by millions of people daily, which makes understanding their effectiveness both practical and important. For this experiment, white vinegar was used to simulate stomach acid because it has a similar acidic pH and is safe to handle in a school setting. Each of the three artificial antacids(TUMS, Gaviscon, and Alka-Seltzer) was tested under the

same conditions to keep the results fair and consistent. The goal was to answer a specific question: Does on brand of Antacid neutralize an acid faster than another. The findings of this experiment could help consumers make more informed choices about which antacid to use.

Elevator Pitch

Project 214 Category: CBIO

Shriyan Srinivasan 7th Grade Creekside Middle Exhibition

A Stacked Ensemble Machine Learning Framework for the Non-Invasive Early Detection of Alzheimer's Disease Using Acoustic Features

Abstract:
Over 55 million people worldwide are living with Alzheimer's disease, a form of dementia. Alzheimer's is a neurodegenerative disorder associated with abnormal accumulation of the proteins amyloid and tau. Over time, these proteins form plaques and tangles that disrupt neuronal communication and ultimately lead to neuronal death. Despite its scale, there is no cure, and early detection remains difficult because early symptoms are frequently mistaken for normal aging, delaying diagnosis by 2 years on average. By the time of clinical diagnosis, up to 60% of neurons in vulnerable brain regions may already be lost. Current diagnostic methods like a lumbar puncture, which analyzes cerebrospinal fluid(CSF) are costly, and require specialized infrastructure that is often unavailable in low-resource settings. Meanwhile, brief cognitive screening tools show limited sensitivity for early stage disease, with detection rates for mild cognitive impairment reported as low as 18-50%. For these reasons, I developed a machine learning(ML) model to detect Alzheimer's related patterns from subtle, voice based changes. My hypothesis was, "A model using voice derived features predicts Alzheimer's disease (AD) status significantly better than the null hypothesis". The null hypothesis assumes no relationship between voice features and AD status, implying performance at approximately chance level (50%). To test this hypothesis, I obtained a dataset containing participants' AD status along with voice derived acoustic features extracted using OpenSMILE, including measures such as pitch, jitter, shimmer, and related descriptors. I then applied statistical feature selection using p-values to identify candidate variables associated with AD status, using LASSO regression to create a smaller, more interpretable feature set. After feature selection, I trained multiple supervised learning models: k-nearest neighbors (KNN), gradient boosting, CatBoost, and binomial logistic regression, along with a multilayer perceptron (MLP) neural network on the same dataset. To assess real world performance, I evaluated the models on an out-of-sample dataset and benchmarked them against a null (chance level) baseline (50%). The best model, was a stacked ensemble framework including a logistic regression, MLP, and gradient boost. The framework achieved a accuracy of 85%, a ROC-AUC (Meaning the model reliably ranks AD cases above

controls across thresholds) of 0.82, and 89% recall for AD, substantially outperforming the baseline. These findings support my hypothesis that voice is a valuable, non-invasive indicator for Alzheimer's disease. A voice-based screening approach could complement existing clinical workflows by enabling earlier, lower friction monitoring, especially in settings where invasive biomarker testing is impractical or routine longitudinal assessment is needed.

Project 217 Category: CHEM

Bailey Van Hoover 6th Grade Frankton Elem School Teacher: Lori Morris

A Clear Foundation: Which Make-up Remover Removes Foundation the Best

Abstract:
As young girls, we start to take an interest in makeup thinking it will make us prettier. We need to feel our best without makeup and can start that by learning how to wash our face. If we play with or wear makeup, we need to make sure we remove it all and the daily dirt to keep our face clean and beautiful. For this experiment, I used four different types of makeup foundation, applied it to an orange to represent skin and let it sit. I then used four different types of makeup remover to remove the foundation. I created a scale for my observations to see how much foundation was removed and left on the skin and pores. My hypothesis for this experiment was "washing our face at the end of the day with micellar water will remove the most makeup foundation and dirt from the skin and pores." After completing the experiment, I observed using Cold Cream or Micellar Water would remove the most foundation and dirt from the skin and pores. Once I completed this on the oranges, I tried to reproduce the experiment using my sister's skin. I noticed the same results using a real person.

Elevator Pitch

Project 218 Category: CHEM

Kniya Middleton 6th Grade Summit MS Teacher: Jordan Leffler

Does Salt or Sugar Help Water Boil?

Abstract:
This experiment serves to show how salt and sugar affect the boiling times of water in an attempt to speed up the process for cooking purposes. The hypothesis was that water would boil the fastest compared to salt and sugar. The experiment was controlled by using three different types of cooktops at the same time. The same pot was used on the same heating surface every time. For each burner and pot combo, there was always a pattern of the fastest

and slowest pot and burner combination. This provided three consistent measurements for each water combination to find out how salt or sugar impacted boiling time. The temperature was the same at the start of every experiment. The sugar water released gases that were deceptive, looking like it was boiling before it reached the right temperature because of gasses being released by the sugar. In the end, the hypothesis was correct, and the water boiled fastest for each burner without anything in it. What consistently sped up the boiling process in each experiment was using the hottest burner with the thinnest pan.

Elevator Pitch

Project 219 Category: CHEM

Elizabeth Bolt 7th Grade Canterbury School Teacher: Joe Caldwell

Water You Waiting For?

Abstract:
The experiment that was tested consisted of this question. What is the healthiest type of water: Spring, Mineral, Purified, Tap, or water from a river in Eagle Marsh? I researched fish tank testing and the harmful chemicals in water. A very harmful chemical is nitrate as it is very harmful to babies and young children. The hypothesis was this: After doing research the following hypothesis has been made. If five types of water are tested, springwater, mineral, tap, purified, and Eagle Marsh water from the creek, using fish tank testing strips, then tap water will be the cleanest. The reason behind this is the tap water will be the cleanest because it does not have as much bacteria as the other kinds of water and won't have as much nitrate. It will be the cleanest because it will be in the normal range of the fish tank testing strips when it is tested.

Some of the materials that were used were purified, spring,and mineral water. For the methods first start with filling up the water type in a red solo cup, then grab a testing strip and let it sit for 2 seconds, wait 30 seconds for the colors to show, then compare them to the sheet. Repeat all steps for all types of water.

After collecting the data here is what was observed. The hardness level on all of them was pretty high and not good. Every single type of water had no iron levels, free chlorine, and nitrite of those chemicals in them which is very good. Some mistakes that were made were not setting a timer for letting it sit out. Also a variable that was not controlled was the weather. The weather could have affected the chemicals in the water, especially the water from the river.

After testing the following types of water a conclusion has been made. After doing research the following hypothesis has been made. If 5 types of water are tested, spring water, mineral, tap, purified, and Eagle Marsh water from the creek, using fish tank testing strips, then tap water will be the cleanest. The reason behind this is the tap water will be the cleanest because it does not

have as much bacteria as the other kinds of water and won't have as much nitrate. It will be the cleanest because it will be in the normal range of the fish tank testing strips when it is tested. My hypothesis was partially correct. While some things that were tested about Tap water were healthy it did not have a healthy hardness with it being over 250 mL. I do not have an actual clear answer to the original question. After the experiment was made every single type of water had some good things and some bad things to it. The unhealthiest types of water that was found after the results were Eagle Marsh water and Spring water. Both had extremely high hardness levels with Spring water having the highest with 1000 mL, Eagle Marsh water had an average amount of hardness at 500 mL. Both had a high amount of pH with both having an average level of 8. Their average amount of total alkalinity was the same with an average amount of 180 mL. The reasons the averages on both types of water were so high was because of geological impact and how when they are dissolving minerals they dissolve minerals like calcium, limestone, and chalk. If this project was to be redone again it would be tested when the temperature is average.

Project 220 Category: CHEM

Deep Patel 7th Grade Edgewood MS Teacher: Matthew Richard Wise

Does hotter or colder temperature effect reaction time?

Abstract:
The intention of this project was to find out if higher or colder temperature effects chemical reaction time. In total there are four different chemical reactions. One at a higher temperature, one at room temperature, one at a cold temperature, and one even colder. We get our final conclusion by monitoring the rate of reaction. The reaction we used is MgOH+HCl2 yields MgCl2+H2O. The cold and coldest ones use lots or some ice while the room temperature one uses nothing and the hottest one uses a bunson burner to heat it up. In conclusion, the reaction with the higher temperature concluded the fasted.

Project 221 Category: CHEM

Evelyn Sweigert 7th Grade Saint Charles Borromeo Teacher: Sydney Wilder

Which antacid neutralizes acid the fastest?

Abstract:
The purpose of my project was to find which antacid balances acid the fastest. My hypothesis was that the Alka-Seltzer antacid would cancel out the acid fastest because it has a very strong ingredient in it called sodium bicarbonate. I tested this by first boiling shredded red cabbage

leaves and getting the natural pH indicating juice. Then, I took 25 milliliters of vinegar and 75ml of red cabbage juice and I put them together in a cup and it stimulated the stomach's acid. Next, I put the antacid in and started a stopwatch and tested the pH every minute with a pH strip for 7 minutes. In the end, I found out that 2 antacids didn't do anything, 2 made a little cancel of the acid and 1 completely balanced it out. Overall, my hypothesis was correct and the Alka-Seltzer antacid cancelled it out in under 2 minutes and brought the pH from a 4 to a 7.

Project 222 Category: CHEM

Mallory Barnard 8th Grade Huntington Catholic School Teacher: Amy Ball

Chromatography Chemistry

Abstract:
N/A

Project 225 Category: EAEV

Lanora Nye 6th Grade Summit Middle School Teacher: Jordan Leffler

Which fabrics block ultra-violet radiation the best?

Abstract:
The purpose of this science fair project in the year 2026 is to answer the question, "How effective are different fabrics at blocking UV?â€. This was the project chosen because UV radiation can cause incredible harm to the human body (possible skin cancer) and it is important to prevent too many rays from reaching your skin directly. At the beginning of this project, the hypothesis made before the experiment was that the most protective fabric would be the UV protective fabric. It was believed that this would happen because the product is advertised to protect a person's skin. In order to test this hypothesis, 4 fabrics were laid on a UV radiation test card. For each fabric, a UV light would be shown onto the fabric on the card for 30 seconds, 2 minutes, and five minutes. Using the intensity of the UV rays that penetrated the fabric (which is represented on the card) the data was marked and later turned into a data table. During the procedure/experiment, it was realized that thicker fabric was less penetrated by UV rays. Although this fact was found out about during research as well. In conclusion, from both research and experiment it was learned that the results of too much exposure to UV rays is likely to cause bad things like skin cancer. And it was determined that the best fabric/s is thicker denser fabrics like denim, which was the most effective in the experiment.

Project 226 Category: EAEV

Mason Craun 7th Grade Greater FW YMCA Teacher: Amanda Kuhns

The Good the Bad the Bacteria

Abstract:
Testing water in different areas of the home to discover what is contained in the water.

Project 228 Category: EAEV

Cassie Ulrey 8th Grade Heritage Hall Inc Teacher: Kelly Beeson

That's So Degrading! Which Bioplastic Degrades the Fastest?

Abstract:
My project was: "Which homemade bioplastic breaks down the quickest?" The bioplastic types chosen for this experiment were gelatin, milk, and orange peel plastic. The hypothesis was: "I believe that the gelatin plastic will break down the fastest because it is the softest. I think the milk plastic will take the longest because it is the most rigid. I don't think the purchased bioplastic will degrade at all because it requires a commercial compost facility." First, all the materials for making the bioplastics were gathered and the bioplastics were made. After they were made, they were buried in soil and checked every two days. Their mass was measured in grams, recorded in the logbook, and then the plastics were reburied. At the end of 30 days the final measurements were taken and recorded. The results obtained partially denied the hypothesis. Based on mass measurement alone, the gelatin plastic did not appear to degrade the most in a 30-day period. However, this was because the dirt absorbed into the plastic and could not be removed. This means it may have actually been degrading more than the orange peel. The orange peel plastic appeared to degrade the most, losing an average of 0.122 g, followed by the gelatin plastic at 0.052 g. The milk plastic lost 0.031 g and, finally, the control lost 0 g. Knowing which bioplastics degrade and which do not gets us one step closer to a pollution solution!

Elevator Pitch

Project 229 Category: CHEM

Eeshaani Verma

8th Grade Hibberd Intermediate School Teacher: Tiauna Washington

Which household acids corrode metals the fastest?

Abstract:
The purpose of this project was to understand how chemical reactions work. This is very important, as many different household acids can react differently to different materials, especially when used on metals, and many people do not know this, leading to the point of my experiment. For the procedure itself, I took my 3 liquids and measured them equally then poured in a cup. My control was water. I put an unused iron nail in each and tracked the results for 7 days. Based on the results, the vinegar had the most corrosion. This was likely due to the acetic acid in vinegar. The acid helps speed up the process of corrosion, leaving us with a dramatic result. This helps explain why metals can become corroded when exposed to different materials.

Elevator Pitch

Project 231 Category: EGSD

Natania Sanders & Josie Durnell & Avery Wright

7th Grade 7th Grade 6th Grade Greater FW YMCA Teacher: Amanda Kuhns

Hair Curls

Abstract:
A look at which curls hold best in different hair textures.

Project 227 Category: EAEV

Ethan Wright

8th Grade Greater FW YMCA Teacher: Amanda Kuhns

The Ooze that Preserves

Abstract:
A non-newtonian approach to food preservation.

Project 233 Category: EGSD

Paisley McCullogh 6th Grade Delta Middle School Teacher: Travis Richey

You Need to Charge Your Phone ASAP

Abstract:
This project tested which charger and type of electrical source would charge a phone fastest.

Project 234 Category: EGSD

Casen Connelly 7th Grade Carroll Middle School Teacher: Sherri Foster

Geodesic Domes What is the best material?

Abstract:
My project is on how material affects the strength of a dome. The independent variable in my project is strut material, and the dependent variable is the strength of the dome. My controls are the length of A's and B's, the same weighted books, same surface tested on, the frequency of the dome, and the amount of A's and B's in a dome. A geodesic dome is a dome made out of multiple triangles that form hexagons and pentagons. I wanted to figure out what material would be the best for a small sized dome because my little brother wanted something like a house for his toys. So I made domes out of rolled up paper, plastic straws, and 3d-printed PLA. For each dome I had to make 35 A's which were 3 inches long or 7.6 cm, then I had to make 30 B's which were 2 1/2 inches or 7.3025 cm (Mikes Inventions 0:42). For each dome I tested its strength by putting different weights of books on it until it either broke or the top bent inward. I predicted that if I change the material of a dome then the paper dome would hold the most because it's not flimsy and paper is good when put together. This was incorrect because the PLA dome held the most. My final results were that 3d-printed PLA held the most and paper held the least. This led to giving my little brother a 3d-printed dome.

Project 235 Category: EGSD

George Sordelet 7th Grade NE Region Home Schools Teacher: Shaelin Maurer

Copper Coins

Abstract:
The purpose of this experiment is to turn a quarter into copper. My hypothesis is, yes you can change the physical property of a coin using electroplating and electrolysis. My procedure is to first create your electrolyte solution mixing vinegar and salt. Next, you take a positive alligator

clip and connect one end to copper wire and the other to the positive terminal on a 9v battery. Then you do the same with your black alligator clip, attaching one end to the quarter and the other end to the negative terminal on the battery. How this happens is electroplating and electrolysis as well as reduction-oxidation (redox). The result of my project was a copper quarter. My hypothesis was correct, because the quarter became copper.

Project 236 Category: EGSD

Dominick Sanders 8th Grade Greater FW YMCA Teacher: Amanda Kuhns

Whipped Cream

Abstract:
Discovering which brand of whipped cream leaves the least amount of product unused

Project 237 Category: ENEV

Mara Smith 7th Grade Saint Charles Borromeo School
Teacher: Sydney Wilder

Which sorbent will remove the most oil from water?

Abstract:
The purpose of my project was to determine which sorbent would remove the most oil from water. My hypothesis was that the sponge would remove the most oil from the water because it is the heaviest material and because sponges in general soak up a lot of liquid so I assumed it will also do the same for oil. I tested this by filling 4 bags made out of nylon netting with ¼ ounce of cotton pads, sponges, 100% polyester, and 100% wool and securing them with rubber bands.

I then submerged each bag in a mixture of 4 cups tap water and 1 cup synthetic motor oil. I waited a total of 5 minutes and 30 seconds before removing the bags. A reading was taken of the remaining water level and of oil and water level. I performed the experiment two times measuring volume only initially and measuring volume and weight the second time. I found that all the sorbents did remove oil from the water, with the sponge removing the least amount of > cup and the polyester and wool both removing ½ cup. While my hypothesis was not correct, I was surprised to learn that you cannot just look at total weight of liquid removed because some weighed more than others, but did not remove the same amount of oil. The wool was the best sorbent because it removed the least amount of water and a ½ cup of oil.

Project 238 Category: ENEV

Clare Richert 8th Grade Huntington Catholic School Teacher: Amy Elizabeth Ball

Spinny Blades

Abstract:
N/A

Project 239 Category: ETSD

Asher Haynie 6th Grade Saint Mary School Teacher: Katie Duckworth

Marble Run

Abstract:
Hello, my name is Asher Haynie, and I am in 6th grade. The title of my science fair project is Marble Roller Coaster. My project is about finding what height a marble needs to successfully pass through a loop and how velocity affects its motion. I chose this topic because I am interested in speed, velocity, and how objects move.

My hypothesis was that the marble would pass through the loop more easily when it was dropped from a higher height. I thought this would happen because the marble would gain more speed and velocity as it fell from a greater height.

To test my hypothesis, I conducted an experiment where I dropped the same marble from different heights on a roller coaster track with a loop. The track and marble stayed the same for all trials, and the only variable I changed was the release height. I carefully recorded whether the marble successfully completed the loop for each height and measured the patterns in its motion.

The results showed that the marble was more successful at passing through the loop when released from higher heights. Greater height produced greater speed and velocity, which helped the marble stay on the track through the loop.

In conclusion, my hypothesis was supported. This project taught me that increasing height increases speed and velocity, which is important for understanding roller coasters, loops, and real-life motion. If I repeated the experiment, I would test more heights or different loop sizes.

Project 240 Category: ETSD

Sophie Ball 8th Grade Saint Mary School Teacher: Katie Duckworth

Bridges

Abstract:
My science fair project is about bridge design and strength. Bridges are built in many different ways, such as Warren bridges, Bailey truss bridges, and suspension bridges. Engineers choose different bridge designs depending on the location, materials, and the amount of weight the bridge needs to support. For my project, I decided to build and test a lattice truss bridge, which is a type of bridge made from many connected triangles that help distribute weight and make the structure stronger.

The purpose of my project was to see how much weight a model lattice truss bridge made from Popsicle sticks could hold. My hypothesis was that the lattice truss bridge would be able to hold a large amount of weight because the triangle shapes make the structure strong and stable.

To complete my experiment, I built a bridge using Popsicle sticks and glue. I carefully selected straight Popsicle sticks and glued them together to form triangle patterns. I used binder clips to hold the joints while the glue dried to make the structure stronger. After the bridge was finished and fully dry, I tested it by gradually adding weights to see how much weight it could support before breaking.

The results showed how strong a triangle-based structure can be when the weight is evenly distributed. This project helped me learn how engineers design bridges to safely support heavy loads.

Project 241 Category: ETSD

William Beane 8th Grade Saint Mary School Teacher: Katie Duckworth

How Does Weight Affect a Drones Lift

Abstract:
My science fair project is about how weight affects a drone's lift. Drones use spinning propellers to push air downward, which creates lift and allows the drone to rise into the air. I wanted to find out how adding different amounts of weight would affect how well a drone could lift off the ground and stay in the air.

My hypothesis was that as more weight is added to the drone, the drone will have a harder time lifting off the ground and flying. I thought this would happen because the propellers can only produce a certain amount of lift.

To test my hypothesis, I used a drone and gradually added small amounts of weight to it. I made sure the weight was balanced so the drone would stay stable. During each test flight, I observed whether the drone could take off, how high it could fly, and how stable it was in the air. I recorded the results for each amount of weight added.

The results showed that as more weight was added, the drone had more difficulty lifting off and staying stable in the air. Eventually, the drone could no longer lift off the ground. In conclusion, the experiment showed that weight directly affects a drone's ability to produce lift. This project helped me understand how engineers must consider weight when designing drones and other flying machines.

Project 242 Category: MATH

Olivia Fox 7th Grade Canterbury School (PK-08) Teacher: Joe Caldwell

You Don't Know Blackjack

Abstract:
In the game of Blackjack it is common knowledge that "the house always wins" an experiment was conducted to see if this statement is true. Blackjack is a popular card game over 80% of American adults know how to play, the object of the game is to have cards that's total value is closest to 21 without going over or "busting". Going into a game of Blackjack the dealer, also known as the house, has about a 0.5% edge of the player, even if the game is played with perfect strategy. This occurs because the player both has to play first and does not have to follow set rules like the house does. If three different Blackjack strategies are tested using a random number generator to simulate many games, then it is predicted that the standard strategy of hitting on 16 and staying on 17 has the highest win probability.

To test this hypothesis multiple experiments were conducted. The first test was played completely by hand using a standard deck of cards. The player's strategy was decided by a strategy card, or "cheat sheet", that can be found in many casinos. Each strategy was tested 50 times each, or 50 games were played with the dealer using each strategy. The second experiment was an Excel simulation using a random number generator. Cards were given a code using the first letter of their suit name, and either their number value or the first letter of the card's title. These codes were then assigned a random number that would be randomly selected to decide the cards used in each hand. The same strategy card used for the physical test was

programmed into the Excel sheet and used to make the decisions for the player. Each strategy was tested this way 50,000 times each.

After conducting experiments, data was collected. The three strategies that were tested were the strategy of hitting on 15 and staying on 16, hitting on 17 and staying on 18, and the standard strategy of hitting on 16 and staying on 17. The first time they were tested in a small sample size of fifty, the result surprisingly showed the strategy of hitting on 17 and staying on 18 had the highest dealer win percentage with 64% and the standard strategy to have a 62% win percentage. During the Excel simulation, more surprising outcomes occurred with the results showing the strategy of hitting on 15 had a dealer win percentage of 47.6% and the standard strategy had a dealer win percentage of 47.4%. The strategies were tested a second time using the simulation, with the player adjusting to the dealer's new strategy to allow for more accurate results and this test showed the standard strategy had the highest dealer win percentage with 47.4%, and the strategy of hitting on 15 went down to 43.7%. The strategy of hitting on 17 had a win percentage of 47% in the first test, then going down to 46.4% on the second.

After analyzing the initial data, the results showed the original hypothesis to be incorrect. The first 50,000 games simulated with Excel showed the standard strategy to have a lower dealer win percentage than the strategy of hitting on 15 and staying on 16. It was then decided more testing was necessary. It was realized that the first games simulated and played were done so without the player adjusting to the dealer's new strategy. Once these adjustments were made the win percentage for the strategy of hitting on 15 went down by 4.1%.

Elevator Pitch

Project 243 Category: MATS

Elin Edwards 6th Grade Woodside MS Teacher: Rachel Leone

Ferrofluid Fix

Abstract:
Microplastics are small plastic particles that contaminate water sources and learning how to remove them is important because it could help improve human health, marine life and the environment. The purpose of my experiment is to explore how effective the ferrofluid magnetic removal method extracts different types of microplastics from water. If the ferrofluid magnetic removal method is used on water containing different types of microplastics, then it will extract all types of microplastics because according to the chemistry rule â€˜like attracts like,' the microplastics should stick to the ferrofluid allowing them to be removed from the water using a magnet. I conducted an experiment using five different types of microplastics: polypropylene,

polystyrene, polyvinyl chloride, acrylic, and polyethylene terephthalate. The ferrofluid magnetic removal method worked best on the PVC pipe (polyvinyl chloride) samples removing 98.2% and was the least effective on the styrofoam (polystyrene) samples removing 73.8%. My hypothesis was supported as the ferrofluid magnetic removal method successfully extracted all five varieties of microplastics from the water. Microplastics are a part of everyday life and they can be difficult to avoid. My goal is to continue to develop removal methods to treat larger bodies of water so we can have cleaner lakes, rivers, and oceans.

Elevator Pitch

Project 244 Category: PHYS

Rahil Patel 7th Grade Edgewood Middle School Teacher: Matthew Richard Wise

What is the effect of the wing shapes on lift generation

Abstract:
What is the effect of the wing shapes on lift generation

Project 245 Category: PHYS

Juliet Underwood 7th Grade Saint Charles Borromeo Teacher: Sydney Wilder

What is the strongest kind of wood in a two point fluctuate test?

Abstract:
The purpose for my experiment is to find which wood is the strongest. My hypothesis was that OSB would be the strongest. I tested this by clamping one end of board to a workbench and a clamp with a bucket. Then putting salt in the bucket until it broke. Then weighted the amount of salt it took to break, making sure to include the clamp on the end with the bucket. OSB was the weakest wood with an average of 0.44 kg. Red Oak was the strongest wood with an average of 4.94 kg.

Elevator Pitch

Project 246 Category: PHYS

Atticus Wilder 7th Grade Saint Charles Borromeo Teacher: Sydney Wilder

What basic geometrical shape is the strongest?

Abstract:
My project answered the question: what support shape is the strongest when used in trusses made of soft flexible materials. I believed that the triangle would be the strongest shape for these trusses. To figure this out I modeled and 3D-printed 12 plastic trusses with square, trianglular, hexagon, and circle supports. I continuously stacked weights on these trusses until they weren't able to hold anymore weight with three tests to see how strong they were. The hexagonal truss did the best, then the circle truss, after the square truss, and the triangle truss did the worst. I concluded that the strongest support shape for trusses with soft flexible materials is a hexagon. My hypothesis was completely wrong. While I thought the triangle supported truss would do the best it did the worst.

Project 247 Category: PHYS

Finn Harris 8th Grade Saint Mary School Teacher: Katie Duckworth

Blast Off Bottle Rockets

Abstract:
N/A

Project 248 Category: PHYS

Charlie Noll 8th Grade Saint Mary School Teacher: Katie Duckworth

Space X-Ray

Abstract:
My science fair project is about exploring transient X-ray events and characterizing stellar winds to better understand extreme astrophysics. Transient X-ray events are short bursts of high-energy X-rays from space, often caused by explosive or highly energetic phenomena like supernovae, black holes, or neutron stars. Stellar winds are streams of charged particles released by stars, which can affect surrounding space and the evolution of the star itself. I chose this topic because I am interested in how extreme forces in space work and how astronomers use X-ray data to study these events.

My goal was to investigate how these high-energy phenomena behave and what information they can provide about extreme conditions in the universe. I reviewed astronomical data from X-ray observatories and analyzed patterns in the frequency, duration, and intensity of transient events. I also studied how stellar winds carry mass and energy away from stars and how they interact with their environment.

The results showed that transient X-ray events are highly variable and can provide clues about the properties of dense stellar objects. Stellar winds vary depending on the type and age of the star, and they play an important role in shaping surrounding space.

In conclusion, this project demonstrated how observing X-rays and stellar winds helps scientists understand extreme astrophysical processes. This research could be useful for predicting cosmic events and learning more about the life cycles of stars.

Project 249 Category: CHEM

Yazan Alnatsheh 7th Grade Carroll Middle School Teacher: Sherri Foster-Kuhns

Time it takes ice to melt in different liquids

Abstract:
To determine how the different liquids, water, Sam's Diet Cola, 2% milk, Capri Sun Berry Juice, and natural orange juice with pulp affect the rate at which ice melts, and how liquid composition affects heat transfer. How long does it take for ice to melt in different liquids? There are many different compositions that change the rate of melting, and Sam's Diet Cola will be the clear winner, but what factors affect the rate at which ice melts? I placed identical ice cubes into equal amounts of each liquid at room temperature. I made the liquids room temperature after letting them sit for about 2 hours and then put the equal sized square shaped ice cubes in. I used measuring cups to get equal amounts of liquids, and I used a thermometer to make sure they were all the same temperature. I recorded melt times across 3 different trials, and averaged them. After data review, the first trial was identified as an outlier, and I averaged the remaining 2 trials to determine the melting times. Water was the fastest, while orange juice was the slowest, showing that liquids that contain higher densities, sugars, pulp, or any artificial ingredients slowed melting. This impacted the way I looked at liquid composition, and can make key findings for other experiments doing the same stuff showing that if the temperatures were really high, it could change the results of the experiment.

Project 250 Category: ____

Ahren Palmer 6th Grade NE Region Home Schools
Shaelin Maurer

Title: _____

Abstract: N/A

Project 251 Category: ENBM

Ashlyn Schafer 7th Grade Carroll Middle School Teacher: Sherri Foster-Kuhns

Parametric Prosthetics

Abstract:
This experiment was about finding out what prosthetic hand design could be 3D printed and still be easily used while having good performance. I printed a base, joints, proximal, middle, and distal finger sections to replicate a real hand, but I used a 40 pound fishing line as a tendon to bend the prosthetic fingers. The tendon to joint distance was changed along with the thickness of the fingerprint. This experiment was conducted by testing how much force was required to close the prosthetic between different tendon lengths. I tested the success rate of the design in practical use by repeatedly picking up 5 objects that you would find around the house like a cube, a hat, a tennis ball, a cup, and a pair of glasses. I tested every design by grabbing the object from a vertical angle and a horizontal angle. My hypothesis was that the design with the 15 mm tendon to joint distance and the 4 mm fingerprint thickness would have the highest overall success rate and ease of use. After collecting the data and finding the overall average of each design I found out that the most effective design was the design with the 15 mm tendon to joint distance with the 2 mm fingerprint thickness.

Elevator Pitch

Project 255 Category: CBIO

Rohan Khatri 12th Grade Canterbury School Teacher: Rebekah Randall

Relative EEG Band Power Changes in Response to Pure Tone Onset Stimuli Across Varying Frequencies

Abstract:
Background: Electroencephalography (EEG) records voltage fluctuations in the brain. EEG can be decomposed into well-defined frequency bands, all of which reflect different functional states. While auditory stimulation is known to influence EEG, the specific effect of a pure-tone input on the relative power of EEG brain bands has not yet been studied or analyzed. To address this gap, this study utilized a computational, deterministic, and qualitative pipeline to simulate how tones spanning the human auditory range (20â€“20,000 Hz) alter cortical dynamics at stimulus onset.

Methodology: The framework integrated four peer-reviewed and established models: The Auditory Modeling Toolbox v1.6.0, for outer and middle ear amplitude modulations; Verhulst et

al. (2018), for modeling cochlear and inner hair cell dynamics; DynaSim, which converts voltage into neuronal spike trains through its simulated thalamocortical spiking stage; and the Jansen-Rit cortical model, which is a system of differential equations numerically integrated using a fourth-order Runge-Kutta method with a 5ms timestep. Together, these models generate realistic, simulated, single-cortical-column EEG values. Each trial ran for 400ms, as excitatory inputs in the brain decay, on average, to 10% of their original strength in the first 200ms, and 1% within the first 400ms. That decay was modeled using a multiplicative exponential decay function of the form exp[ln(0.1)t/0.2]. Results are qualitative, as the Jansenâ€“Rit model does not produce quantitatively accurate absolute magnitudes, but its relative power distributions are interpretable. The simulated EEG waves were then analyzed using a power spectral density (PSD), and their relative band powers were calculated from PSD's output by adding up a band's total power and dividing it by all bands' powers. To generate graphs of each individual wave, a Discrete Fourier Decomposition was used.

Results: Below 1kHz, the relative power of all bands other than Delta decreased in a concave down manner, while Delta increased concave up. The results displayed a pronounced, non-monotonic redistribution of power from 90-315 Hz (the human vocal range): Delta (-1.21 pp) and Theta (-0.57pp) decreased, while Alpha (+0.78pp), Beta (+0.80pp), and Gamma (+0.20pp) increased. Above 1 kHz, Delta and Theta decreased asymptotically, Beta and Gamma increased asymptotically, and Alpha remained stable.

Conclusions: This behavior is consistent with the middle ear's high-pass filter properties and overlaps with the human vocal range, suggesting that a biologically meaningful onset-driven shift redistribution from slower-band dominance toward relatively higher fast-band power on that interval. This pipeline provides a reproducible framework for future studies to improve upon, whether that's by adding stochasticity, incorporating background brain activity, or conducting empirical EEG validation.

Project 256 Category: CBIO

Ishan Ramrakhiani 12th Grade Canterbury School Teacher: Rebekah Randall

Gene-Specific Cross-Attention vs Global Pooling for Virtual RNA Inference

Abstract:
Purpose. Colorectal cancer is the third most commonly diagnosed cancer in the United States, with approximately 107,320 new cases and 52,900 deaths expected in 2025. Virtual RNA Inference (VRI) models predict spatial gene expression from Hematoxylin and Eosin (H&E)-

stained histology images, but current approaches use global pooling of image features, discarding spatial information about which tissue regions are most relevant for each gene. This study introduces a multi-head cross-attention mechanism that allows each gene to learn which histological regions are most relevant to its expression pattern, guiding predictions toward biological coherence.

Procedure. H&E whole-slide images paired with Visium spatial transcriptomics data from colon tissue were used. Tissue patches were extracted from Visium spots and encoded using a frozen UNI2-h pathology foundation model (681M parameters) on 4× NVIDIA A100 80GB GPUs, producing 256 spatial tokens per patch. In the standard baseline, these tokens were globally pooled into a single 1536-dimensional vector and passed through a two-layer MLP (1536-->1024-->1000) to predict 1,000 spatially variable genes. A systematic ablation of head depth, width, dropout, and batch normalization confirmed the minimal architecture was optimal. In the cross-attention model, a learnable gene query matrix $Q \in R1000\times1536$ was introduced, with one query vector per gene. These queries attended to the 256 spatial tokens via multi-head cross-attention, allowing each gene to focus on histologically informative regions rather than relying on a pooled summary. A two-layer MLP then mapped each gene's attended features to a scalar prediction.

Results. The baseline model achieved a mean per-gene Pearson correlation of 0.442 (range 0.406-0.472) across eight random seeds. The cross-attention model achieved comparable performance (mean 0.439, range 0.403-0.464), with results compared seed-by-seed to control for initialization variance.

Conclusions. Multi-head cross-attention with learnable gene queries provides a biologically motivated architecture for VRI that enables gene-specific spatial attention over histology patches, offering a pathway toward more interpretable and biologically grounded gene expression inference from standard tissue slides.

Elevator Pitch

Project 257 Category: BMED

Achyut Ethiraj & Aditi Ethiraj 10th Grade Carroll HS Teacher: Michelle Brenner

Synthesis and Characterization of Novel pH-Responsive Dual-Layer Chitosan-Alginate Smart Nanogels for Curcumin Delivery with Relevance to Colorectal Cancer and Biological Validation in Drosophila melanogaster

Abstract:
Colorectal cancer (CRC) is the second leading cause of cancer-related deaths worldwide, emphasizing the need for targeted therapies. Curcumin, a natural compound, demonstrates anti-cancer properties but is limited by hydrophobicity, degradation at gastric pH, and low bioavailability at the tumor site. This study develops a pH-responsive dual-layer chitosan-alginate smart nanogel (NG) to improve targeted curcumin delivery at the tumor sites. NGs were synthesized using ionic gelation, in which deacetylated chitosan was cross-linked with sodium tripolyphosphate, incorporating solubilized curcumin for the core-shell system. The sodium alginate outer-layer was applied through electrostatic interactions. Twenty systematic trials evaluated multiple variables: solvent composition, pH, polymer ratios, and Rotations per minute (RPM). Encapsulation efficiency (UV-Vis spectroscopy) improved from 32% to a peak of 90.4% (mean of 87% ±2.2%). Structural characterization established successful NG formation. SEM/TEM imaging showed uniform spherical morphology with average diameters of 147 nm (single-layer) increasing to 342 nm (dual-layer). Zeta potential reversal from +32.5 to -32.7 mV confirmed alginate layering. FTIR verified the interactions among all components, and fluorescent microscopy validated curcumin internalization within the NG matrix. Drug release kinetics, modeled via Korsmeyer-Peppas analysis, showed dual-coated NGs suppressed gastric release to <1% while achieving 74% curcumin release at colonic pH- 3.8 fold increase over single-layer NGs. Biological validation in Drosophila melanogaster confirmed pH-responsive delivery: dual-coated NGs exhibited negligible foregut florescence with progressive hindgut accumulation, mirroring colon-targeted release. This study establishes that dual-layer chitosan-alginate NGs markedly enhance stability and site-specific curcumin delivery, advancing therapeutic potential for CRC.

Elevator Pitch

Project 261 Category: CELL

Elva Gu 10th Grade IN Aca for Sci Math & Humanities Teacher: Justin Crowder

Effects of Environmental Heat Stress on Changes in RAD51 in Yeast

Abstract:
DNA double-strand breaks threaten genomic stability and must be repaired for cells to survive. RAD51 is a key protein involved in homologous recombination repair in eukaryotic organisms. This study investigated how elevated temperature influences RAD51 protein abundance and cellular growth in Saccharomyces cerevisiae, or yeast. It was hypothesized that RAD51 knockout

strains would show slower growth and reduced protein abundance under heat stress compared to wild-type strains.

Wild-type, RAD51 knockout, and GFP-tagged RAD51 yeast strains were cultured at 30°C and 37°C. Growth was assessed using serial dilution spot assays standardized by OD600 measurements. RAD51 protein levels were analyzed through Western blotting with PGK1 as a loading control.

At 30°C, RAD51 knockout strains exhibited reduced growth compared to wild-type, confirming the importance of RAD51 for normal cell proliferation. Unexpectedly, at 37°C, knockout strains showed relatively improved growth compared to wild type after extended incubation. Western blot analysis demonstrated that RAD51 protein abundance decreased at 37°C compared to 30°C, suggesting reduced stability and less expression under heat stress.

These results indicate that while RAD51 supports growth under standard conditions, heat stress alters its abundance and may change cellular stress responses in complex ways. This research may provide insight into how environmental stress influences DNA repair pathways and cellular survival in eukaryotic organisms.

Elevator Pitch

Project 262 Category: CELL

Jedrek Nguyen 11th Grade Homestead Senior High School

Teacher: Tammy L Behrens

Identification and Evaluation of DCT as a Novel Antifungal Lead Against Candida albicans

Abstract:
Candida albicans is an opportunistic fungal pathogen that causes clinically significant infections, especially in immunocompromised individuals. Antifungal resistance in Candida albicans highlights the need for novel therapeutic strategies and new drug candidates. This study investigated the antifungal activity of several candidate compounds targeting metabolic pathways potentially associated with fatty acid synthase, a key enzyme in fungal lipid metabolism. Initial screening using optical density (OD600) measurements identified compound DCT as the strongest inhibitor among seven tested compounds, demonstrating consistent, concentration-dependent suppression of fungal growth.

To further evaluate efficacy, serial dilution assays were performed to estimate inhibitory ranges and compare activity against a clinical reference drug. DCT demonstrated strong antifungal activity with growth inhibition consistent with an estimated MIC between approximately 0.78-1.56 µM, supporting its potential as a lead antifungal candidate. Amphotericin B was used as a

positive control and demonstrated growth inhibition consistent with an estimated MIC of approximately 0.156 µg/mL under the conditions tested, providing a benchmark for comparison with the novel compound. Dose response trends observed across serial concentrations demonstrated reproducible, concentration-dependent inhibition of Candida albicans growth.

Based on these findings, a checkerboard assay combining DCT and Amphotericin B showed reduced fungal growth in several combination wells compared with single-agent controls, suggesting potential interaction or enhanced inhibitory effects. These findings support DCT as a promising antifungal lead compound and provides a quantitative framework for evaluating combination therapies targeting fungal metabolism. Future studies will evaluate mechanistic interactions involving fatty acid synthase pathways.

Project 263 Category: CHEM

Harrison Stanski 9th Grade South Side HS Teacher: Katherine Crowl

Does Type of Metal Affect Corrosion Levels?

Abstract:
In summary, I put the nails in vinegar on January 14th and removed them on the 19th. The nails slowly corroded. The ones that showed signs were all but the stainless steel ones. 2 of the galvanized steel nails lost 1 gram and 0.05 oz. However the steel nails didn't. I looked closer though and saw rust on them so I wiped it on a paper towel and I was able to see rust wipe off on the towel.

Project 264 Category: PHYS

Zain Nasir 9th Grade Yorktown High School Teacher: Brad Hess

Deep Learning Parameter Estimation of Black Hole Mergers from LIGO Data

Abstract:
When black holes collide, they create ripples in spacetime called gravitational waves. LIGO detectors measure these waves to determine black hole masses, distances, and spins. Traditional analysis methods require substantial computation time, creating bottlenecks in characterizing detection events.

While various neural network architectures exist for gravitational wave analysis, direct comparisons of their performance are lacking. This study compared convolutional networks and

vision transformers for estimating merger parameters from gravitational wave spectrograms. Spectrograms are visual representations showing how signal frequency evolves as black holes spiral together.

Beyond measuring performance, it was also examined what features each architecture learns from the data. Analysis revealed that the networks concentrate on the characteristic chirp pattern, the rising frequency sweep produced by accelerating orbital motion. Further investigation compared the feature extraction mechanisms of convolutional and attention-based approaches.

This study validates deep learning as an efficient computational approach for parameter estimation of black hole mergers while revealing which signal characteristics are important for accurate predictions.

Project 265 Category: CHEM

Preston Park & Sage Parker

12th Grade Warsaw Community HS Teacher: Mark Allen Riege

The Effects of pH on Color Retention of Curcumin Dyes

Abstract:
Synthetic dyes widely used in textiles can harm the environment through chemical pollution, making plant-based dyes an eco-friendly alternative. This study investigates the effect of pH on the durability of turmeric-based dyes applied to fabric. Fabric samples were dyed and then exposed to acidic, neutral, and basic solutions to observe changes in color retention. By evaluating the relationship between pH on and dye stability, this research aims to highlight the potential of sustainable plant-based dyes for textile applications in the future.

Project 267 Category: EAEV

Arha Kureti 10th Grade Carroll High School Teacher: Michelle Brenner

A Burning Reason: Exploring the Flame Retardancy Potential of Agricultural Waste Products and Testing their Ecotoxicological Safety on Daphnia Magna

Abstract:
With 2.25 million tons of annual flame retardant production, prevalent phosphorus flame retardants contribute to aquatic ecosystem disruption and downstream eutrophication.

Agricultural waste disposal causes 6% of global greenhouse gas emissions. This study developed bio-based flame retardants from banana pseudostem, young green coconut tissue, and coconut button tissue, evaluating their performance on cotton fibers, cotton fabric, and dry Spanish moss–using burn tests–for potential textile and wildfire prevention applications. After testing tissue samples for polyphenol and potassium presence (char–forming micronutrients), banana sap and coconut extract were prepared–using 5% acetic acid for polyphenol extraction from coconut tissue. Ecotoxicological safety was compared to that of ammonium polyphosphate flame retardant using a multigenerational epigenetic study on aquatic model Daphnia magna, assessing microfiber-mediated chronic exposure effects at sub-lethal treatment doses, simulating real re-release conditions. Population and DNA methylation changes were tracked across five generations (three exposure, two recovery), using a colorimetric ELISA assay for global 5-methylcytosine percentage quantification. Burn tests showed reduced flammability in all treatments. Coconut extract demonstrated highest efficiency: near-zero burn rate and flame time, with under 3% mass loss in each material. Untreated materials showed 100% mass loss. Ecotoxicity assessment showed banana sap supporting stable population growth similar to control; coconut extract exhibited initial acidity stress before recovery. Bio-based treatments induced no heritable DNA methylation changes; ammonium polyphosphate caused mortality and algae overgrowth in the F2 generation, causing DNA hypomethylation. Demonstrating agro-waste's potential for repurposing into effective, environmentally safer alternative flame retardants, to existing phosphorus formulations, utilizing low-cost, scalable extraction methods.

Elevator Pitch

Project 268 Category: MATS

Frank Cai 11th Grade Homestead High School Teacher: Matt Elder

The Use of Machine Learning in Creating Novel Iron-Based Shape Memory Alloy

Abstract:
Nickel-Titanium (Ni-Ti) alloys dominate the shape memory alloy (SMA) market but are limited by high material and processing costs. While iron-based SMAs (Fe-SMAs) offer a cost-effective alternative, discovering compositions that rival Nitinol remains a significant challenge. This study leveraged an AI Large Language Model (LLM), inspired by advanced discovery agents like GNoME, to hypothesize a novel, low-cost Fe-Mn-Al-Si-Ni-C SMA and evaluate the "reality gap" between computational prediction and physical processability. The AI-hypothesized alloy underwent arc melting, hot rolling, and cold drawing, followed by Abnormal Grain Growth (AGG) heat treatments. Although the AI successfully identified a thermodynamically stable

composition, experimental characterization revealed severe processing brittleness and a persistent dual-phase microstructure rather than the targeted single-phase austenite. Cyclic tensile testing and Synchrotron X-ray Diffraction (XRD) confirmed the absence of a stress-induced martensitic transformation; instead, the alloy accommodated stress through irreversible dislocation slip, resulting in high residual strain. These findings demonstrate that while current AI models successfully generate stable compositional heuristics, they lack the crucial process-structure-property context required to predict functional manufacturability, highlighting the continued necessity of physical experimental validation in AI-driven materials discovery.

Project 269 Category: MCRO

Colton Berghorn 9th Grade South Side HS Teacher: Katherine Crowl

Dirty Doors

Abstract:
What rooms around the school have the most germ infested door handles? I swabbed 5 commonly used door handles and grew the bacteria to test which door handles had the most bacteria so you know what you could be touching everyday. I thought the nurse's door handle would be the germiest, but between the rooms of a gym, math, english, science, janitor's closet, and the nurse's office, the janitor's closet door handle was the most germ infested.

Elevator Pitch

Project 270 Category: PHYS

Mikhail Nosov 9th Grade Burris Laboratory School Teacher: Mariia Nosova

Planetary Aerodynamics: Lift and Stability of Disc-Shaped Aircraft on Earth, Venus, Mars, & Titan

Abstract:
The purpose of this project was to study how disc-shaped aircraft behave in the atmospheres of Earth, Venus, Mars, and Titan. I investigated how disc shape, size, speed, and lift coefficient affect lift and flight stability. I used the lift equation to calculate lift in different atmospheric conditions and compared flat discs with dome-shaped discs. I also studied how spinning the disc, like a Frisbee, can improve stability through the gyroscopic effect. The results showed that dome-shaped discs produce more lift and less turbulence than flat discs. Rotational stabilization

also improved stability, especially in dense atmospheres like Venus and Titan. The hypothesis that both disc shape and atmospheric density affect stability was supported. Medium dome-shaped discs with rotation appear to be the most effective design for flight in different planetary atmospheres, while stable flight on Mars is more difficult because of its thin atmosphere. These results suggest that simple disc-shaped aircraft, especially dome-shaped and rotating designs, could be used as stable and efficient flying systems in different planetary atmospheres. This could be useful for designing future drones or probes for planetary exploration.

Elevator Pitch

Project 271 Category: PHYS

Jeremiah Sandoval 9th Grade South Side High School

Teacher: Katherine Crowl

Hit it Hard

Abstract:
In summary; the type of ball does effect the exit velocity. the different types of regulation balls have slightly different outcomes with those that are from the MLB, college, and tournament play going further than the others. Leading to the question if their balls are "juiced" as it is more easy to hit base runs with them.

Project 272 Category: CHEM

Zaina Nasir 10th Grade IN Aca for Sci Math & Humanities

Teacher: Justin J Crowder

Sustainable Adsorption of Textile Dyes Using Agricultural Waste

Abstract:
Water pollution from textile dye discharge remains an environmental challenge, particularly in developing nations such as Bangladesh, where untreated industrial wastewater contaminates rivers and freshwater sources. Synthetic dyes such as methylene blue are widely used in textile manufacturing and are resistant to natural degradation, posing ecological and health risks. This study explores a sustainable, low-cost solution by turning agricultural waste into functional adsorbents for dye removal. Three adsorbents were engineered and compared: raw powder, heat-treated biochar, and magnetized biochar. The magnetized version was synthesized by depositing FeO nanoparticles onto the biochar surface to enable magnetic separation. Batch

adsorption experiments were conducted using methylene blue solutions, and removal efficiency was quantified using UV-Vis spectrophotometry. This research demonstrated how agricultural byproducts can be converted into effective environmental remediation materials and highlights scalable, low-cost water treatment strategies suitable for regions disproportionately affected by industrial water pollution.

Project _____ Category: ETSD

Ashton Ehle 8th Grade

Ascension Lutheran School Teacher: Abbey Nichole Mieritz

Sweeper BOT

Abstract:

Do you ever get tired of sweeping? Would you like to never sweep again? For this engineering project, I have designed and fabricated a remote control sweeper. It is designed for warehouses that can sweep any hard floor.

I used CAD, which is a type of computer program that allows its user to design 3-D objects, to design my sweeper. I had to revise my design numerous times to achieve the right layout to fit my functional requirements. I used a 3-D printer to fabricate the body and parts for my project. Through manufacturing my science fair project prototype, I created a cost effective but non-labor intensive way to sweep concrete floors. This solution was cost effective because it costs less than competing products. It was non-labor intensive because instead of sweeping with a broom, all the user had to do was control the sweeper with an electronic device. I solved the problem of sweeping with a broom. I started my design plans with an autonomous vacuum cleaner and later realized that a sweeper was all that was needed for hard floors. I also switched to a remote control because the development of an autonomous vacuum cleaner was extremely complicated.

Project _____ Category: ETSD

Maddlyn Ehle 8th Grade

Ascension Lutheran School Teacher: Abbey Nichole Mieritz

Color Sorting Machine

Abstract:

The purpose of my experiment is to sort corn by color. My experiment is to build a color sorting

machine with reasonable cost. I started out sketching ideas on paper and using SolidWorks how I could make a machine that sorts seeds. Then using SolidWorks I printed out physical models. My solution was able to measure different frequencies of light. In conclusion, my experiment has not yet meet all of my functional requirements but I have demonstrated many of the basic requirements.

Project _____ Category: PHYS

Clara Peterson 7th Grade Ascension Lutheran School

Teacher: Abbey Nichole Mieritz

Designing a Stronger Electromagnet

Abstract:
The purpose of my science fair project was to create a stronger electromagnet by testing two features: the metal (hardened steel, zinc, and stainless steel) and changing the number of coils around the bolt. My hypothesis is that using hardened steel and coiling the wire more on the bolt could create a stronger electromagnet. My null hypothesis, which is the opposite of my hypothesis, is that the type of metal I used won't impact the strength of the magnet. While doing my experiment, I tested different metal rods and wrapped the coil around the rod different times to see, which one was the most magnetic. But the two things I never changed was the battery and the tape I was using. I found that hardened steel works better than both zinc and stainless steel. Stainless steel had no magnetic pull. Zinc had enough force to lift three staples. While hardened steel could lift twenty-two staples in ideal conditions. In conclusion, I determined that the type of metal and number of coils significantly impacted the strength of the magnetic force. I saw a difference in magnetic force from zero staples, to three staples, and finally, to twenty-two staples.