MIDWOOD HIGH SCHOOL RESEARCH PROGRAM SCIENCE FAIR 2022

2022 Midwood High School Science Fair
2 June 2022 — 3:30 to 5:30 PM

Michael McDonnell — Principal
Jenessa Kornaker — Assistant Principal
Tovia Rosenfeld — Assistant Principal
Glenn Elert — Research Coordinator
Stacy Goldstein — Research Teacher
Avanel Cunningham — Research Teacher

Timeline

1:55 PM (Period 9)

- Junior and Senior judges congregate in library
- Junior and Senior tasks are explained
- Junior and Senior judging packets distributed (time to read abstracts)
- Senior group photo

2:45 PM (Period 10)

- Scheduled classes on 2nd floor annex moved to main building
- Junior and Senior judges set up rooms

3:30 PM (Period 11)

- Sophomores move to assigned rooms, boards already in position
- Sophomores given time to make adjustments to boards and self
- Judging begins at 3:45

4:30~5:00 PM

- Judges return to A214 (Research Room) with completed packets (calculators available)
- Sophomores return boards to A214 (Research Room)

4:30~5:30 PM

- Students may leave as soon as all judging materials have been collected
- Everyone must leave bfore 5:30

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Seniors

Aisha Ahmad, Enaya Ahmad, Rabiah Aziz, Estrella Carbajal Leon, Benny Dong, Sammy Feng-Xie, Jamyang Gyamtso, Nafisa Haque, Maryam Hussein Mansour, Shaniah James, Bintia Keita, Owaish Khan, Pei Xin Lin, Shirley Lin, Zitong Liu, Anne Mai, Christina Martinez, Kamila Muratova, Jessica Myers, Daelah Nicholas, Anthony Nosoff, Daniel Nudelman, Bolanle Orioke, Francisco Rodriguez, Julia Serjantova, Muhammad Sharjeel, Jessica Sheynin, Harkomal Singh, Samarpreet Singh, Joy Tang, Jhoselin Toalongo, Xiang Qing Wang, Jason Wu, Coco Xie, Michelle Yang, Lian Hao Zheng, Katherine Zhong, Tiffany Zhu

Juniors

Sameer Ali, Anne Barshay, Simoni Basnet, Sudiptto Biswas, Joline Chan, Meerab Cheema, Jiaen Chen, Joyce Chen, Kevin Chen, Edward Min Yau Chok, Mykhaelia Clarke, Aly Emran, Samia Farid, Warner Gephardt, Nazokat Ibrohimova, Adriena Jiang, Sacha Laine Keenan, Ameemah Khan, Noor Khawaja, Altin Kukic, Ka Wing Lau, Emily Law, Janey Liu, Ingrid Lok, Alexis Mai, Faith Matthew, Kaitlynn Mau, Wilhelmina Morehead, Anna Obertos, Christina Obertos, Lucas Paschke, Daria Pozhoga, Sara Qureshi, Jesus Rodriguez, Makzim Semkiv, Shefa Sharafa, Ethan Shek, Jia Wen Shi, Aleena Sklyar, Felix Tom, Chloe Tse, Archana Vaithilingam, Nia Williams, Angel Wu, Aaron Xu, Leheng Yu, Mingfeng Zhong

Teachers

William Hudacek, Wing Tong Lung, Cynthia Ly, Howard Spergel, Jennifer Sullivan

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Sophomores

219-10 Omar Ali
How does the type of video you watch affect how accurately you solve algebraic equations?

216-08 Brandy Antoine & Sabrina Henry
How does the type of vinegar affect the acidity level of the substance?

218-12 Sanbina Babar
The Effect of Gratitude on Student Stress Levels

215-06 Justin Bailey
How Does the pH Level of a Fruit Affect Its Electric Current When It Is Made into a Voltaic Cell?

216-16 Anna Bukhman
pH Impact on Algae Growth

216-04 Marjona BurhANOVA & Sonya Wang
Vision vs. Perception of Scent

218-20 Alexandra Carbajal & Pei Fang (Judy) Chen
The Effects of Different Architectural Structures on its Stability in an Earthquake

220-10 Andrew Chen & Maha Shabir
CURE-ious About Antibiotics

219-04 Huiying Chen & Michelle Kamsan
What Is The Effect of Various Liquid on Oxidation of Apples

220-04 Vienna Chen
Different Vinegars on pH of Quickling Apples

215-02 Xinwei Chen
Effects of pH on Bacterial Degradation

218-10 Diana Chen Feng & Jennifer Fan
Disinfectants vs. Bacteria

215-08 Kate Chung
Is 18 Months Too Early to Start the Weaning Process for a Panda Cub?

216-12 Joshua Coleman
A Home for Homemade Paint

216-06 Afiya Duncan
The Effectiveness of Disinfectants

218-02 Carlos Dutan
How Does the Type of Plant Leaves Affect the Variety of Pigmentation?

218-18 Hao Jun Feng Liu & Alejandro Velazquez
Algae, a tiny destructor: The effect of nitrogen concentration on the oxygen levels of algae mediums

215-13 Zehra Girgin
Frequency Response vs. Speaker Size

215-18 Samuel Gorelik & Kassidy Donald
How does ultraviolet light affect bacteria growth?

219-13 Melanie Hernandez & Shirley Huang
Hair adversity of surroundings

219-11 Jessica Hu & Christina Zhang
The Stroop Effect Under the Interference of Language and Fluency

218-16 Batool Kamal
Rethink What You Drink

220-18 Hamood Khan
One in a melon: the effect of fertilizers on the height of watermelon plants

216-10 Max Kogan & Arblin Arapi
Mag-tastic Differences of Temperature and Electrical Conductivity

215-17 Hailey Lau & Ashley Castillo Mendez
Bacteria: #1 Public Enemy to Masks

220-14 Cindy Li
The Science Behind The Perfect Cookie

220-12 Jada Lin & Judith Jones
The effect of root vegetables on the production of energy

219-03 Kina Lin
Melting Time Between Different Chocolates

219-02 Jaimie Ling & Xue Feng Zou
Fighting Bacteria with Different Disinfectants

219-01 Shanshan Luo
Raw vs. boiled tomatoes: Which contains more vitamin C?

219-08 Lena Maad & Ayesha Chowdhury
Voltages and Temperature

215-03 Eda Maqellara & Elana Chen
No Bacteria Please!

219-14 Lenny Martinez
The effect of enteric coated Tylenol on a simulated stomach

215-01 Firdavs Marupov & Usman Gujar
Marinade Adsorption

215-07 Magaly Mendoza & Chloe Wu
The Effect of Different Types of Natural Disinfectants on the Inhibition of Bacterial Growth

216-20 Devin Morales & Ava Ference
CME's vs. EMI and RFI Grounding Systems

220-16 Kelly Mordekhaiev & Aleena Gitman
The 5 Second Rule: Fact or Myth?

218-04 Areeba Mubarik & Vicky Zheng
Sugar Content in Fruits

215-15 Alifia Ogarro
The Lemon Battery

215-04 Adrian Perez & Fiona Zhao
How different acne medications affect the development of E. coli bacteria

215-14 Victoria Prozorova & Ibrahim Ahmad
Eat it or leave it?

218-14 Emely Rivas & Katelyn Martinez
The Biofuel in Bio-you

215-11 Victoria Ronan & Lucy Guo
Germ-Proof!

219-18 Fatima Shahjahan & Linda Ching
In What Packaging Does an Avocado Rot the Slowest?

218-06 Hai Li Sze
Caffeine influence on academic performances

219-15 Nuzhat Tabassum & Ariane Charles
Interactive Games Affect the Learning of Students

215-10 Elana Toyber & Maria Bazilevich
The Stroop Effect

220-02 Eliana Velednitskiy & Elisa Corbaxhiu
The Pop About Painkillers: Name Brand vs. Generic Painkillers in Simulated Stomach Acid

216-14 Linda Xiao & Kate KhazANOVA
Wiping Away the Bacteria

216-02 Jinyu Xu
Soil Moisture Content vs. Volt Resistors (Prototype)

218-08 Rebecca Yakobovich & Eman Shabbir
Conformity Trends in High School

219-06 Rosabelle Yavorsky & Victoria Sukhova
Ice Cream: Does Sugar Affect How Fast it Melts?

220-06 Oleg Zaika & Sodik Abdunabiev
Which Brand of Soda is the Most Acidic?

216-18 Eric Zhang & Ling Xin Jiang
The Pedagogical Potential of Digital Storytelling: Effect on Active Memory Recall of High School Students

220-08 Tiffany Zheng
Password Security

219-07 Ashley Zhu
Temperature vs. pH

219-17 Joey Zhu
Germination and Magnetism

220-20 Elizabeth Zlobinsky & Humayrah Hossain
Different types of papers' effects on the environment

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Abstracts

219-10 How does the type of video you watch affect how accurately you solve algebraic equations?

Omar Ali (Ms. Goldstein – Mathematical Science)

Before starting homework, I like to watch a movie so that I'm relaxed and can easily focus on the task at hand. I like to switch between various genres of movies like funny, horror, action and etc. The purpose of this test is to see if the type of movie you watch before you start doing homework will affect how well you do in your homework. I've shown individuals a scary clip, funny clip, trippy clip, and no video while testing them in between each video. Then each person's homework was graded and that data was put in a ANOVA test. After collecting data, individuals that watched no video got an average of 85% on their homework, individuals that watched horror videos got an average of 69%, individuals that watched funny videos got an average of 77%, and the individuals that watched the trippy videos got an average of 71%. This is significant because it shows that individuals that watched the scary clip did worse than individuals that watched any other type of videos.

216-08 How does the type of vinegar affect the acidity level of the substance?

Brandy Antoine & Sabrina Henry (Ms. Cunningham – Chemistry)

Our motivation for doing this experiment was to find out which types of vinegar are more effective for certain purposes (cooking, cleaning, etc.) based on their acidity level. We used titration to find the molarity of acetic acid in three different types of vinegar; rice, apple, and white vinegar. We collected data based on the average mL of NaOH (aq) used during the titration and the molarity of each vinegar solution afterwards. The techniques that were used to analyze the data were through a data table and a graph. The key findings from the experiment were that the white vinegar used the most amount of NaOH and highest molarity of acetic acid over all three types of vinegar. The white vinegar resulted in 0.87 M, the rice vinegar was 0.71 M, and finally the apple cider vinegar resulted in 0.73 M. This indicates that white vinegar is more acidic compared to apple cider and white vinegar, which can help someone decide which vinegar is better to use depending on their taste.

218-12 The Effect of Gratitude on Student Stress Levels

Sanbina Babar (Ms. Goldstein – Behavior & Social Science)

The purpose of this project was to determine if there is a significant difference between the stress levels of students who show more gratitude vs. those who do not. High school students were given a survey and asked to rate their stress level from 1-5. Then the students were given a list of things everyone has in their life. They had to select things they were grateful for this year. The number of choices students selected was compared to their stress level. More choices indicated higher levels of gratitude. The technique used to analyze the data was a t-test where the stress levels of the two groups were compared with the t-stat value and p value. The t-stat value was 2.363 and the p value was 0.013685

which is less than 0.05, rejecting the null hypothesis and accepting the alternative hypothesis that there is a significant difference between the stress level of students who show more gratitude. The conclusion showed gratitude has a positive effect on the stress levels of students.

215-06 How Does the pH Level of a Fruit Affect Its Electric Current When It Is Made into a Voltaic Cell?

Justin Bailey (Ms. Cunningham – Physics & Space Science)

Electric current can be monitored with a voltammeter running between a copper wire and a zinc nail placed into a fruit. My experiment's purpose was to see if a fruit's pH level affected the quantity of electric current it produced in this arrangement. My hypothesis was that the fruit would produce more electric current the more acidic the pH was.

216-16 pH Impact on Algae Growth

Anna Bukhman (Ms. Cunningham – Earth & Environmental Science)

As our population expands, the industrial impact on the environment worsens. With increasing air pollution, acid rain lowers the pH of water. My experiment aimed to determine the effect decreasing pH of water on algae growth. I used a neutral control tank with 17 L of tap water and an acidic experimental tank with an additional 300 mL of lemon juice. I added 0.5 mL of algae, and 0.5 mL of potassium nitrate to both tanks at a steady rate as algae nourishment. Throughout the week, the turbidity of both tanks was measured using a secchi disk. The depth at which the disk could no longer be seen was measured in cm. At the end of the experiment, I concluded that the algae I used grew best in acidic conditions. As expected, the algae bloom occurred at a rapid rate in the tank with the lower pH. In the neutral tank, the algae barely grew and no real change in the turbidity occurred within the tested timeframe.

216-04 Vision vs. Perception of Scent

Marjona BurhANOVA & Sonya Wang (Ms. Cunningham – Biochemistry)

Scent perception acts as a crucial factor in neurological adaptation and can be influenced by the presence of visual cues. We wanted to experiment with sensory factors to demonstrate a relationship between human senses, specifically, vision and olfactory senses. We tested this hypothesis through a simple experiment that was conducted with false visual cues in hopes that it can alter the way participants are able to perceive a certain scent. Results found that on average, 84% of participants guessed correctly with the blindfold compared to 24% of participants who guessed correctly without. We analyzed our data based on accuracy, whether or not participants assumed correctly. Key findings of our experiment demonstrated that participants who wore the blindfold performed better than those without. As a result, we found that by manipulating the interpretation of sensual factors, cross-modal integration between our sensory systems are disrupted, ultimately modifying olfactory perception.

218-20 The Effects of Different Architectural Structures on its Stability in an Earthquake

Alexandra Carbajal & Pei Fang (Judy) Chen (Ms. Goldstein – Engineering)

The largest earthquake in the U.S. measured a magnitude of 9.2 on the Richter scale. This one earthquake alone left behind a total of $311 million in damages which is worth about $2.9 billion today. Every year, earthquakes cause millions of dollars in damage in the U.S. For this reason, an experiment has been conducted on which house structure can best withstand an earthquake, as a precaution to minimize the damage caused by these destructive forces. To execute this project, a cube, geometric dome, and pyramid were built, and placed on Jell-O which simulated the ruinous force of an earthquake. When

testing each structure, data was collected using the vibrometer app. Using this data, an ANOVA test was conducted, proving that there was a significant difference between the type of structure and how unsteady it was during the simulated earthquake. In correspondence to this, t-tests between each structure were conducted, proving that the pyramid is the most sturdy in an earthquake.

220-10 CURE-ious About Antibiotics

Andrew Chen & Maha Shabir (Ms. Goldstein – Microbiology)

Natural antibiotics have been used as remedies prior to the discovery of penicillin. While they were not considered true antibiotics, people were well acquainted with its antimicrobial properties. Today, many natural antibiotics are common household items and readily available remedies for skin wounds. We will determine the effectiveness of three antibiotics (garlic, honey, and lavender oil) over 24 and 48 hours by storing them in agar plates at body temperature, 37 °C. We used an app, ColonyCount, to measure the average CFU (Colony-Forming Unit) for each plate. We found that lavender oil is the most effective antibiotic: an average CFU of 9 after 24 hours and 10 after 48 hours. The second highest-performing antibiotic is honey with an average CFU of 36 after 24 hours and 39 after 48 hours. Garlic came in last with an average CFU of 139 and 152. However, honey and garlic may actually pose a greater threat if used since the data shows that they lead to higher CFU counts than the control.

219-04 What Is The Effect of Various Liquid on Oxidation of Apples

Huiying Chen & Michelle Kamsan (Ms. Cunningham – Chemistry)

Enzymes in fruits like apples react to oxygen in the air after being cut. This is called an oxidation reaction which causes damage to the cells and is responsible for the brownness shown on sliced apples after a period of time. Prior research primarily determined the effect of various liquids on the taste and smell of apples and scarcely addressed the freshness of the apples. In this experiment, sliced apples were soaked in lemon juice, salt water, baking soda water, and vinegar to discover the effects of various liquids on the oxidation speed of the apples and which liquid best prevents apple slices from turning brown. Ultimately, the result of our experiment showed that lemon juice and salt water-soaked apple slices kept their original color after one hour of exposure to air. This finding indicates that salt water and lemon juice are the best liquid for slowing oxidation and preserving the fresh color of apple slices.

220-04 Different Vinegars on pH of Quickling Apples

Vienna Chen (Ms. Goldstein – Chemistry)

Vinegar is a common household item used in cooking and cleaning due to its acidity. It serves a role in food preservation during pickling by extending durability of produce by soaking in a vinegar solution and killing harmful bacteria. The purpose of this experiment is to determine whether the type of vinegar, white distilled, rice, or apple cider, has an impact on the pH of apple pickling brine after 5 days of refrigeration. In this experiment, a vinegar brine made with water, salt, sugar, and vinegar was used to soak apples. The initial pH of the solution was taken after covering half an apple with brine and the final pH was taken from 5 day refrigerated pickles. Using an ANOVA test to compare the final pH level of the pickles of each vinegar brine, resulted in a p value of 0.5978, greater than 0.05, indicating no significance between type of vinegar and pH of pickles. Therefore proving that in cooking, rice, white distilled, and apple cider vinegar can be interchangeably used.

215-02 Effects of pH on Bacterial Degradation

Xinwei Chen (Ms. Cunningham – Microbiology)

What inspired me to do this project is that I have seen people wiped down items more often than before because of the pandemic. This made me question which substance is most effective at degrading bacteria based on their pH. The purpose of my experiment is to allow people to use the right cleaning products to degrade bacteria and obtain better hygiene. In order to do this, I cleaned pennies with different pH ranging from low to high and collected the amount of bacteria before and after cleaning. Two t-tests showed that our calculated p-value is less than the critical value, therefore, supporting the null hypothesis. The data table showed a key finding in which bacteria increased in all the petri dishes except the control group which uses water that has a neutral pH. This indicates that a neutral pH of 7 is best at degrading bacteria. This information is critical for societal life as it means people should use more neutral pH products to clean bacteria infected surfaces.

218-10 Disinfectants vs. Bacteria

Diana Chen Feng & Jennifer Fan (Ms. Cunningham – Microbiology)

Students push faucet handles to wash their hands, which risks students gathering more bacteria onto their hands. Although the school janitors use various products to clean bathroom faucets, their effectiveness is unclear. This sparked our interest in researching the effectiveness of different disinfectants on bacterial growth. To execute this project, we disinfected bathroom faucets with Lysol and the school disinfectant (Zep Spirit II). Then, we collected samples from the faucets and incubated them. We used an app (Promega Colony Counter) and found that colonies increased after utilizing the disinfectants. After using Lysol, there was nearly decuple the amount of bacterial growth before testing the disinfectant. In contrast, double the amount of bacteria grew after using Zep Spirit II. Thus, the school disinfectant is more effective than Lysol. However, it was not successful in preventing bacterial growth. This calls for the necessity of bathroom sensor faucets at Midwood High School.

215-08 Is 18 Months Too Early to Start the Weaning Process for a Panda Cub?

Kate Chung (Ms. Goldstein – Animal Science)

Panda cubs are said to become less dependent on the mother when the age of 18 months is reached, also starting the weaning process for the cub. Weaning is defined as the withdrawal of the mother's milk; transitioning from being nursed to an adult diet. Inspired by Smithsonian Zoo's controversy in 2017, the purpose of the experiment is to observe whether the presence of the mother will have an influence on the offspring's behavior, determining whether 18 months is the best age to start weaning. The experiment collects data through the use of an ethogram and recording continuous focal data of Mei Xiang (mother) and Xiao Qi Ji (offspring, age 20-21 months), the data is then run through a t-test. The results show that the mother's presence does not significantly impact the offspring's behavior, having a p-value of 0.5 which is greater than 0.05. This finding indicates that the offspring is becoming independent at 20-21 months, arguing that 18 months is possibly too early to start weaning.

216-12 A Home for Homemade Paint

Joshua Coleman (Ms. Cunningham – Chemistry)

When looking for good quality paint, it always feels really difficult to do so. So instead of looking for it, why not make it. Being able to make paint can help save money and time trying to look for good quality paint. While making paint can be hard, the payoff of getting good paint is worth it. The way I did it was by first buying good quality paint as

reference and then making two different paint as the representatives of homemade paint. I also made variations of those homemade paint by either adding/decreasing the amount of water to a given mixture, giving a total of 7 test subjects. We tested those qualities by seeing their durability, drying time, and how many strokes it takes to fully paint a surface. After collecting the data, a few things I learned was a) adding water will cause the paint to be very slippery on the surface and b) taking away water will cause the paint to be very sticky/lumpy. This experiment overall can help you learn the science behind paint.

216-06 The Effectiveness of Disinfectants

Afiya Duncan (Ms. Cunningham – Biochemistry)

Following the Covid-19 pandemic, the question 'which disinfectant is most effective at preventing bacterial growth' birthed the inspiration behind this experiment. In order to conduct this experiment, bacteria from the underside of a garbage can lid was collected and swabbed onto 4 different experimental agar plates and 1 control plate. Then approximately 3 mL of Lysol disinfectant spray, 75% alcohol hand sanitizer, Pine Sol, and a Clorox/Bleach spray was applied to the experimental plates and left in an incubator for 3 days. The goal was to analyze which plate had the least bacterial growth and determine that the respective disinfectant was the most effective. Using virtual bacterial colony counters, it was determined that the Lysol disinfectant spray was most effective at preventing bacterial growth, which can also be applied to preventing the proliferation of Covid-19 on surfaces.

218-02 How Does the Type of Plant Leaves Affect the Variety of Pigmentation?

Carlos Dutan (Ms. Cunningham – Plant Science)

The motivation of doing this project is to discover the how the type of plant leaves affect the pigments it could possibly contain. The primary method used to conduct this experiment is the use of paper chromatography to identify pigments using plant leaves, which will be either spinach leaves, iceberg lettuce leaves, or northern white-cedar leaves, and an acetone mixture. The data collected consisted of the distance of the plant leaves mixture and the distance the acetone traveled on the chromatography paper, which was measured using a ruler in centimeters. The data is used to calculate the Rf value through the equation, Rf=Distance traveled by the sample component (cm)/Distance traveled by the solvent (cm). Based on the Rf values, spinach leaves contain chlorophyll a, iceberg lettuce leaves contain anthocyanins, and the northern white-cedar leaves contain chlorophyll a, indicating that green plants are more likely to contain chlorophyll.

218-18 Algae, a tiny destructor: The effect of nitrogen concentration on the oxygen levels of algae mediums

Hao Jun Feng Liu & Alejandro Velazquez (Ms. Goldstein – Earth & Environmental Science)

Eutrophication can devastate both marine and human life. Eutrophication occurs when algae is exposed to an abundance of nutrients, causing it to explode in growth. Some of these consequences of eutrophication include destroying ecosystems, making the environment unfit for marine life, and making it toxic for humans to breathe around. This experiment used spirogyra (a type of algae), grown in a bottle of distilled water with varying concentrations of nitrogen using different amounts of fertilizer in each bottle. The oxygen levels (measured in mg/L) of the algae mediums were recorded daily using an oxygen sensor. Using ANOVA tests, it was found that the nitrogen concentration had no significant effect on the oxygen levels of the algae mediums. This is important because this can tell us that eutrophication can not occur on a smaller scale, and so extreme conditions where large amounts of fertilizer and algae would need to be met to see the clear and harmful effects.

215-13 Frequency Response vs. Speaker Size

Zehra Girgin (Ms. Cunningham – Physics & Space Science)

Sound is transmitted through waves; there are multiple factors like frequency and amplitude that determine how far it will reach or how loud it will be. This experiment was inspired by the mechanical waves unit in the physics curriculum and aims to show how frequency works. To demonstrate this, a speaker was made using cardstock, a coiled magnetic wire with a neodymium magnet placed in the center, all connected to an audio cable attached to a device; the speaker cone was switched to test three different sizes being 2, 4, and 6 cm. Sound with frequencies ranging from 100-1000 Hz were played and the loudness was measured using a calibrated dB meter on phyphox. This data was then subjected to the ANOVA test and there was a p-value of $1.91E\text{-}14 < 0.05$ meaning that the null is rejected and the alternative hypothesis that if the cone of the speaker is bigger then, the frequency response will be greater because a larger speaker will cause a greater disturbance in the medium, is accepted.

215-18 How does ultraviolet light affect bacteria growth?

Samuel Gorelik & Kassidy Donald (Ms. Cunningham – Microbiology)

With the pandemic still on the rise, people have never been more scared of bacteria constantly spreading on all surfaces around us, and causing the spread of diseases. This leads to the question: how is the growth of bacteria affected by ultraviolet radiation? When bacteria are directly exposed to UV radiation it's DNA is changed, thus preventing it from replicating. This led to our hypothesis: "If ultraviolet light is shined on bacteria, it will grow slower than bacteria under no ultraviolet light." To carry out this experiment we used 9 samples of bacteria collected from various places. Each sample of bacteria was placed in contact with 3 different levels of UV light. Lowest being total darkness, medium (natural light), and lastly high (8 UVC+40 UVA UV). We collected our data through running an ANOVA test. Consequently, UV light slowed the growth of bacteria. Thus, schools and workplaces can utilize UV lighting to disinfect classrooms and offices, to help slow the spread of disease.

219-13 Hair adversity of surroundings

Melanie Hernandez & Shirley Huang (Ms. Cunningham – Chemistry)

Our experiment began by obtaining hair from 7 samples. A handmade hygrometer was used to determine the effects of humidity changes on hair structure after being chemically treated over different time intervals. The "point 0" label was the origin and the wooden stick and bottle cap were attached to the hair. Humidity was altered by placing the hair in a warm bathroom and fridge. Data was collected by observing the "pt. 0" distance movement after 5 minutes, signaling whether treated hair cells have contracted or expanded. Data was organized by a data table consisting of distance moved (humid and cold), the difference between these aspects, and the averages. The hair bleached for the longest has the highest distance moved at 2 cm, but the lowest under cold conditions. We conclude that treating hair chemically can damage it, as it's less resistant against humid conditions. In order to keep healthy hair, individuals should be careful with the chemicals that they expose their hair to.

219-11 The Stroop Effect Under the Interference of Language and Fluency

Jessica Hu & Christina Zhang (Ms. Goldstein – Behavior & Social Science)

Midwood High School is one of the most diverse schools in New York. There are many bilingual students in Midwood making it most suitable to conduct a study that centers around language. Building on the fundamentals of the Stroop effect and the original Stroop test by John Ridley Stroop, this study is reestablished with the purpose of studying

the Stroop effect under the interference of language and fluency. The data was collected through kahoots with images of incongruent words and distribution of a google form, however, it represents only the Midwood community. After analyzing the data with t-test, there is no significant difference between fluency and language. Thus, a student's fluency and language did not play a role in the Stroop test as scores remained fairly constant. This dispels the misconception of how fluency and language impact the Stroop effect. As the Stroop effect goes beyond language boundaries, it can be utilized to understand the fundamentals of cognitive responses.

218-16 Rethink What You Drink

Batool Kamal (Ms. Cunningham – Biochemistry)

Glucose, found in almost all common foods and drinks, is a molecule that Type 2 Diabetic patients need to be most cautious with as the smallest bit could potentially cause their blood sugar to rise tremendous levels. Therefore, in order for these patients to enjoy soft drinks, they must drink the diet versions, which are claimed to have 0% glucose. However, it is not known if diet drinks are actually better than the original drinks. To carry out this experiment, urinalysis test strips were dipped into 15 mL solutions of invertase mixed with a variety of soft drinks, both diet and non-diet, over a 90 minute period. It was found that the average percentage of glucose in the diet drink solutions was 0.41% and the average percentage in non-diet drink solutions was 1.86%. This data was input alongside an invertase control solution for comparison and it was concluded that diet drinks are ultimately better for Type 2 Diabetic patients, as advertised.

220-18 One in a melon: the effect of fertilizers on the height of watermelon plants

Hamood Khan (Ms. Goldstein – Plant Science)

When tending to plants, many don't know if synthetic fertilizer, organic compost, or no fertilizer at all is optimal for plant growing. Through measuring the heights of the plants in centimeters, one can see which watermelon plant grows tallest. Inputting the daily heights of the watermelon plants into a Google Sheet, an ANOVA test can be made. When looking at the p-value in the ANOVA test, it is greater than 0.05, with a value of 0.07. This means we must reject the alternative hypothesis, and accept that there is no significant difference in the heights of plants grown with peat moss, organic compost, or no fertilizer. This information is paramount to daily lives, as fertilizer can be expensive, and it may be unnecessary. Growing plants to be the healthiest they can be will provide more food, oxygen, and environmental regulation in one's everyday life. One can also see if the type of fertilizer, if any, affects the height of watermelon plants significantly.

216-10 Mag-tastic Differences of Temperature and Electrical Conductivity

Max Kogan & Arblin Arapi (Ms. Goldstein – Physics & Space Science)

Magnets are a major part of technology nowadays and are used in machinery and computers. The purpose of this experiment is to see how different temperatures ranging from 0 °C to room temperature to 100 °C affect both Neodymium and Gadolinium magnets, magnetic strength and electrical conductivity. To measure magnetic strength, the distance between an iron block and Neodymium was measured and the distance between the Neodymium and Gadolinium was measured as well. A multimeter was used to measure electrical conductivity. Based on data, at 100 °C the magnetism and the electrical conductivity of both the Neodymium and Gadolinium magnets was at its weakest while the inverse at 0 °C This is important because hard drives in computers that are usually prone to overheating contain Neodymium magnets. This may explain why hard drives may lose important data when overheating. Similarly, these results may explain why Gadolinium is kept at such cool temperatures in MRI machines in order for best results.

215-17 Bacteria: #1 Public Enemy to Masks

Hailey Lau & Ashley Castillo Mendez (Ms. Cunningham – Medicine & Health Science)

The COVID-19 pandemic has remained prominent in today's society and has introduced the surgical mask, which is being worn worldwide preventing the spread of this disease. Though, it has never been fully established the most prominent time to change out a mask. To execute our experiment, we gathered materials to create kits for our five subjects that consisted of labeled agar bacterial plates indicating every swab time, sterile swabs, and a mask. We conducted two trials where subjects were asked to swab their unused mask at 8:30 a.m. and transfer it to the plate, then put it on. After every four hours (12:30 p.m. and 4:30 p.m.), they were asked to swab and rub their bacteria again in the indicated slots. We let the bacteria grow for 72 hours and counted the colonies using an application to create a graph showing that at 4:30 p.m. there was the most bacteria. This is significant as it provides a time where the mask is filled with a large amount of bacteria and should be switched out.

220-14 The Science Behind The Perfect Cookie

Cindy Li (Ms. Cunningham – Product Testing)

As cookies are one of the most popular desserts, investigating what would make the "perfect" cookie would maximize the enjoyment of the wide audience that eats them. If different baking ingredients were tested to find out how they affected cookies in order to make a recipe for the "perfect" cookie, then the only ingredient that would need to be changed in the control recipe would be incorporating only brown sugar, because brown sugar would create a chewier and browner cookie. Taking a regular family chocolate chip cookie recipe, only the type of butter, leaven, and sugar were changed. The findings suggest that for the "perfect" cookie, European butter would work best to get a wider, browner, crispier, and richer cookie; baking soda, for a larger, golden, and soft cookie; and brown sugar, for a wider, thicker, and chewier cookie. My project was successful because it allowed for the necessary data to be collected, however, making all the recipes on the same day would have been beneficial.

220-12 The effect of root vegetables on the production of energy

Jada Lin & Judith Jones (Ms. Goldstein – Chemistry)

About 728 million people around the world had no access to electricity in 2021. Potatoes are often used as a battery consisting of starch, salts, and water which help to produce electricity. However, other root vegetables may have more broken down organic tissues, reducing resistance and allowing for electrons to flow easier thus producing more energy. To test what root vegetables may produce more energy than potatoes, onions, carrots, and sweet potatoes were used. Data was collected in voltages and based on if the root vegetables lit up the dip LED light bulb. The data was arranged into four separate data tables corresponding to the type of root vegetable. It was then organized so that it displayed the amount of voltages each number of root vegetables produced and how many root vegetables it took to light up a dip LED light bulb. These findings are significant because root vegetables are a low voltage source of energy that could be used as backup when there is no power.

219-03 Melting Time Between Different Chocolates

Kina Lin (Ms. Cunningham – Product Testing)

Chocolate has been increasingly popular today as a sweet treat that many people eat on a daily basis. Everyone who has eaten chocolate knows that it melts rather quickly if you're grabbing it with your hands, especially during the summer. However, not

everyone can tell the difference between different types of chocolates. So in this experiment, three types of chocolate: dark, milk and caramel chocolate will be tested for how long it takes to melt in the sun. The hypothesis is that if the color of the chocolate is darker, then it will melt faster because dark colors absorb more heat than lighter colors. The chocolates will each be placed in one small plate for a total of three trials where sunlight is available. The final result showed that dark chocolate melts faster than both milk and caramel chocolate because it contains more cocoa butter/fat than the other two. Therefore, chocolates can vary depending on the ingredients it is made out of.

219-02 Fighting Bacteria with Different Disinfectants

Jaimie Ling & Xue Feng Zou (Ms. Goldstein – Cellular & Molecular Biology)

Bacteria can be found everywhere and are vital for the survival of the ecosystem. However, harmful bacteria can cause one to become ill. Disinfectants are used to kill germs and bacteria. This experiment will test the growth of bacteria using different kinds of disinfectants. Lysol, Windex, and Soo'AE were sprayed into 3 petri dishes each with E. coli K-12 bacteria and 3 dishes were not sprayed with anything. The dishes were placed into an incubator and the number of bacteria colonies were observed for 4 days. The data was then analyzed through a t-test where the dishes with no disinfectants were compared to the dishes with disinfectants. Results revealed that the use of disinfectants decrease bacteria growth with Windex inhibiting bacteria growth the most, followed by Lysol, and then Soo'AE. This is significant as humanity is still experiencing the effect of Covid and learning the most effective disinfectant to use can help lower the chances of spreading the virus.

219-01 Raw vs. boiled tomatoes: Which contains more vitamin C?

Shanshan Luo (Ms. Cunningham – Chemistry)

Tomato is a fruit that is commonly seen in people's meals. Some people like to cook tomatoes while others eat them raw. This project focuses on whether the amount of boiling time (no-boil, 30 seconds, 5 minutes, and 10 minutes) affects the concentration of vitamin C in tomatoes and impacts how much vitamin C a person can intake. The hypothesis was that there is a significant effect of boiling time on the concentration of vitamin C in which raw tomatoes contain the most vitamin C. Four tomatoes are boiled at their specific time and squished into juices. Titration was used to analyze the amount of Vitamin C (ascorbic acid) in the fruit. The experiment showed no significant effect between the boiling time and the amount of vitamin C since the p-value of 0.23 is greater than 0.05. During the experiment, the tomatoes were accidentally oxidized, which may influence the results, so next time, it is necessary to ensure that there is no oxygen exposure.

219-08 Voltages and Temperature

Lena Maad & Ayesha Chowdhury (Ms. Cunningham – Physics & Space Science)

What "pressures" electricity to be conducted? It's voltage, and it can decrease or increase depending on various factors, one being temperature. Knowing voltage is essential for conducting the most effective electricity. By being able to know at which temperature voltage is the most powerful, electrical conductivity can increase. This made us wonder: At which temperature is voltage the highest? If temperature gets warmer, then voltage would increase, because voltage and temperature have a direct relationship. Fruits serve as a good conductor for electricity due to their juice acting like electrolytes and therefore lemons, limes, and oranges were used to answer this question. The fruits were at 40 degrees Fahrenheit, 60 degrees Fahrenheit, and 85 degrees Fahrenheit. For oranges, as temperature increases, voltage was 0.46, 0.49, and 0.51. For limes it was: 0.51, 0.61, 1.69. Finally, for lemons: 0.28, 0.58, 1.36. Everything went according to plan, and our hypothesis could be accepted.

215-03 No Bacteria Please!

Eda Maqellara & Elana Chen (Ms. Cunningham – Microbiology)

The purpose of this experiment was to identify the dirtiest surface of the three most common objects found in an average classroom in the United States: desks, chairs and doorknobs. Observations of the bacterial growth of each surface was collected from Petri dishes placed into an incubator for a duration of three days. Each of these surfaces were tested in various classrooms in the second floor of the annex building of Midwood High School. The intention for testing the surfaces from three different rooms was for the goal of collecting statistics that is not limited to only the surfaces of one room because the outcome would not be as relevant and widespread. Additionally, data from one room is not a good indication of how much bacteria there may be in other classrooms as well. After the experiment was conducted, it was revealed that the desks had a larger average bacterial growth than the other two surfaces.

219-14 The effect of enteric coated Tylenol on a simulated stomach

Lenny Martinez (Ms. Goldstein – Medicine & Health Science)

Pills, this is one of the many forms of taking medication. However there is not one type of pill, these also vary. Some pills are taken orally with water or dissolved in liquid and drunk, some are chewable, and others are swallowed with the aid of water. The focus of this experiment was testing two pills in tablet form, both would be the exact same except one of the tablets has an enteric coating. A tablet that is enterically coated is produced in order to last longer when it reaches the stomach, but in reality how effective is a Tylenol's enteric coating? After the collection of data I put it through a t-test in order to observe the data. The p-value was less than 0.05, at around 0.00011. Based on the results the null hypothesis is rejected and the alternative hypothesis is accepted. Enteric coated Tylenol tablets are better suited for medication to be released into the bloodstream over a longer period of time compared to uncoated tablets where immediate release is better suited.

215-01 Marinade Adsorption

Firdavs Marupov & Usman Gujar (Ms. Cunningham – Product Testing)

By determining what factors contribute to ingredients sticking to the meat, this project was designed to determine which marinade preserves the meat the best. Forty tofu cubes, each two inches long, were cut identically. Five testing solutions, including aqueous solutions of salt, sugar, lemon juice, vinegar, and water itself were created. Additionally, six standard solutions were made with water and varying amounts of food dye. With an average of 5.5 for vinegar solution and a slightly higher average of 6.0 for lemon juice solution, the lemon juice had the highest average. Evidently, sugar solution had a slight decrease in average in Trial 2, while water and salt solutions remained constant throughout the experiment. We used bar graphs from Google Sheets to represent the experimental data. Fundamentally, acids are the best marinades, as they break down the surface of the food and are used to break the cells, penetrating the tissue and absorbing into it.

215-07 The Effect of Different Types of Natural Disinfectants on the Inhibition of Bacterial Growth

Magaly Mendoza & Chloe Wu (Ms. Cunningham – Product Testing)

People have become more cautious about the bacteria in their homes ever since the COVID-19 outbreak. During this time, there were many shortages in essential supplies such as cleaning products. This experiment will investigate the best alternatives to using commercial cleaning products. Natural disinfectants are more accessible, affordable and better for the environment. The effectiveness of each disinfectant was tested by using a doorknob and measuring the bacterial colonies formed in the petri dish when the

disinfectant was used. We swabbed five natural disinfectants; lemon juice, vinegar, H_2O_2, lavender oil, and alcohol. The effectiveness of each disinfectant was measured by comparing the average bacterial growth on those petri dishes to the bacterial growth on the petri dish with no disinfectant. The results showed that alcohol had the least amount of bacterial growth. This finding will allow for insight to those who wish to make their own effective natural disinfectant at home.

216-20 CME's vs. EMI and RFI Grounding Systems

Devin Morales & Ava Ference (Ms. Cunningham – Plant Science)

The introduction of CMEs into Earth's ecosystems has devastated satellites and even ground-based electrical systems, which destroy internet connections and even electric power plants wreaking havoc on the Infrastructure. In short, the world's infrastructure, especially in third-world countries, is not developed to withstand CMEs after researching alternatives and finding that grounding systems would be a safe and cheap alternative to implement within these grounding systems. A grounding system is equipment grounding that connects earth ground to non-current carrying conductive materials such as conduit, cable trays, junction boxes, enclosures, and motor frames. Through the use of a voltaic cell, the voltage of this cell through a voltmeter; we then applied helium gas in different quantities of 50 ml, 100 ml, and 150 ml onto the systems, then measured the voltage. In conclusion, EMI and RFI grounding systems protect ground-based electrical systems.

220-16 The 5 Second Rule: Fact or Myth?

Kelly Mordekhaiev & Aleena Gitman (Ms. Goldstein – Biochemistry)

All throughout childhood, hearing someone say “5-Second Rule” and proceed to eat something off of the ground has never sat right. Whether or not doing this felt okay, data addressed in this experiment could really put this to the test. This issue was addressed by dropping a piece of baloney cut in half onto the floor for different time intervals including 5 seconds, 30 seconds, and 60 seconds. Each of these time intervals were conducted with two trials to ensure the reliability of the results. After placing the petri dishes into the incubator where bacteria was left to grow for 48 hours, the number of colonies that were present were counted and then recorded into a spreadsheet. After running the data through an ANOVA test, it was concluded that there is no significant difference between the two variables. So, for all those people that eat things off of the ground blaming this infamous 5-second rule, although it still may be weird, science proves that this is indeed fine.

218-04 Sugar Content in Fruits

Areeba Mubarik & Vicky Zheng (Ms. Cunningham – Medicine & Health Science)

Fructose in fruits have many health benefits and by figuring out which fruit contains the most amount of sugar, we can benefit those with hypoglycemia and by figuring out which fruit has the least amount of sugar, we can benefit those with diabetes so they can both have a diet of 25%-30% of fruits. We hypothesized that if we test the amount of sugar in the apple using a Brix refractometer, then it will contain the most amount of sugar. In our experiment, we used a Brix refractometer, which showed the amount of sugar each fruit juice contained in the unit, Brix percentage. It was discovered that green grapes contained an average of approximately 21% Brix, the red apple was about 15% Brix, the cherry tomato was about 9% Brix, the orange was about 14% Brix, and the lemon was about 8% Brix. Overall, our experiment was successful and went according to plan.

215-15 The Lemon Battery

Alifia Ogarro (Ms. Cunningham – Cellular & Molecular Biology)

The purpose of the Lemon Battery experiment is to demonstrate the connection that can be found between electrolytes, circuits, metals, and oxidation/reduction reactions. The goal is to create enough energy to be able to successfully power a small led light. Overall it's simple, fun, and shows how acidic foods can contribute to power/electricity. I found that at least 4 lemons were needed in order to see any visible movement in the voltmeter. The zinc and copper plates being used are electrodes and the juice from the lemon is the electrolyte. The copper being positive and zinc negative. Electrons flow from the zinc through the lemon to the copper. As it continues, energy builds until it's enough to finally be able to power the light. The lemon battery can be used as a renewable energy source. It doesn't pollute the environment and is biodegradable. These acidic foods could even be used to power up a whole city if necessary! We can power anything with the fresh resources around us.

215-04 How different acne medications affect the development of E. coli bacteria

Adrian Perez & Fiona Zhao (Ms. Cunningham – Medicine & Health Science)

Due to hormonal changes teenagers experience the most acne growth compared to other age groups. The effectiveness of different popular acne medications varies. There are hundreds of reviews on the internet in an attempt to decipher which acne medication is 'the best.' This was tested by growing bacteria and sectioning off areas labeled with popular acne medications and recording bacteria growth. According to the data CeraVe acne foaming cream cleanser (in comparison with Neutrogena and Derma-E) had the least amount of bacteria growth. To analyze this data various bacteria counting apps were used and charts were created to accurately compare data. The key findings of this experiment were that CeraVe had the least amount of bacteria growth, making it the most effective at preventing bacteria. However, later calculations reveal that the null hypothesis was accepted which means that the skincare products did not have a large impact on the spread and growth of the bacteria.

215-14 Eat it or leave it?

Victoria Prozorova & Ibrahim Ahmad (Ms. Cunningham – Microbiology)

People have always wondered if you can eat food after 5 seconds being on the floor. This experiment shows if bacteria can really contaminate food after 5 seconds of being on the floor. If the bologna is dropped onto the floor for 5 seconds, then the bologna would be contaminated by bacteria because as soon as a piece of food touches the floor, the bacteria immediately contaminates the food. By testing the hypothesis, the floor and bologna (before and after 5 and 30 seconds) were swabbed. Then it was recorded onto separate petri dishes and was tested for the amount of bacteria. From doing this experiment, it was found that the bologna was contaminated by the bacteria that was on the floor and that the longer the bologna is on the floor, the more bacteria it picks up. The experiment was overall successful and worked according to the procedure. The setting the amount of time the piece of bologna should be taken out of its packaging to ensure the same amount of bacteria on each bologna piece.

218-14 The Biofuel in Bio-you

Emely Rivas & Katelyn Martinez (Ms. Goldstein – Earth & Environmental Science)

Ecosystems are significantly impacted by the fuel emissions of vehicles and the determinants of vaporous contamination. Today, 74% of overall pollution is caused by the utilization of non-renewable energy sources. Biofuel can be a better asset when compared to the weaknesses brought by the use of nonrenewable energy since it tends to

be made with an assortment of materials like biomass. In this experiment, various yields were tried to figure out which kind of biomass would create the most bioethanol. Each crop went through pretreatment, cellulose hydrolysis, glucose maturation, and ethanol extraction (estimated through a graduated chamber). Beets delivered the most amount of bioethanol with an average of 21.75 mL. This crucial finding is essential to the Earth's well-being and to reduce climate change overall. Beets can be turned into biofuel globally to sustain everyday activities that require fuel such as charging a phone, powering a vehicle, and providing heat to households.

215-11 Germ-Proof!

Victoria Ronan & Lucy Guo (Ms. Goldstein – Microbiology)

Given the current abundance of illnesses being spread, it is vital to keep one's hands clean, but which hand sanitizers can accomplish this? This experiment compared the efficacy of hospital-grade alcohol-based hand sanitizers (Purell, Safeguard, and Germ-X) to commercial alcohol-based hand sanitizers (Bath & Body Works, Suave, and Dove). To do so, antimicrobial disks infused with sanitizer were placed onto petri dishes inoculated with Staphylococcus epidermidis, a common skin bacteria. Statistical analysis of the zones of inhibition showed a significant difference between hospital-grade sanitizers and commercial sanitizers. This could be due to the ingredients, as the commercial hand sanitizers had many more ingredients for hydration and fragrance, which could be interfering with the effectiveness of the alcohol. Thus, it would be beneficial to conduct additional experiments testing different hand sanitizer formulas to determine the most optimal one for preventing bacterial growth.

219-18 In What Packaging Does an Avocado Rot the Slowest?

Fatima Shahjahan & Linda Ching (Ms. Cunningham – Chemistry)

Avocados are notorious for rotting fast, especially once cut. This project will test which type of packaging works best to keep avocados from rotting. The different types of packaging used in the experiment were plastic wrap, glass container, plastic container, and no packaging. The hypothesis was that the avocado inside the plastic wrap will rot the least because it consumed the least amount of oxygen. The avocado was cut into fourths and placed in their own type of packaging (or no packaging). To collect data, a picture was taken every ten minutes of the avocado and the rottenness was recorded (most to least). At the end of the experiment, it was found that the avocado slice with no packaging rotted the most, inside the glass container was second, in the plastic container was third, and finally the avocado that rotted the least was the one in the plastic wrap. Overall, it was concluded that to keep an avocado from rotting fast, the best packaging is to wrap it inside of plastic wrap.

218-06 Caffeine influence on academic performances

Hai Li Sze (Ms. Cunningham – Behavior & Social Science)

Many, if not most, high school students have a high caffeine intake and a dependence on caffeine primarily to either relieve stress or to give themselves a boost of energy. Students tend to rely on caffeine for a multitude of reasons, such as improving concentration, increasing physical energy, and to feel relaxed. This intrigued my thoughts of whether or not caffeine had an effect on academic performances. In order to successfully execute this project, using google form as a tool to collect data was efficiently utilized. 8th grade leveled reading comprehension tests were administered before and after consuming caffeine to compare if results drastically changed. Additionally, data sets were organized into a chart based upon the 5 participants, heart rates before and after were also being recorded. This is significant because this experiment illustrated that the consumption of caffeine does the majority of the time improve academic performances, if not scores still stayed the same.

219-15 Interactive Games Affect the Learning of Students

Nuzhat Tabassum & Ariane Charles (Ms. Cunningham – Behavior & Social Science)

In this experiment, we used a website called Scratch to code an interactive game for middle schoolers. Through our game, they learned about plant reproduction and the different parts of a flower, ultimately to test how interactive games help students learn. A google form quiz was used to measure their initial knowledge of the topic. Afterwards, they played the game on scratch and completed a final google form with identical questions to measure their improvement. The number of correctly answered questions from the quiz taken before the game and after the game shows improvement. A t-test was used to analyze the data. The number of points scored increased by an average of 0.89. With a t-statistic of -1.59 and a t-critical of 2.12, the results are significant and the null hypothesis is rejected. The results of the experiment are significant as it proves that an interactive activity that incorporates several learning styles, a student can increase their overall understanding of a topic.

215-10 The Stroop Effect

Elana Toyber & Maria Bazilevich (Ms. Cunningham – Behavior & Social Science)

The purpose of this experiment is to measure a person's selective attention capacity and processing speed in accordance to when the color of the ink doesn't match the typed word (ex: the word red written in green font). In this experiment, participants used an online Stroop Test for three trials and a Google Form to record their congruent, incongruent, and Stroop Effect results. The congruent results displayed their reaction time (ms) when the Stroop effect is not present, the incongruent results displayed their reaction time (ms) when the Stroop effect is present, and the Stroop Effect time is the congruent results minus the incongruent results. On a Google Sheet, the ANOVA test demonstrated the results of the experiment and revealed that the Stroop effect delays the reaction time of only some people since the data varies greatly, with the calculated Stroop effect ranging from -125 to 332 in a single trial. This variety shows that the Stroop effect is not consistent.

220-02 The Pop About Painkillers: Name Brand vs. Generic Painkillers in Simulated Stomach Acid

Eliana Velednitskiy & Elisa Corbaxhiu (Ms. Goldstein – Biochemistry)

The pharmaceutical industry manufactures painkillers as a way to relieve various types of discomfort ranging from headaches to arthritis. This experiment addresses which type of painkiller is the most beneficial to consume for individuals seeking the fastest or longest-lasting pain relief. To test this, the dissolution rates of Tylenol and Advil were timed alongside their generic counterparts, Acetaminophen and Ibuprofen, respectively. Each pill was placed inside simulated stomach acid that was synthesized by combining HCl, NaCl, KCl, and distilled water, and the dissolution times were recorded over three trials. Using t-tests, statistical significance was found between the variables. of the four pills, Tylenol had the fastest overall time of 116 seconds, but generic Ibuprofen was faster than Advil. The results concluded that name-brand painkillers are not always more effective for quicker pain relief than generic as it varies depending on the individual medicines.

216-14 Wiping Away the Bacteria

Linda Xiao & Kate KhazANOVA (Ms. Cunningham – Microbiology)

This research is designed to reveal the effectiveness of disinfection among the disinfectant wipes: Clorox, Lysol, and Purell wipes. There is an ongoing pandemic and although there were no approved brands of disinfectants against COVID-19, people could still use the disinfectants that were available to protect themselves to an effective measure. The project involves collecting bacteria from door handles around the school and recollecting

the bacteria after we disinfect the door handles. After 72 hours, we collected data from each of the six plates. We used bacteria detector apps to find the bacteria on the plates. By subtracting the amount of bacteria after from before, we calculated the growth/decay. We initially hypothesized that Clorox would decrease bacteria more but concluded that Lysol wipes had the most significant effect on decreasing bacteria populations. With this experiment, we were able to inform ourselves and our audience from what wipes to refrain/continue the use of.

216-02 Soil Moisture Content vs. Volt Resistors (Prototype)

Jinyu Xu (Ms. Cunningham – Engineering)

Water conservation is important as it minimizes the risk of water shortages due to climate change. In order to obtain large bodies of water, such as the ones used in sprinkler systems, energy is required as the pumping of water requires large use of greenhouse gases, increasing gas pollution. The method used was to build a sensor that measures the soil moisture content needed for no further use of irrigation systems. The sensor was constructed using a breadboard, ohm resistors, 9V battery, LED that acted as the sensor, and probes that were placed in the soil. When the LED turned off, the percentage of rainwater in the soil was enough without further irrigation. The data states that the LED sensor turned off when the soil moisture content was around 25-30%. The key findings help determine the amount of voltage the resistor had to be for the final prototype of the sensor. Thus, knowing this information would be useful to ensure water conservation and reduce the use of irrigation.

218-08 Conformity Trends in High School

Rebecca Yakobovich & Eman Shabbir (Ms. Cunningham – Behavior & Social Science)

We conducted our experiment to test if conformity trends differ among different high school age groups as this behavior creates influences based on actions and behaviors. We hypothesized that if the students are younger, then they will be more likely to conform to their older peer's ideas because they're older and more experienced than them. Subjects sat in a room with four confederates and saw four lines on the screen; they were then asked to match them. Our data shows a distinction between the number of times students from each grade conformed, with a mean of 4.00 from freshmen, 2.16 from sophomores, and 1.62 from juniors. Our hypothesis was confirmed because our average scores were statistically significant as the p-value was below 0.5. This is beneficial as it allows us to obtain a deeper understanding of the influence of other peers on one's decisions and behaviors.

219-06 Ice Cream: Does Sugar Affect How Fast it Melts?

Rosabelle Yavorsky & Victoria Sukhova (Ms. Goldstein – Chemistry)

In this experiment, a combination of culinary skills and chemistry was combined to deepen the understanding of how different sugar substitutes affect how fast ice cream melts. Three sugar substitutes were used in the making of a simple ice cream recipe which incorporated basic ingredients such as heavy whipping cream and condensed milk which were later taken out of the freezer and timed to see which of the three melted the fastest. Using a keen eye and a timer, the three different bowls of ice cream were observed: one made with sugar free syrup, one with agave syrup, and one with honey to test how the amount of sugar in each substitute lead to a slower or faster melting reaction. After analyzing the results from multiple trials, a pattern corresponded to the melting rates dependency of ice cream with a sugar substitute of less sugar compared to the opposite. The ice cream with sugar free syrup (least sugar) repeatedly maintained a longer time stamp before fully melting.

220-06 Which Brand of Soda is the Most Acidic?

Oleg Zaika & Sodik Abdunabiev (Ms. Cunningham – Chemistry)

The motivation of this experiment was to determine which soda was the healthiest based on acidity. Coco Rico, 7-Up, Mountain Dew, and Sprite were the four sodas tested in this experiment. The method we used to execute the project was a titration experiment. The data we collected from the experiment was the amount of sodium hydroxide used to titrate each brand of soda. The techniques used to analyze the data were the equation $M_1V_1=M_2V_2$, which gave us the molarity of each brand of soda, and the equation pH=-log[Molarity], which gave us the pH of each soda. The reason that the pH helped us determine the acidity of the soda is because the lower the pH, the more acidic a substance is. The key findings of this experiment was that Mountain Dew was the most acidic soda, whereas Sprite was the least acidic soda. These findings are significant because they help individuals choose a healthier drink.

216-18 The Pedagogical Potential of Digital Storytelling: Effect on Active Memory Recall of High School Students

Eric Zhang & Ling Xin Jiang (Ms. Goldstein – Behavior & Social Science)

Storytelling is the combination of visual/auditory elements with the contextualization of information to facilitate understanding. Previous research shows that storytelling holds potential benefits through the inclusion of context to help link objects and attract attention in young children–tested here as a potential alternative to traditional teaching methods for high schoolers. A story was given with the objective of remembering certain objects, while the control group directly gave the objects to remember, both followed by a one-minute interval for processing and retaining information. In the ANOVA test, the p-value was ~.4188, and greater than 0.05, accepting the null hypothesis that digital storytelling has no significant effect on improving the active recall of high school students. However, while the effects of digital storytelling are inconclusive (based on mixed student responses and insignificant data analysis), certain elements can still be regulated for student benefit.

220-08 Password Security

Tiffany Zheng (Ms. Cunningham – Computer Science)

Within our time, we hone in on the digital age which revolves around accounts and passwords. Passwords tend to be crafted of simple things to remember or relation to oneself, but how secure are these passwords? This experiment dives into those aspects with the use of python, then using a graph to analyze the data. As the word in use had more letters, the time to crack shot up more. For 6 lettered words, they took 2,520 seconds in order to crack, however, when you add just 2 more letters it skyrockets to 2,592,000 seconds. This experiment showcases the significance in password security and that even the slightest difference between 2 letters makes a difference. This knowledge can be used to further the safety and variety of our passwords used in our day to day lives.

219-07 Temperature vs. pH

Ashley Zhu (Ms. Cunningham – Chemistry)

At first, I had no clue what am I going to research about for my science fair project. Later, I was inspired by the lesson I was learning in my AP Chemistry class. We are learning about acid and base, which pH was a big part of the unit. I was struggling to understand the unit by itself. I wanted to use this science fair project opportunity to show what kind of research I could do by myself and gain more understanding of pH value. For this experiment, I tested the change of pH value of the energy drink, red bull stored in different temperature. I used lithium paper to collects the data from the experiment. Then

I match the color of the paper with the color scale to figure out which pH value the color of the paper match with. The color of the paper turns darker as the temperature becomes cooler. This experiment was significant because humans would not drink too acidic drinks. So this experiment help people to figure out at what temperature is better to intake the red bull.

219-17 Germination and Magnetism

Joey Zhu (Ms. Cunningham – Plant Science)

Geomagnetism has often been associated with the exploration of the dynamics of Earth's interior and its surrounding space environment. However, limited studies have attempted to ascertain the role that the magnetic field itself has on the process of seed germination. This review aims to highlight the probable prominent role that magnetism plays in the germination process, by understanding how different levels of magnetism influences the percentage of germination, the overall mean germination, and the speed of germination. Groups of “high magnetism” were obtained through approximately 25 wraps of 22 ft copper electric coils and an electrical voltage of 50 V applied to it, while “low magnetism” was composed of 10 wraps of 11 ft copper coil and an electrical voltage of 15 V applied to it. Each dish was exposed to different magnetic fields for a span of 1 hour each day. Results have indicated magnetic fields to be an effective and emerging tool to assist plant germination rate and process.

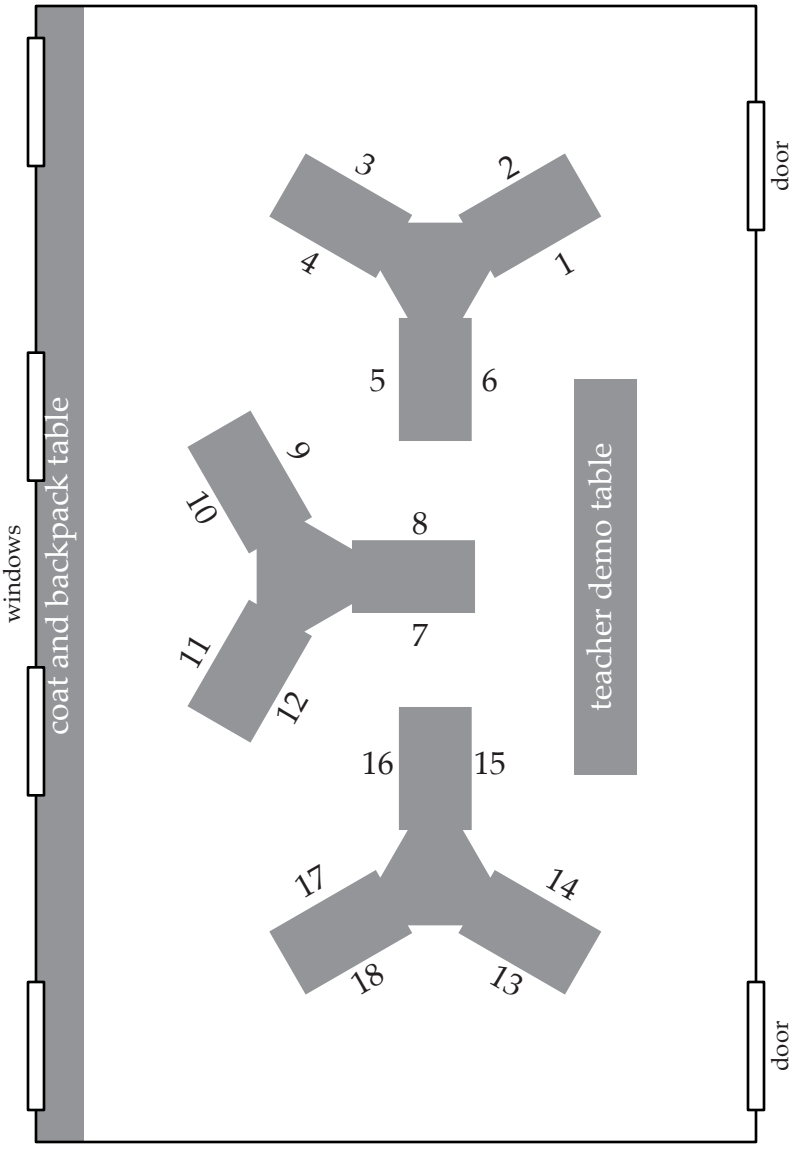
220-20 Different types of papers' effects on the environment

Elizabeth Zlobinsky & Humayrah Hossain (Ms. Cunningham – Earth & Environmental Science)

Paper in general can contribute to deforestation with the amount of trees it uses due to its mass production. Paper waste is a large contributor to harming humans as well as wildlife and the environment. The current paper making process creates a large carbon footprint and increases carbon emissions that are released into the earth’s atmosphere. Our experiment addresses this issue by indicating which type of paper is the most efficient to use. The types of paper that will be tested include virgin paper (which is paper made from trees, the most prominently used), recyclable paper (from reused old paper), and cotton rag paper (from post-consumer cotton fibers). The deconstruction of these certain papers will indicate which is best for the environment. The chemical being used to break down these papers would be muriatic acid, specifically hydrochloric acid. The type of paper that takes the least time to dissolve will be the most sustainable for the ecological state of the earth.

Room Arrangements

A215, A219



A216, A218, A220