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SENIOR DIVISION PROJECT ABSTRACTS

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Note: Additional projects may have been added after the printing of this book. Omissions should not be considered as a negative reflection on the student or their project.

SENIOR DIVISION – BEHAVIORAL AND SOCIAL SCIENCE

Project Number: SBS001

Grade: 11

Title: Cognitive Counting Skills

Abstract: The purpose of this experiment was to determine whether patterns made a significant difference in how the brain counts objects. The procedures involve showing a series of cards that contain dots ranging in quantities from 5-12, with one patterned and one non-patterned display for each quantity, to test subjects, and timing how long it takes them to recognize the quantity. The data includes the individual recognition times as well as any incorrect responses. In conclusion, only certain patterns are easier to recognize than scattered displays, and some patterns are more accurately recognized.

Project Number: SBS002

Grade: 9

Title: Quiet or Chaotic Learning Environment?

Abstract: The purpose of this experiment is to test the hypothesis that students work better in a quiet classroom. Students did assignments and tests while in a quiet classroom and then while in a chaotic classroom. Scores on these student assignments and tests supported the hypothesis.

Project Number: SBS003

Grade: 10

Title: Adderall On Concentration

Abstract: Adderall is a prescription drug used to treat ADHD and is now being abused by students, who use it as a study aid. The experiment includes two different doses of adderall solutions. The control group had a pure water solution. The planarians were then trained to run through a Y maze and forced to go to the right by a weak electrical shock. The time it took for each planaria to complete the maze was recorded, along with the number of shocks administered to train the planaria. Data and conclusions are still pending.

Project Number: SBS004

Grade: 12

Title: How Do Mice Navigate a Maze?

Abstract: The purpose of the experiment is to determine if mice use their short term memory, vision, or smell to find their way through a maze. The eight mice will be placed in two different mazes, one with wooden walls and one with reflective mirrors, on the walls. Food will be used in half of the trials to determine if smell is a factor. The mazes will be reversed to determine if the mice remember the pattern of the maze. The trials will be timed and any behavioral differences will be recorded.

Project Number: SBS005

Grade: 9

Title: Effect Of Gender On Optical Illusions

Abstract: This project is used to see if gender affects peoples' interpretation of optical illusions. It's important because there are many gender differences and perhaps some in vision. It's believed that there will be differences between the genders' perception, other scientific investigations have proven it. Fifteen male and fifteen female subjects were tested using five black and white illusions, viewing for five seconds. Gender had a definite affect in the outcome of this study. The predicted conclusion to this experiment was consistent with the outcome. This proves gender does effect vision, and is helpful to those who study optometry.

Project Number: SBS006

Grade: 9

Title: Myspace

Abstract: The problem is, "What stereo-type on myspace.com will attract the most profile views?"

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It is hypothesized that the myspace account with the stereo-type gangster for both girls and boys will attract the most views.

Project Number: SBS007

Grade: 10

Title: Every Person Counts

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS008

Grade: 9

Title: Anions as Natural Anxiolytics

Abstract: The purpose of this experiment was to determine if anions in the ambient air decrease anxiety in human subjects.

Project Number: SBS009

Grade: 9

Title: You and Your Senses

Abstract: In my science fair experiment, I was testing to see if people with hearing loss have better senses than those without it. To do this, I designed tests to verify the accuracy of people's senses. I had four groups of people that I compared to get my results. I used children with and without hearing loss and the same for the adults. I tested for people's sense of touch, visual observation, and smell. My final results helped me to conclude that people with hearing loss generally have better senses than those without it.

Project Number: SBS010

Grade: 11

Title: Childhood Obesity: Parental Overfeeding

Abstract: Do parents exceed recommended portion sizes when serving their children breakfast? Is excess affected by the size of serving dishes? Twenty-six volunteers were asked to serve their child a breakfast of cereal and juice. Group A subjects used an eighteen ounce bowl and an eleven ounce glass; Group B subjects used a twenty-eight ounce bowl and a thirty ounce glass. On average, Group B subjects served thirty-nine percent more cereal and thirty-eight percent more juice than Group A subjects. Chi-square analysis confirmed statistical significance. Results show that parents are more likely to serve larger portions using oversized dishes.

Project Number: SBS011

Grade: 9

Title: Handwriting Analysis

Abstract: The hypothesis is that a person's handwriting is affected by their mood. Students were given a survey to complete on a daily basis and asked various questions about their mood. They were asked to write, in cursive, statements that were scripted so that there were similar components regardless of their choice. The handwriting was analyzed and compared to their mood. Results to this point have not shown a relationship between handwriting and mood.

Project Number: SBS012

Grade: 11

Title: The effect caffeine has on a person

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS013

Grade: 12

Title: Reality TV and Heart Rate

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Abstract: The purpose of this experiment is to determine whether being told to root for a particular team, rather than picking your favorite team, affects the heart rate during competition series. Participant heart rates were monitored and compared against a baseline measurement.

Project Number: SBS014

Grade: 10

Title: Effect Of Age On Memory

Abstract: There have been questions on memory and how it affects a person's everyday activity or if a person is at a certain age to lose their memory. The age that was thought to remember the most was the age group 36-49 years because it seems that they were most likely to remember things better and more clearly than the other ages. Fifty people were asked to participate and were split into five age groups with ten people in each group. There were two tests to be completed, one long term and the other short term. Participants were asked to read and memorize twenty words then recite as many of them as they could remember. Three days later, they were asked again to recite as many of the twenty words as they could remember. The age group 13-19 remembered better than the age group 36-49. Age does affect memory along with things that happen in everyday life like depression and stress that can make the hippocampus shrink and reduce the amount of memory. Overall the age group 13-19 shows that teenagers pay attention to people and their surroundings and that is a very important age for a person to learn because there is not a lot of stress or anything for that person to worry about so there isn't a loss of memory.

Project Number: SBS015

Grade: 12

Title: Impact of Ethnicity on Social Decisions of 5th & 6th Graders

Abstract: This project investigated whether 52 students in 5th and 6th grade explicitly displayed ethnic stereotypes in their social decisions. Each child was shown a poster containing pictures of Caucasian, African-American, Asian, and Hispanic children matching his or her gender. The child was asked to choose which one of the depicted children was the most/least athletic, most/least intelligent, most/least proficient at English, and best/worst friend. Ethnicity of each depicted child was identified and the questions were then repeated. Statistical analysis showed answers fell into the range of a normal distribution meaning that students did not explicitly display ethnic stereotypes.

Project Number: SBS016

Grade: 11

Title: Effect of Time on Memory

Abstract: The purpose of this experiment was to determine the effect of different periods of time between review sessions on the efficiency of storing information into long-term memory. The procedures involved allowing sixty test subjects to study fake math formulas three times, where either one, three, five, or seven days lapsed between each review session, and then testing them to see how well they remembered these formulas. Data included the test subjects' scores (in percentages) on the tests. I concluded that students remembered the formulas best when one day has lapsed between each review session.

Project Number: SBS017

Grade: 9

Title: Commercials

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS018

Grade: 10

Title: Timbre Preference & Personality

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Abstract: This project investigates correlations between personality type and timbre preference, a preference for one "quality" of one musical sound over another. Timbre is the aspect of a sound that allows one to distinguish between different instruments. It is physically rooted in the amplitudes of the members of the overtone series. Standard measures were used, i.e. the KTS-II and ITPT. While the sample size was limited, this study indicated that those with a certain personality attribute often tend to prefer a particular timbre. Implications may include pedagogy and therapy.

Project Number: SBS019

Grade: 12

Title: Statistical Analysis of High School Students

Abstract: The purpose was to determine if various factors such as: your race, sexual orientation, religion, and response to political statements are independent from the location of your high school. I collected my data by designing and hosting a web survey that was open to high school respondents from both urban and non-urban areas. I then used various methods of statistical analysis to investigate the claims that the factors are independent of each other. The conclusion was that, based on the data I had collected, some factors are independent and others are dependent on where your high school is located.

Project Number: SBS020

Grade: 9

Title: The Effect of Color on Memory

Abstract: I propose to determine if humans remember black and white images or colored images more. First take the subject into a quiet area with no distractions. Then explain what you will be testing them on. Give the subject 45 seconds to memorize as many pictures as they can, then put the board down and give them 45 seconds to say as many as they can remember. Record the results on the data sheet. With the data supplied at this time more black and white images are being remembered over colored pictures. Further testing will be conducted to support this finding.

Project Number: SBS021

Grade: 11

Title: How does music affect blood pressure?

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS022

Grade: 11

Title: Does Classical Conditioning Work?

Abstract: Classical conditioning is a learning process in which associations are made between a natural stimulus and a neutral stimulus. The purpose of this experiment is to prove whether classical conditioning really works. In order to conduct this experiment, 14 students will have their eyes trained to dilate to the sound of a whistle. To do this, the lights were turned off and a whistle was blown immediately, then just the whistle was blown. During trial one, 75% had eye dilation and 25% did not, during trial two, 83% had eye dilation and 17% did not.

Project Number: SBS023

Grade: 9

Title: Memory

Abstract: This experiment tested the effects of age and gender on memory. Adults, teenagers, males, and females were used. The materials were DVDs, DVD players, envelopes, directions, and quizzes. Forty subjects were each given two envelopes. They first followed directions to watch a scene from the movie, and then completed a quiz about the scene to be graded. The quizzes were averaged according to age and gender. Teenagers had a 20.5% better average score than adults and females had a 3% better average than males. The hypothesis was wrong because teenagers had a better memory than adults, and males and females were about equal.

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Project Number: SBS024

Grade: 11

Title: Hear This, See That?

Abstract: The purpose of my experiment is to determine any difference in visual and auditory senses between male and female high school students. I hypothesized female students have stronger auditory senses; male students have stronger visual senses. Procedure: random recruitment of twenty-five male and twenty-five female students, each are shown box of twenty objects, fifty seconds to view, student writes objects recalled, listens to audio of twenty different objects, student writes objects recalled. Although the averages for visual results are only slightly higher than those of the auditory results, I speculated high school students perform better in a visual environment.

Project Number: SBS025

Grade: 9

Title: Are You Left Or Right Sided?

Abstract: The science fair project I decided to do deals with the brain. The project deals with what side of your brain does what. The work of my project shows very interesting information. This isn't information that you need to know, but it's something that would be interesting to know. The volunteers that helped me with my project now know a little more about their brain and how it works. After doing this project, I can do different activities and think of which side of my brain is being used. I hope that the volunteers for my project can do the same thing. When I did this project my hypothesis was that more people would be more right-sided than left-sided. I tested different volunteers and found out if they were left of right-sided. This gave me different results of different people. With this information I concluded that more people were left than right-sided. After all of my information was collected and I tested 10 people, more people were right-sided. I came upon this conclusion by looking at my data sheets and deciding if the person used their right side the most for the activities. 8 out of the 10 people I tested used their right side the most. Everybody uses their brain everyday no matter what they do. Doing this project gave people a perspective on the brain and what part of the brain does what. The brain hemispheres do a lot of different actions that separate the left and the right side of the brain distinctively. The left side of the brain processes information by taking pieces and lining them up, and arranges objects in logical order. The right side of the brain prefers open-ended questions, responds to demonstrated directions, and looks at similarities. The hemispheres of the brain are both important.

Project Number: SBS026

Grade: 10

Title: See It and Believe It

Abstract: For my experiment I wanted to see if seeing a color in food could trigger a mistake in perception of flavor. I used Lemon Gelatin and died it five different colors: Yellow, Red, Lime Green, Purple, and Orange. I used 56 students in this experiment and had them sample each color of gelatin and answer a few questions on a survey sheet they were given. Through looking at the surveys I came to a conclusion that the color alteration in food can trigger a mistake in perception of flavor. Though some students were able to identify that all the gelatin had the same flavor they couldn't identify what flavor it actually was.

Project Number: SBS027

Grade: 9

Title: Caffeine Effects on Short Term Memory

Abstract: The purpose of this experiment was to see if caffeine in the form of black coffee improves short term memory. To do this, a group of 25 people were brought together. Each person was given a verbal and auditory memory test prior to drinking coffee. After the allotted time of five minutes, each subject was given thirty minutes to drink a regular 8oz. cup of black coffee. Following the coffee, two similar memory tests were given, with a time limit of five minutes. Data was collected, and the initial hypothesis was supported.

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Project Number: SBS028

Grade: 9

Title: Remember This

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS029

Grade: 11

Title: Do Cell Phones Affect Reaction Time?

Abstract: When using cell phones while driving, impairments arise between the effects of a hands-on phone versus a hands-free phone on reaction time. Human subjects were tested on their reaction times conducting a "ruler test" while the subjects were talking on a hands-on phone and on a hands-free phone. These measurements were manipulated to represent the reaction time that each subject exhibited. The average reaction time for the hands-free phone was 0.19 seconds, while the average for the hands-on phone was 0.21 seconds. These results are useful in regulating cell phone use and enforcing hands-free phones as opposed to hands-on phones.

Project Number: SBS030

Grade: 9

Title: Music And The Mind

Abstract: The purpose of the experiment was to determine the effects of various types of music on Alzheimer's patients. Different music was played and the patients mood and body movements were observed. Older songs had the best results. All songs played had a positive effect and subjects showed body movement. Recognition was also shown when older songs were played.

Project Number: SBS031

Grade: 11

Title: Sleep and its Effect on Test Scores

Abstract: Adolescents undergo a sleep phase delay. The hypothesis is that with an additional one and a half hours of sleep students will perform better than they would without this sleep. Students were given three tests one as a control, one with additional sleep, and one at a different time. The hypothesis was proven correct by the data that was gathered and analyzed.

Project Number: SBS032

Grade: 12

Title: The Color of Learning

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS033

Grade: 11

Title: Music's Effect on Test Scores

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS034

Grade: 9

Title: Multitasking Madness

Abstract: Please visit exhibit for student's abstract.

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Project Number: SBI001

Grade: 12

Title: Nitrogen-fixing Bacteria Effects on Plant Growth

Abstract: Nitrogen is essential for all life on the planet, but is mostly found in a gaseous state. Bacteria are the only organisms that can combine gaseous nitrogen with hydrogen and create ammonia. These so called "nitrogen-fixing bacteria" are what sustain plants in ecosystems and are usually independent soil organisms. Comparing the growth of plants in my experiment was to test whether the bacteria created a viable difference in the process and resultant growth. I found this to be true and the presence of the nitrogen-fixing bacteria would be assumed to result in the greater growth of the plant.

Project Number: SBI002

Grade: 12

Title: Nicotine on Marine Systems

Abstract: Nicotine-based insecticides are considered less harmful to the environment because they are more natural and specific to insects. The purpose of my experiment is to determine if these insecticides can also have a significantly harmful effect on marine systems. I chose sea urchins as test subjects because they are indicator species and their reproduction can be easily manipulated. My control groups were fertilized in ASW while my experimental groups were fertilized in a 1.5 ppb nicotine solution. 31.8% of the eggs were fertilized in the experimental groups while 74.6% were fertilized in the controls. Therefore, nicotine has a negative effect.

Project Number: SBI003

Grade: 11

Title: Geotropism

Abstract: My experiment was based on Geotropism, growing plants at different angles to find out which angle would produce the best. I did this trying to answer the question which one would produce food the best. I did this by taping cups to a ringstand at 0 degrees, 180 degrees and 90 degrees East and West. I found out that the best producing angle was both 90 degrees East and West, although all of the angles produces about the same. I performed my experiment in a 42 day range under the same conditions the entire time.

Project Number: SBI004

Grade: 9

Title: Apps of Terra-sorb Hydrogel

Abstract: The hypothesis stated that with crystal addition, plants would show increased growth. Terra-sorb hydrogel crystals were added to the soil of three radish and peperomia obtusifolia plants. The control was untreated soil. The pots contained 0, 3, and 6 grams of crystal and 250 grams of soil. The plants were observed and measured over a period of nine weeks. The results showed that the crystals had a positive effect on growth over a short period of time. However, long term results were negative.

Project Number: SBI005

Grade: 10

Title: Effect of Temperature on the nitrogen cycle

Abstract: The project's purpose was to test how temperature affected the nitrogen cycle in four aquatic environments. With global warming, water temperatures are rising and the nitrogen cycle plays a key role in the aquatic food chain. Two aquariums were set up at forty degrees; two aquariums were set up at eighty degrees. The nitrogen cycle was begun artificially with chemicals. The tanks were tested daily using six criteria over six weeks for chemicals involved in the cycle and results recorded. Does temperature affect cycling rates of nitrogen and ammonia in aquatic environments? Data is inconclusive and further testing is required.

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Project Number: SBI006

Grade: 9

Title: Glow With the Flow: Year Two

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI007

Grade: 11

Title: Effect Of Paw Preference On Sex

Abstract: This project is to see if two common species differ in paw preference. The study will provide needed information for the study of brain hemispheres in different species of organisms. The dogs and cats will differ slightly and the males will have a higher probability of being left-pawed. Each of the species will be individually shown a toy or treat that they must reach for with a paw. After a five minute break, the individual was tested again for a total of three trials. The paw that was used was recorded as the dominant paw. The results of the testing showed that females were more likely to be right-pawed and males left-pawed. The results were consistent with the hypothesis because of the preferences of the males and females. These findings may prove to be important to animal behaviorists because they may link paw preference with behavior.

Project Number: SBI008

Grade: 11

Title: miRNA-10b Antisense Treatment on Prostate Cancer

Abstract: MicroRNAs are single stranded, noncoding RNAs typically 21-23 base pairs long that are important in many biological processes, and mature miRNAs have a main function of down regulating gene expression. By using the antisense of miRNA-10b, suppression effects on prostate cancer cell line metastasis, through assays of the proliferation and invasion efficiencies of the cells, are performed by utilizing the Transwell and MTT assay techniques. Furthermore, PCR is used to replicate RNA strands, and therapeutical effects are graphed and p-values are analyzed to ensure accurate results indicating potent limitations of oncogenic behavior.

Project Number: SBI009

Grade: 11

Title: Effect Of Different Beverages On Muscle Fiber

Abstract: Many humans are concerned with the health of their bodies, what they put into their system, and how it affects the physical composition. The initial idea of this project was to determine what different types of beverages physically do to your muscles. The physical appearance of the muscle changed after placing different meat in seven different drinks. After twenty-four hours, the muscle fiber had changed based on appearance and weight. It was obvious that beverages which contain high amounts of sugar such as colas affect the muscle negatively and the muscle benefits from water with minerals and healthy ingredients.

Project Number: SBI010

Grade: 9

Title: Microwave Radiation effects on angiosperm growth

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI011

Grade: 9

Title: Tap H₂O Intrusion Effects on Algae

Abstract: In this experiment, the purpose was to test tap water and a mixture of tap water + sodium nitrate on two types of algae: Chlamydomonas reinhardtii and Euglena sp. Each type of algae was added to different concentrations of tap water and tap water with the addition of .1% sodium nitrate. With both types of algae, the results showed that the algal percent change in growth varied depending on the

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concentration of the two variables. It was concluded that tap water and tap water + sodium nitrate both had effects on the growth of both types of algae.

Project Number: SBI012

Grade: 9

Title: Toxicity Analysis of Plant Combustion Products

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI013

Grade: 9

Title: Ammonia vs Bleach: Which cleaning product inhibits E coli longer?

Abstract: The purpose of this experiment was to find whether bleach or ammonia was more effective in inhibiting E coli for an extended period of time. First, the experimenter plated E coli and added in sensitivity discs. The plates were then incubated for two days and the inhibition zones were measured. Bleach continually proved that it could inhibit E coli longer than ammonia.

Project Number: SBI014

Grade: 12

Title: The P Filter: Which Type of Soil

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI015

Grade: 10

Title: Does Caffeine Affect the Growth of Plants?

Abstract: This project was to experiment to determine whether or not caffeine has an effect on the growth of plants. The topic was chosen because of an interest in determining the effectiveness of the addition of coffee grounds to the soil of developing plants. Rapid-cycling versions of Brassica rapa were grown over a period of 4 weeks. Plants were exposed to varying concentrations of caffeine by watering plants daily. Observations and growth measurements were taken over the life cycle of the plants exposed to caffeine and compared to those which received only distilled water as the control.

Project Number: SBI016

Grade: 9

Title: Effect of Temperature on Bread Mold

Abstract: I wanted to find out what temperature would make bread mold grow the most. I will expose pieces of bread to the air, then place them in plastic baggies. The bags will be held in different temperatures and I will record how much mold grows in each temperature and what kinds of mold.

Project Number: SBI017

Grade: 9

Title: How Light Affects Pupil Dilation

Abstract: The purpose of the experiment is to investigate if age and gender influence pupil dilation with the use of different light intensities. Ten subjects of various ages consisting of seven males and three females were asked to look at a designated spot on a white wall at a distance of 2 meters. Different light sources were placed between the subject and the spot below the subject's line of sight. The subject was required to relax and look at the spot on the wall under ambient light so that a baseline pupil measurement could be made. After a specific amount of time an optic ruler was used to measure pupil dilation. The data shows that the younger test subjects exhibited a larger pupil size. Also, greater pupil dilation was shown in the female subjects. The older test subjects' pupils were smaller because the muscles in their eyes were weaker than that of the younger test subjects. Females naturally have a larger pupil size than males. The results could be used to find a way to increase the strength of an older person's pupil, thus increasing the pupil's reaction to changes in ambient lighting.

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Project Number: SBI018

Grade: 11

Title: Is there more to the Spice of Life?

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI019

Grade: 11

Title: The Effects Of CO₂ On Plant Growth

Abstract: The purpose of this experiment is to see if increased Carbon Dioxide levels increase C₃ plant growth. Three different variable mixtures of Carbon Dioxide and a control without Carbon Dioxide were used. The total height of each plant was measured. Observations concluded lower levels of Carbon Dioxide can help plant growth, however higher levels can stunt plant growth. Future experiments can use a C₄ instead of a C₃ plant.

Project Number: SBI020

Grade: 11

Title: The Magnetic Field

Abstract: This lab studied the relationship between the number of magnets put under a potato plant and its relative growth. Budding potato plants were placed into soil with three, two, or one magnets underneath them, or with no magnets underneath them, then were left to grow for several weeks, then measured for height. The heights were then averaged and graphed. The equation found was $h=1.525x^2-2.085x+5.265$, where h is the average plant height and x is the number of magnets used. This data shows that magnets have an increasingly positive effect on plant growth.

Project Number: SBI021

Grade: 12

Title: The effect of kinetin on the rate of onion root tip mitosis

Abstract: To determine the effect of kinetin on mitosis rates, I will root onion bulbs in varying solutions of kinetin and compare the mitosis rates in the root tip cells. I will calculate the mitosis rate based on the number of cells in each stage of mitosis, through microscopic examination. I hope these trials will allow me to determine the optimum level of kinetin to stimulate maximum cell growth.

Project Number: SBI022

Grade: 12

Title: Identifying Opsins in *Inia geoffrensis* Year 4

Abstract: Previously, cellular anatomical analysis of the retina of the *Inia geoffrensis* reveals the presence of rods and cones. This observation raised the question as to whether the cone function for monochromatic high acuity or whether the cones can provide color vision. A molecular approach was used to identify and characterized the dolphin's long-wavelength sensitive cone opsin gene sequence. Based on the conceptual translation of the DNA sequence to *Inia's* long-wavelength sensitive cone opsin gene protein's predicted absorption appears to be bathochromic. A bathochromic shift would be consistent with the dolphin's adaptations to life in a shallow nutrient rich ! freshwater environment. This indicates *Inia's* possesses a functional long wavelength sensitive cone opsin gene that is shifted towards the red end of the light spectrum like that of *Trichechus manatus* (West Indian manatee) and not blue shifted as in oceanic cetaceans

Project Number: SBI023

Grade: 10

Title: Fertilized Plant Growth

Abstract: Fertilized Plant Growth is an experiment to determine which fertilizer works best when growing plants. I chose the lima bean plant to be tested with Miracle Gro plant fertilizer and Vitamin B₆, and hypothesized that Vitamin B₆ would prove to be more efficient. After the process of germinating, planting,

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watering, and measuring the results of my hypothesis were conclusive. Vitamin B6 is a better plant fertilizer than Miracle Gro, and it could save plant growers a lot of money.

Project Number: SBI024

Grade: 11

Title: Analyze digestion of bread carbohydrates

Abstract: The purpose of my experiment was to determine if different breads had different concentrations or types of sugars. I digested three different bread types with amylase enzyme, and tested for the presence of glucose with Benedict's solution. The bread digests were analyzed using a spectrophotometer, and the wavelengths were compared to a graph of known concentrations.

Project Number: SBI025

Grade: 9

Title: How Sweet is It?

Abstract: This project compares the stated amount of sugar in a serving of apple juice to an obtained reading of sugar as well as comparing sugar amounts among the samples. The hypothesis was that pure apple juice would contain the most sugar and the nutrition label would be accurate. 8 brands of apple juice/blends were tested. No sugar-free or artificially sweetened brands were tested. A refractometer was used to test each of the 8 juice samples twice obtaining a reading of sugar content in the juice. The experimental results supported the hypothesis by staying within an acceptable range of error.

Project Number: SBI026

Grade: 9

Title: How Food Supplement Affect Weight Gain of Juvenile Mice

Abstract: My project was about juvenile mice. I had two cages with two mice in each one. Each cage had an exercising wheel in it. I gave the two mice in cage one regular mouse food and plain water to eat and drink. I was trying to see if the mice that eat the sugared food will weigh more than the mice eating the plain food. My conclusion is that the mice I feed the sugar food to did not gain more weight than the mice eating the regular cereal.

My experiment may not have worked out because the mice could have been sick; they may have not eaten if they did not like the food.

Project Number: SBI027

Grade: 10

Title: O₂ Dependent Arthropod Growth

Abstract: The hypothesis states that with an increased oxygen level, arthropods (insect, arachnids, etc) will grow larger than arthropods breathing normal oxygen levels.

Project Number: SBI028

Grade: 10

Title: Biodeterioration

Abstract: The process of rusting is a form of biodeterioration which takes place in our everyday environments as well as on the ocean floor. Various forms of bacteria have been mining the metals from the steel of the RMS Titanic since it sank in 1912 resulting in the formation of "rusticles". To illustrate the process of biodeterioration at a steady rate three steel coupons were placed in separate beakers of saltwater along with a section of copper pipe. The steel coupons were left to rust and were observed daily. Biological Activity Reaction Tests (BARTs) were performed on a sample of water from each beaker after seventeen, thirteen, and nineteen days to test for the presence of iron related, sulfate reducing, and acid producing bacteria. By dividing the difference between the weight of the steel before and after the experiment by the number of days the experiment had been run it was possible to calculate the amount of time that it would take for the Titanic to biodeteriorate.

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Project Number: SBI029

Grade: 11

Title: Green Tea Extracts as Anti-Inflammatory Agent

Abstract: Activation of the immune system and secondary inflammation are characteristic of inflammatory bowel disorders (IBD). Treatment of IBD aims at inhibition of inflammation. Based on the anti-inflammatory properties of the green tea extract Epigallocatechin Gallate (EGCG) I hypothesize that EGCG inhibits intracellular signaling pathways of key IBD inflammatory mediators like Interferon-g (IFN-g) or Tumor Necrosis Factor-alpha (TNF-a). HeLa reporter cells for STAT1 or STAT3 transcription factor activity were stimulated with IFN-g or TNF-a in the presence or absence of EGCG. EGCG is able to inhibit STAT1 and STAT3 activation and may be beneficial in the treatment of IBD.

Project Number: SBI030

Grade: 10

Title: Cell wall size and plant decomposition

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI031

Grade: 10

Title: Can Chickens See Color?

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI032

Grade: 9

Title: Hot Blooded

Abstract: Does an animal's blood pressure affect its body temperature? The independent variable is blood pressure. The dependent variable is the body temperature. Every week for six weeks, the blood pressure and body temperature was taken under the supervision of a veterinarian. Data was collected to determine if any relationship existed. According to the data, the blood pressure of a Labrador Retriever doesn't affect its body temperature.

Project Number: SBI033

Grade: 9

Title: Does Temperature Affect Pond Fish

Abstract: This project was done because I noticed that there are changes in the fish's activity levels in the different seasons. I wanted to do an experiment where I watched the fish and compared their activity levels in warm and cold weather. To do this experiment, put fish in a pond, take the temperature, watch what the fish do for ten minutes, and log the activities of the fish. It was found that the fish were less active when the water was colder. This might have happened because as the water gets colder, the fish tend to slow down their metabolism.

Project Number: SBI034

Grade: 9

Title: Insect Attraction to Lotion and Insect Repellent

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI035

Grade: 9

Title: The Mozart Effect

Abstract: It is believed that when you listen to classical music it will heighten your brain functions for a short amount of time. Or if you listen to classical music on a regular basis from the time that you are a small child until you are an adult, it will make your intelligence higher than it would be if you did not listen

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to classical music. ‘The Mozart Effect’ is an experiment to show if classical music does in fact heighten your brain functions or make you smarter to an extent. I discovered that listening to classical music does heighten your brain functions to an extent. Although classical music may possibly heighten brain functions, it does not take into consideration gender, ethnicity, educational level, or geographic location. Furthermore I only used a mathematics test, so this test also only takes concrete thinking into consideration.

Project Number: SBI036

Grade: 9

Title: Feel the Rush

Abstract: Everybody loves to drink pop. Have you ever wondered when you go to drink that can of pop, exactly what it is your doing to your heart? With this question in mind, I formed an experiment in which, I hypothesized that drinking two and a half cans of Mountain Dew will increase the body’s pulse and blood pressure, systole and diastole, due to the caffeine it contains. I began my experiment by taking my subjects blood pressure’s and pulse’s. I then had them drink a can of pop, wait twenty minutes, and take their blood pressure and pulse, again. Then, they repeated these steps one and a half more times. During this experiment physical activity was not limited, but gender, age, race, amount of pop consumed, and time limit, remained the same. My data had no visible pattern. I compared the average systolic measurement to the baseline measurement, and found that subjects 1 and 3’s measurement was higher than subjects 2 and 4’s. When comparing the average diastolic measurements, to the baseline, subjects 1, 2, and 3’s measurements increased while 4’s decreased. Comparing the average pulse readings of each subject, to the baseline, every subject increased. Based on my experiment my hypothesis was not rejected nor accepted. Everybody’s body reacted differently to the amount of caffeine in the pop. To get a more accurate answer I would need more subjects, and the subjects would have to be in a more controlled setting.

Project Number: SBI037

Grade: 11

Title: The effect of light color on rate of photosynthesis

Abstract: I wanted to find out if one color of light was better for the rate of photosynthesis. I used Elodea plants in test tubes, which I covered with colored cellophane. My control condition had no cellophane on the test tube. All tubes were placed the same distance from the light source, and I counted the number of bubbles produced during 5 minutes. I found that white light without any cellophane produced the most bubbles.

Project Number: SBI038

Grade: 9

Title: Science of Baseball

Abstract: My project is called “The Science of Baseball.” The purpose of this experiment was to find out which baseball can hit a baseball further, a wooden or aluminum. How I found this out was I measured out 90 meters in intervals of 10 meters. I then hit five baseballs with each type of bat, and then recorded how far they went. The outcome of my experiment was that an aluminum bat hit the baseball further than a wooden bat. The wooden bat hit one baseball further than the aluminum bat once, I think that was my error. The distance that the aluminum bat hit was always consistence.

Project Number: SBI039

Grade: 9

Title: How sweet it is!!!

Abstract: My experiment was to determine if yeast can produce carbon dioxide gas using sugar substitutes. Five different yeast and sugar or sugar substitute mixtures were created and poured separately into a plastic bottle. A cap with tubing attached went onto the bottle and the other end of the tubing went into a graduated cylinder inverted in a bucket of water. The volume of gas in the cylinder was measured every 5 minutes for 30 minutes or until the cylinder was full. The results of

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my experiment were that yeast could produce gas with the sugar substitutes which supported my hypothesis.

Project Number: SBI040

Grade: 9

Title: Chloride Salt Effects on Algal Populations

Abstract: The Purpose of this experiment was to investigate the effects of chloride salt concentrations on two different algal populations. Six sets of test tubes were filled with different concentrations of water, algae, and a variable. They were placed in a test tube rack and were given light by an overhanging fluorescent lamp. A spectrophotometer was used to measure absorbance (and indirect measure of population size) and set at a wavelength of 430 nm. The Results drawn from the ANOVA data analysis showed p-values greater than .05 so the null hypothesis was rejected.

Project Number: SBI041

Grade: 9

Title: Effects of Coffee on Plants

Abstract: The problem investigated was the effect that coffee had on plant growth. Hyacinth and hosta were grown from seed in various combinations of soil and coffee grinds. The mass, ph and height of each plant was measured and recorded. The results supported the hypothesis that coffee did affect plant growth.

Project Number: SBI042

Grade: 10

Title: Multidimensional Music

Abstract: Multidimension Music, composed by French composer Jacotte Chollet is said to do remarkable things to human blood composition, such as hyper-oxygenation, white blood cell increase, slowing of decomposition, and many other things. These three effects are the ones being tested. Small blood samples are extracted from human subjects before and after listening to the music, over a period of two weeks. The blood samples are examined under a microscope to observe decomposition rates and white blood cell production. A Pulsox machine is also used to determine blood oxygenation rates. Further experimentation will prove the claims about this music true.

Project Number: SBI043

Grade: 12

Title: Effect of Rice on Fruit Ripening

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI044

Grade: 12

Title: The Role of TLR4 in Intestinal Healing

Abstract: Necrotizing enterocolitis occurs in pre-term and low birth weight infants and is marked by intestinal inflammation with high levels of circulating lipopolysaccharide. The LPS receptor, toll-like receptor 4, plays a critical role in the development of necrotizing enterocolitis. I hypothesize that CpG-DNA will inhibit pro-inflammatory signaling in response to the inflammatory mediators LPS, IL-1 β , TNF- α , and IFN- γ . Cultured enterocytes will be exposed to pro-inflammatory mediators with or without co-treatment with CpG-DNA and Western blot analysis will be conducted to determine an inflammatory response. Results indicate that CpG-DNA is effective in inhibiting the signaling of IL-6, an intermediate mediator of the inflammatory process.

Project Number: SBI045

Grade: 9

Title: Tainted Spinach & Don't Blame The Soil!

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Abstract: Last year, I researched the bacterial contamination of spinach and lettuce and found that spinach contained more bacteria than lettuce. I theorized that spinach, more readily than lettuce, is invaded by environmental bacteria through its root system. In order to investigate this theory further, I grew spinach and watered the plants with a solution containing E.coli. I plated the emulsified spinach plants and observed the growth of E.coli. There was no E.coli growth on any of the plates. It appears that the spinach contamination does not occur via the root system but rather by an external source.

Project Number: SBI046

Grade: 9

Title: When Good Bananas Go Bad

Abstract: What container preserves a banana's freshness for the longest time? This project was to see if different containers affect the spoilage rate of bananas. Green bags were expected to perform the best. They are advertised to remove ethylene gases that accelerate the ripening process. Nine bananas, double-zip bags, easy-zip bags, green bags, aluminum foil, plastic wrap, plastic container, self-stick wrap, and twist-top storage bags were used. Each banana was placed in its container, observed for data daily, and photographed when changes were seen. The self-stick wrap worked the best. Every container grew a minor amount of mold. Once that was seen, they were considered spoiled. The self-stick wrap was the most air-tight and was sealed directly to the banana. Every container grew mold because there was enough moisture to grow mold; the control didn't grow mold at all. This project is important because the information it produced can help to prevent waste.

Project Number: SBI047

Grade: 10

Title: Temp On Drosophila Reproduction

Abstract: Over the years the Earth's temperature has been changing unpredictably. This project is intended to learn whether or not temperature will effect the reproduction of insects, more specifically Drosophila Melanogaster. It is expected that the drosophila will have the best reproduction rate in the highest temperature, because the higher the temperature, the faster their metabolism, causing them to reproduce more frequently.

Project Number: SBI048

Grade: 9

Title: Whose Tongue is Cleaner?

Abstract: The title of my project is "Whose Tongue is Cleaner?" I wanted to see if canines' tongues are actually cleaner than humans. I swabbed sixteen human and canine tongues with cotton tipped applicators and applied them to a Petri-dish with a ten square grid. The dishes were incubated for thirty-six hours. The growth on them was then recorded in percentages. At the conclusion of the experiment, the canines' tongues turned out to have grown fourteen times more bacteria than human tongues

Project Number: SBI049

Grade: 11

Title: Damage Memory of Plants

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI050

Grade: 9

Title: Water Bottles: To Reuse Or Not Reuse

Abstract: My experiment was asking is it better to reuse or not to reuse water bottles. Which one will have higher bacterial content. What I did was I swabbed the water bottles and swiped that into the nutrient agar that was in the petri dishes. I grew the bacteria in an incubator for two days. I got my results of there is less bacteria in the used and not washed water bottles.

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Project Number: SBI051

Grade: 11

Title: Which Foods Best Attract Wildlife?

Abstract: The project is finding out which foods best attract wildlife. Finding out what attracts a bear will be interesting. I thought I would find that bears come in the most and that apples attract the most wildlife because they give off a strong scent. I put different kinds of food out on each of four nights. The foods were hamburger, donuts, corn, and apples. A camera was set up to take pictures of the wildlife. The most wildlife came in for the corn. My results did not match my hypothesis. Corn attracts more animals than foods with strong scents.

Project Number: SBI052

Grade: 9

Title: Can An Apple spoil the Fruit (Fly)

Abstract: My experiment will attempt to determine whether exposure to an electro-magnetic field (EMF) emitted by a lab top computer causes observable changes in fruit fly behavior, reproductive rate, development, and/or mutation. My hypothesis is that EMF exposure will cause observable changes in the experimental fruit flies when compared to a control. Several generations of flies will be continually exposed to EMF's by being placed on a laptop computer. Behavior changes will be noted, reproductive rate will be determined by counting offspring, and a dissecting microscope will be used to monitor the appearance of developmental and mutational changes.

Project Number: SBI053

Grade: 10

Title: Effect Of Microwaves On Seed Germination

Abstract: The project "The effects of microwaves on seed germination" is about how radiation effects the growth of seeds. This project is important because it can help people learn what microwaves do to what is put into them. My hypothesis was that the longer the radiation exposure, the less growth that would occur. I used six containers with moist paper towels in them and put ten seeds in each container. I let the seeds germinate for six days and then measured and averaged them. The results showed that the longer radiation exposure the less growth occurred.

Project Number: SBI054

Grade: 9

Title: The Effects of Metals on Bean Plants

Abstract: The purpose of this investigation was to see if various concentrations of harsh metals would decrease the growth of bean plants. 10,20,30,40,and 50g of Lead, Tungsten, Copper, Iron and Tin were placed in the soil with bean seeds. A control group with no metals in the soil was also grown. This same format was repeated a second time. The Copper, Iron and Tin did well, while the control, Lead and Tungsten did not. Research states that iron is essential to all living things, iron helped the plants without reaching toxicity. Copper and Tin are found in vitamins people take. These also helped the bean plant without reaching toxicity. Lead is dangerous and was to the bean plant. Tungsten has been shown to kill red worms in soil and it cause the bean plant to be brown and thin. The control group did not have benefit of vitamins.

Project Number: SBI055

Grade: 9

Title: Effect Of Different Colors On Plant Growth

Abstract: The question is "Which color of plastic wrap allows plants to grow the tallest"? This project is for people to know which color of plastic wrap to surround their plants in when starting plants indoors. The hypothesis for this project is that the plant surrounded by clear plastic wrap will grow the tallest because it will allow more light in for the plant to grow. Plant two seeds in a pot, surround each in a different color plastic wrap, water them, measure each plant, and then record the results for four weeks. The plant with the yellow grew the tallest, then clear, green, blue, orange, and finally red. The results

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stayed consistent because the yellow let the same amount of light in as the clear did. The lighter colors allow more sunlight to go through and hold in the heat to allow the plants to grow. This project is of interest to others so they can start plants indoors with the right color of plastic wrap.

Project Number: SBI056

Grade: 10

Title: Pyramid Preservation

Abstract: The purpose of this project is to determine why organic matter preserves longer when enclosed in a pyramid and what factors play into the evaporation process. The experiment was conducted with three pyramids and four types of fruit. The fruit in each pyramid, along with fruit left in the open air, were exposed to different temperatures, airspace amounts, humidity levels, and light. One pyramid, which was exposed to heavy heat but light humidity, yielded fruit that evaporated rapidly and kept its natural shape. The pyramid that contained minimal heat but heavy humidity yielded fruit that was slow to dry and became mold infested. The last pyramid was kept with an average amount of heat, humidity, and no light, and yielded fruit that was slightly more preserved than the fruit outside of the pyramids and with less mold. Natural mummification leaves organic matter devoid of water and it takes on a leathery, preserved appearance.

Project Number: SBI057

Grade: 9

Title: Soap effects on algal populations

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI058

Grade: 11

Title: Effect of Trans Fat on Monocytes

Abstract: The purpose is to find the effects trans fats have compared to other fats on monocytes. The procedure is to plate monocytes on a 24 well plate. Expose two wells to normal medium, three to soy oil, three to crisco, four to albumin, four to stearic acid, four to oleic acid, and four to elaidic acid. Measure the amount of acylcarnitine in each well through gas chromatography mass spectroscopy. The results show trans fats cause the monocytes to produce more acylcarnitine than cis unsaturated fats of saturated fats. The mechanism through which trans fats are metabolized involves increased acylcarnitine.

Project Number: SBI059

Grade: 10

Title: The Effects of Temperature Changes on Embryonic Development in Chicken Eggs

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI060

Grade: 10

Title: Stem Cells to Cardiomyocytes

Abstract: One out of every five deaths in America is caused by heart attack, during which sections of cardiac muscle tissue die. It was suggested that stem cell therapy could alleviate this malady; however, none have been able to effectively obtain cardiomyocytes (CM) from stem cells for implantation into the patient heart. Three-dimensionally grown Muscle-Derived Stem Cells (MDSCs) were shown in this experiment to differentiate into CMs at a significant rate, as evidenced by immunostaining for cardiac-specific proteins. The three-dimensional culture is thus a very promising solution to efficiently generate CMs, eventually for use in clinically regenerating the heart after injury.

Project Number: SBI061

Grade: 9

Title: Does Music Effect How Fast You Can Do Word Searches

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Abstract: For my science fair project I chose to do one on music and word searches. For this project you have to first get a person to do a word searches with the music after they are done you need to write down there time so that I can compare them in the end. Then when there done you have to get the same person to do a different word search and give it to them without the music and write down there time on that one. For this project I needed at least six or seven people so that I can compare my information and tell if you can do better with the music with or without music.

Project Number: SBI062

Grade: 12

Title: STRESSORS IN A CAPTIVE SNOW LEOPARD

Abstract: The purpose of this experiment is to determine whether captive snow leopards have adapted to human activity and will not be stressed by it. The snow leopard was observed when he was put into potentially stressful situations caused by human activity, each week, at the same time. The data shows that the snow leopard was still stressed by everyday human activity. The data shows that snow leopards may not adapt quickly. This finding could help protect the species. The data could help the conservationists dealing with the decreasing populations of snow leopards to concentrate their efforts on decreasing human encroachment.

Project Number: SBI063

Grade: 9

Title: BRINE SHRIMP & LAUNDRY SOAP

Abstract: The purpose of this investigation is to determine if brine shrimp are affected by a laundry soap concentration. This was tested by adding 3 different concentrations of laundry soap to 12 separate containers with ten brine shrimp, 100mL of water, and 2.5mg of dissolved salt. To feed of Brine Shrimp a solution of flour and water was added once every two days to each of the containers. The project lasted a week. At the end of the week, the brine shrimp in the containers with higher concentrations of soap died faster than those in lower concentrations.

Project Number: SBI064

Grade: 9

Title: Effects of GW on Bile Duct Cells

Abstract: The purpose of my experiment was to determine the effects of a potential anti-obesity drug (GW501516) not yet available to consumers on bile duct epithelial cells. To reach this purpose, human bile duct cancer cells were cultured in vitro and treated with dimethyl sulfoxide (DMSO) and GW501516 at low doses of 0.5-500 nM for 24-72 hours. The cell proliferation reagent (WST-1) was used to measure the number of viable cells and statistical analysis was performed. GW was found to promote bile duct tumor cell proliferation and therefore should not be used as an anti-obesity drug.

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Project Number: SCH001

Grade: 11

Title: How Magnetism Affects Temperature

Abstract: The purpose of this experiment was to see if the temperature of various substances would be affected by a magnetic field. Water, which is polar; iron, which is a magnetic substance; iron(III)nitrate, which consists of iron (III) ions; and sodium chloride, which is an ionic compound were chosen for testing. Temperature used ranged from 10C to 80C. A time frame of 1 minute was used. It was found that the magnet affected the the temperature of all substances at the higher temperatures.

Project Number: SCH002

Grade: 12

Title: The End Justifies the Means

Abstract: The purpose of this experiment is to compare and contrast the effects of gemstone production by means of percent composition and stoichiometry. Topaz and Citrine were produced in order to show a general consensus on production methods when dealing with different types of gems. Topaz was formed with the following chemicals: CaF_2 , AlCl_3 , and Na_2SiO_3 . Citrine was formed with the following chemicals: $\text{Fe}(\text{NO}_3)_3$ and Na_2SiO_3 . The amounts used varied by the method of determining them. The first trials used percent composition and the second trials used stoichiometry to determine the amount of reactants to be used. The solutions were prepared by heating the reactants in combination with distilled water over a Bunsen burner and then allowing them to evaporate over time. It was discovered that the structure was of a higher quality for both citrine and topaz when the reactants were solved by the use of percent composition.

Project Number: SCH003

Grade: 9

Title: The Effect of a Kitchen Acid on Counter Surfaces

Abstract: Please visit exhibit for student's abstract.

Project Number: SCH004

Grade: 12

Title: Synthetic Rhodochrosite

Abstract: The purpose of this experiment was to determine under which condition Rhodochrosite would best synthetically grow. Three trials were held. The first tested the growth under scientifically controlled conditions. The second trial replicated an ore deposit in a silver mine, where Rhodochrosite naturally forms. The third trial replicated the natural environment most specifically. The first trial was the most effective. Substantial amounts of pink Rhodochrosite formed inside of a porous rock with the proper trigonal structure that is characteristic of Rhodochrosite, proving that natural environments are not always the most effective.

Project Number: SCH005

Grade: 9

Title: Effect of Temperature on Batteries

Abstract: The purpose of this experiment was to determine whether variances of temperature on batteries will effect how long they last. AA batteries of various brands in different temperatures were tested in electronic items. The different locations of the batteries included a cold temperature area: inside a refrigerator, a warm temperature location and a room temperature location. The batteries were placed in those places from 48-72 hours. Batteries placed in the warm and cold locations did not last as long as batteries at room temperature.

Project Number: SCH006

Grade: 12

Title: NIR Alumina Analysis Method

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Abstract: This report details the development of a rapid, non-destructive near infrared (NIR) method for the quantitative analysis of weight % gibbsite ($\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) in smelting grade alumina over the range 0-10 weight %. A sample pre-treatment method was also developed for minimizing the effect of physically adsorbed moisture on the analysis method. The single term linear least squares NIR method developed in this study has a standard error of calibration of 0.27 wt %, a standard error of prediction of 0.50 wt% gibbsite and a method repeatability error (1 standard deviation) of <0.017%.

Project Number: SCH007

Grade: 11

Title: Poppy Seeds

Abstract: The purpose of my experiment was to test the claim that eating a bagel, muffin etc. containing poppy seeds before a drug screening test will cause a person to test positive for opium. To do this, I created an aqueous solution containing the morphine from poppy seeds and tested it with a drug screening test. I first crushed approximately the amount of poppy seeds contained in two bagels and mixed in an organic solvent. Because morphine is a base, I added an acid to create a salt in an aqueous solution. I centrifuged the mixture to separate the organic matter from the aqueous solution. I removed the aqueous solution and used Fastect II Drug Screen tests to test for opium. I tested the straight solution as well as dilutions of 1/10, 1/100, and 1/1000. All of the tests in all four groups came out positive. I then tested distilled water to check the validity of the tests, and all of those tests turned out negative. While this does not show that after digestion there would be a detectable amount of morphine present, but it does show that, even at 1/1000 dilution, there is enough morphine present in the poppy seeds contained in common foods to be detected by the test.

Project Number: SCH008

Grade: 12

Title: Effects of Cathodic Inhibitors on Carbon Steel

Abstract: The purpose was to determine which concentration of which cathodic inhibitor (calcium carbonate, calcium phosphate, or zinc oxide) prevents corrosion the most in carbon steel. Coupons were submerged in water with their respective inhibitor for four weeks. Masses were compared before and after. The carbon steel paired with calcium phosphate lost the least mass at 0.0036 grams. A hydrated form of the calcium phosphate was used which allowed it to be soluble in water. Unlike the other inhibitors, it dissociated more effectively, thus precipitating onto the coupon and preventing the cathodic reaction of the corrosion process from being completed.

Project Number: SCH009

Grade: 10

Title: Caffeine in Tea Using GC-MS

Abstract: Caffeine consumption of about 100 mg per day is beneficial, but more than 200 mg can be detrimental to health. The amount of caffeine in different brands of tea was successfully determined using a GC-MS instrument. The amount of caffeine in regular tea, 19 - 56 mg per serving, was found to be nearly five times higher than in decaffeinated tea. The cost efficiency was calculated by multiplying cost per serving and mg of caffeine per serving. My hypothesis was proven correct that decaffeinated tea has less caffeine than regular tea but is not always cost efficient.

Project Number: SCH010

Grade: 9

Title: Ice, Ice, Baby

Abstract: Every winter we use salt to help melt the snow and ice on our sidewalks. For my science fair project, Ice, Ice Baby, I decided to find out why it is that salt can melt the ice. The reason I chose this project is because with most things there is apparent heat that is melting a substance, but with salt and ice there is no apparent heat. To find out what actually happens I first hypothesized that when salt comes in contact with ice that it does end up radiating some kind of heat. To prove or disprove my hypothesis I conducted a one day experiment. During this experiment I took a bowl of ice, added salt, and then recorded the temperature of the ice over a 45 minute period in a data table. When I finished these my

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project I saw my hypothesis was wrong and what really happens is that the salt lowers the melting point of the ice causing it to melt.

Project Number: SCH011

Grade: 11

Title: Why Hair Turns Green After Swimming

Abstract: The most common complaint that swimmers have is that their hair turns green. This is usually blamed on chlorine that is added to the pool water. Being a swimmer myself, I wanted to find out what really caused some hair to turn green after swimming. Four hair colors (red, brown, light blonde, and dark blonde) were soaked in four different solutions (water, copper, chlorine, and copper and chlorine mixed) for twelve days. My hypothesis was that all found colors of hair would turn green after being soaked in the copper sulfate. I also believed that the hair soaked in the chlorine solution, distilled water, and the combined chlorine and copper sulfate solution would show no color change. My hypothesis was partially correct. After twelve days, the blonde hair that was soaked in the copper solution turned green. The other hair colors did not show any change in color after being soaked in copper. All hair colors that were soaked in chlorine, water and the chlorine and copper solution also did not show any change in color.

Project Number: SCH012

Grade: 12

Title: Altered States

Abstract: Most colors on rocks or gems in nature come from a contaminant, usually a chemical or from moisture in the air. Vanadium is a chemical that causes a purple color in the gem Tanzanite. In this project, multiple oxidation states of Vanadium were reached by varying the pH levels of the solutions and the methods used. Through the multiple oxidation states of Vanadium, a wide array of colors were reached, and the oxidation states identified.

Project Number: SCH013

Grade: 9

Title: Patterned Adhesion

Abstract: Nature provides inspiration for enhanced adhesion from examples of geckos, spiders, and lizards. Geckos can climb on the ceiling, and move quickly. Their setae have many fine fiber-like structures. Their fibrils are much finer than any other known insects. When the fibrils and spatulas are finer, they provide higher stickiness. In this study the effect of different patterned surfaces and patterned contact areas on adhesion were investigated. The degree of adhesion was measured using the principle of contact splitting. The results can be used as guidelines for designing a super strong and easily removable adhesion system.

Project Number: SCH014

Grade: 10

Title: Shedding Some Light on It...

Abstract: The purpose of my experiment was to create a cheaper and more effective version of the Spec 20 spectrometer. This was done using two different chemicals, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and NaCl , dissolved into water. The light passing between test tubes of these solutions were measured. It was found that test tubes of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ could be measured for their concentrations while test tubes of NaCl could not. The Spec 20 can only measure solutions of that are very light or clear, but the experimental version can measure solutions that are darker. In Conclusion, a more effective version of the Spec 20 was created, but only as an add-on to the original

Project Number: SCH015

Grade: 9

Title: Best Powder for Latent Prints?

Abstract: To determine which fingerprint powder performs best on commonly tested surfaces, I compared traditional and magnetic black powders on a variety of rough and smooth samples. Volunteers

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were asked to leave fingerprints on each surface, and the latent prints were developed with each type of powder. Each print was compared to a rating scale and graded for ridge clarity. Print ratings were evaluated for each powder and surface type. While their performance was similar overall, magnetic powder gave much better fingerprint development on rough surfaces, while traditional powder was superior on smooth ones.

Project Number: SCH016

Grade: 9

Title: How does temperature affect motor oil's viscosity?

Abstract: Please visit exhibit for student's abstract.

Project Number: SCH017

Grade: 10

Title: NaOH from Industrial Wastes

Abstract: Chemical industries produce waste, such as solutions of inorganic salts, NaNO_3 , Na_3PO_4 , and Na_2SO_4 . The purpose of this research is to show that any mixture of these salts can be converted into a NaOH solution (which can be used to absorb CO_2 from exhaust gases of power plants). This reaction takes place in an electrochemical cell with a cation-exchange membrane as a barrier. It was discovered that pure NaOH accumulates in the cell's cathode compartment independent of the composition of the Na salts in the anode compartment. The counter ion of the salt does not affect the NaOH formation.

Project Number: SCH018

Grade: 9

Title: How Do You Spell Relief?

Abstract: The purpose of this investigation was to see which antacid neutralized stomach acid the quickest and most effectively. After gathering all materials, I pulverized the antacids into a powder. A test tube was filled with 20 mL of HCl to which 14.79 mL of antacid was added. Mixture was stirred for 1 minute; pH level was checked every 15 seconds for 1 minute. Then at 5 minutes, and 10 minutes. I recorded the pH levels. Average pH levels were: Roloids 6.80, Mylanta 7.76, Tums 4.52, Pepcid 6.84, Equate 5.33, Control 0.57. Mylanta neutralized pH quickest and at the highest level.

Project Number: SCH019

Grade: 11

Title: The Effects of Acid Rain

Abstract: Please visit exhibit for student's abstract.

Project Number: SCH020

Grade: 10

Title: Acetaldehyde Dehydrogenase

Abstract: Research has shown that 50% of Asians produce more acetaldehyde than other ethnic groups. The purpose of this experiment is to see the distribution of the different levels of acetaldehyde. DNA samples were obtained from human subjects by having mouthwash spit into a cup. A PCR was performed on the DNA to amplify it. An agarose gel was used to separate the DNA.

Project Number: SCH021

Grade: 9

Title: All Purpose Cleaners

Abstract: Please visit exhibit for student's abstract.

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Project Number: SCH022

Grade: 9

Title: Best Biodiesel Winter Blend

Abstract: The objective of this experiment is to determine which biodiesel and diesel blend is best for cold weather. The experimental procedure consists of making biodiesel from vegetable oils and mixing them with diesel to form the blends B20, B40, and B60. The number refers to the percentage of biodiesel. These were tested to determine the cold weather performance by finding the cloud and gel points. The results show that Canola B20 is the best blend to use in cold weather because it has the best gel point and the second best cloud point.

Project Number: SCH023

Grade: 9

Title: TO DRINK OR NOT TO DRINK

Abstract: The purpose of this experiment was to see if bottled and pur filtered water was really better than tap as they advertise. The procedures used were ordering the safe water testing kit and following the instructions for each test to compare the pH, hardness, chlorine, bacteria, lead, pesticide, nitrite, and nitrate levels of each water sample. The data showed that the only levels that differed between the three were the hardness, chlorine, and nitrites/nitrates. From prior research, I know that the contaminants in the water would only affect the taste at the concentration in the water.

Project Number: SCH024

Grade: 11

Title: Metabolic Profiling of Lung and Breast Cancers by NMR Spectroscopy and Eigenvector Analysis

Abstract: The purpose of the experiment was to identify bimolecular fluctuations in cancer patients, compared to their respective control groups. The experiment was conducted using a 11.6 tesla NMR magnet, computer with appropriate software, and other common lab materials like test tubes, flasks, etc. Statistical analysis was applied using Principal Component Analysis. PCA yielded graphs that pinpoint certain molecule regions in a spectrum, which contains all the recorded data. The output of this experiment has wide implications. It can lead to biomarker classifications that can be used to diagnose diseases (various cancers, Alzheimer's, etc.) in extremely early and benign stages.

Project Number: SCH025

Grade: 10

Title: Which brand of popcorn is the best value?

Abstract: I wanted to know which brand of popcorn is the best. I bought 3 different brands of microwave popcorn and compared the mass of the unpopped kernels to the total mass of the bag. I found that the Trails End brand popped the highest percentage of kernels.

Project Number: SCH026

Grade: 10

Title: Rotation V.S. Revolution

Abstract: This project involved the crystallization of Copper II sulfate and potassium aluminum sulfate in 3 different environments (control, rotation and revolution). Control was a constant 5g/20mL, the rotation environment was the solution left on a turntable, and the revolution environment was a crystal seeded into a stronger solution while the crystal is spinning.

Project Number: SCH027

Grade: 10

Title: Analysis of Vinegar A.B. Titration

Abstract: I performed acid base titrations to compare acid concentrations to standards set by the FDA. I wanted to see if four brands of vinegar would meet the standard. I performed research on all four brands and hypothesized that Heinz would be closest in concentration to the FDA standard of 5%. I standardized

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NaOH solution for a strong base for the titrations with the vinegars. I calculated percent concentration of each vinegar and concluded that Giant Eagle brand was closest (at 5.04%) while Heinz was at 5.17%. My hypothesis was not fully supported. Heinz was not closest to the FDA standard.

Project Number: SCH028

Grade: 9

Title: Corrosion and Drain Cleaners

Abstract: The question that was investigated was 'how corrosive drain cleaners are on pipes?' The hypothesis was that the drain cleaner containing concentrated lye would be the most corrosive. Three different kinds of pipes and four different kinds of drain cleaner were tested. Water was the control. Most of the tested drain cleaners proved not to be corrosive over the time period they were tested. Since the cleaner with the most lye was not the most corrosive, the hypothesis was proved incorrect.

Project Number: SCH029

Grade: 10

Title: Determination of the Phosphoric Acid Concentration in Colas

Abstract: The purpose of my project is to determine which leading brand cola contains the highest amount of the weak acid, phosphoric acid. I tested this by taking the pH of the cola as I added a Sodium Hydroxide (NaOH) solution to counteract the phosphoric acid. I tested three trials of each cola and recorded the results every .2mL of my phosphoric acid solution. Coke had the highest phosphoric acid concentration.

Project Number: SCH030

Grade: 9

Title: How does salt affect the boiling point fo water?

Abstract: I tested different concentration of salt solutions and measured the temperature of the water at the time it began to boil. I found that higher concentrations boiled at hotter temperatures in the same amount of time.

Project Number: SCH031

Grade: 10

Title: Alternative Oils

Abstract: Please visit exhibit for student's abstract.

Project Number: SCH032

Grade: 10

Title: Scaffold Degradation

Abstract: Biodegradable scaffolds are structures that support tissue growth in tissue engineering/regenerative medicine. This experiment intended to learn if varying the ionic strength of NaCl in the biodegradation environment would alter the biodegradation rate of the scaffolds. Ten biodegradable scaffolds made of polycaprolactone (PCL) were degraded at three ionic strengths each: 100mM, 10mM, and zero (control). Biodegradation was tracked and masses were recorded. It was determined that the conclusive data was insignificant according to the P-value of the analysis of variants statistics test (ANOVA). Future tests planned to retrieve significant data using a larger sample size and longer duration of biodegradation.

Project Number: SCH033

Grade: 11

Title: How Does the pH Level Of Water Effect Wood?

Abstract: The title of this project is "How the pH level of water effects how rotten wood gets?" The purpose of this experiment is to determine what level of pH level makes wood more rotten. Procedures used in this experiment were to cut the wood into 6 inch pieces. Mix water to cut the wood

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2,3,4,5,6,8,9,10, and 11, weigh wood on scale, write down weight and let wood soak. Check wood weight, color, and water color everyday for 2 weeks, hit wood with hammer to determine rottenness. Level 5 was the least rotten. The most was 11.

Project Number: SCH034

Grade: 12

Title: Effect of pH on Enzymes

Abstract: The hypothesis stated that the more neutral the pH, the greater the effect it would have on the gelatin. Bromelain was added to gelatin and the amount that liquefied was measured. The bromelain was found to be most effective at higher pH's.

Project Number: SCH035

Grade: 10

Title: The Effect of Microwaves on the Stability of Vitamin C

Abstract: Microwaves did not effect the stability of vitamin C. A variety of juices were tested for vitamin C levels. After exposure to microwaves, vitamin C levels were also tested. In addition, the juices were exposed to conventional heating from a stove, which was used as a control. It was determined that microwaves did not effect the vitamin C content.

Project Number: SCH036

Grade: 9

Title: The Best Battery!

Abstract: This project is about which type of battery will last the longest. The batteries are all tested in a slow, medium, and high drain device. Consumers could use this information when buying batteries for their devices. Advertisers say that the lithium type of battery is the best on the market today in high drain devices. In my project, I tested each type of battery in all three devices and every thirty minutes I measured the voltage with a voltage meter recording the readings and repeated these tests until the battery was dead. The results showed that the lithium battery was the best and longest lasting battery in all three devices. Titanium was the second best battery in all three devices. These results mean that when consumers are shopping for batteries, they should buy the lithium battery because it lasted the longest in my testing in all three levels of drainage devices.

Project Number: SCH037

Grade: 9

Title: Mirror Mirror On the Wall

Abstract: I constructed a two-way mirror for my science fair project. I became very interested in two-way mirrors when I visited a Ripley's Believe It or Not museum last summer. When you first entered the museum, there was a large mirror that you were told to make faces in. Afterwards, when you were exiting the museum, you left through a dark room that held a glass window looking through to people making strange faces at you! It was at that time that you realized that the mirror you had made faces in was a two-way mirror. Like I previously stated, I instantaneously became obsessed with these tricky mirrors. Not only are they great for fun houses, but they have many other great uses! My father is a state policeman/criminal investigator, and I found out from him (and some Law and Order television shows) that policeman and investigators use two-way mirrors in interrogation rooms all the time. I wanted to find out some more useful purposes for the two-way mirror, and while researching I discovered that many banks, large businesses and hotels use two way mirrors to monitor the action of the people inside the building. This shows that this crazy mirror can even improve security! After I learned all these things about the two-way mirror, I think it's quite obvious as to why I would want to create one myself. I began researching experiments and recipes for this mirror on the internet, and I ended up testing two. The first one I tested didn't work at all; it just left my glass covered with a gray film that washed off with water. The second recipe however, worked perfectly. Being that this particular recipe was originally used to silver mirrors, I had to water down my solution in order to get the right concentration on my glass. I am so glad I had the opportunity to make one of the most wondrous pieces of glass I have ever heard about!

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Project Number: SCH038

Grade: 11

Title: The effect DNA evidence has in an investigation

Abstract: Please visit exhibit for student's abstract.

Project Number: SCH039

Grade: 10

Title: Don't Burst Your Bubble...

Abstract: The purpose of this project was to determine whether it is possible to conclude if the contents of a bottle are contaminated by timing the air bubble when inverting the bottle. It was done with test tubes that were filled with various solutions of distilled water, ethyl alcohol, and sodium chloride. Different amounts of sodium chloride were added to the test tubes of either ethyl alcohol and distilled water, or just distilled water. The test tubes were then inverted and the bubbles were timed for multiple trials to achieve an average result.

Project Number: SCH040

Grade: 12

Title: Water, water everywhere: Which water is safer to drink?

Abstract: Please visit exhibit for student's abstract.

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Project Number: SCM001

Grade: 11

Title: Simulation of Incompressible Flow

Abstract: The purpose of this project was to implement a numerical approximation of the Navier-Stokes equations for fluid flow. Since the goal was to visually model smoke and other gases, the incompressible, differential version of the equations were used. After reading about water and smoke effects in movies, I researched the topic further and found a paper on stable fluid simulation, upon which my implementation is based. I am still adding to the simulator; the next step is to deal with density, which would allow for simulation of turbulent flow like that of air around spinning helicopter blades.

Project Number: SCM002

Grade: 10

Title: Open Source: Quality Code?

Abstract: Open Source is software developed by a community of programmers with no restrictions on how it can be used or who can use it; in other words, it's free. This project analyzed the quality of Open Source software to determine if it was as good as software from commercial vendors and other sources. A 'lint' program was used to measure the defect rate of Java code from Open Source and other software providers. As measured by the lint program, the quality of the Java Open Source code was superior to the Non-Open source Code by a factor of 10.

Project Number: SCM003

Grade: 11

Title: Primes and Patterns

Abstract: Please visit exhibit for student's abstract.

Project Number: SCM004

Grade: 10

Title: Irrational Numbers

Abstract: After studying the Pythagorean Theorem, I was amazed at how most of the right triangles had measurements composed of irrational numbers. The purpose of this project was to examine the data and find a reasonable explanation or proof of this observation. First I used the graphing model which uses the rational numbers as data points and showed that no matter how large the denominator of the rational number, at least one line with an irrational slope could be inserted between the points. Then I used a proof which shows that an irrational number cannot be expressed as a rational number.

Project Number: SCM005

Grade: 12

Title: Age-Related SWD's in Rats

Abstract: Numerous spontaneous 7-9 Hz spike-wave discharges (SWDs) were seen in rats during absence seizures. To better understand the expression and age-related correlation of SWDs, I proposed to study the EEG signal energy using a Teager energy operator. An algorithm was implemented for calculating the energy of a time series using MATLAB and FORTRAN. I hypothesized that changes in signal energy resulted in an age-related difference in the expression of SWDs. For each animal the difference between the maximum (ictal) energy and pre or postictal energy was enormous, but these values were similar between the 4 and 20 month old rats.

Project Number: SCM006

Grade: 12

Title: Aspects of Siren Sound Travel

Abstract: Two physics equations were used to discover how distance, temperature and vehicle velocity affect the time a stationary spectator will hear the siren of an emergency vehicle before the emergency vehicle reaches the spectator? Through calculations and graphs it was discovered that: Greater distances

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increase the elapsed time linearly. Warmer ambient temperatures increase the elapsed time essentially linearly. Higher vehicle velocities rationally decrease elapsed time. Temperature does not impact elapsed time enough to consider it in pursuit situations. There are vehicle velocity and distance combinations that make pursuits "safe." The results of this experiment apply to emergency vehicle driving procedures.

Project Number: SCM007

Grade: 10

Title: XOR-Secured Password Truncation

Abstract: The program consisted of a series of interrelated security modules that decreased the overall size of a password necessary to maintain security, while at the same time increasing the time necessary to break the password. A combination of standard XOR encryption and a thorough search of running system processes was used to virtually ensure that the threat posed by password cracking programs would be eliminated.

Project Number: SCM008

Grade: 12

Title: Beating Vegas - Not For Dummies

Abstract: I will hypothesize a condition which will give the blackjack player the greatest chance at winning. I will then calculate various probabilities for different circumstances, focusing on improving the player's game, and, using Java, determine the probability for every possibility. Once the mathematical portion of the project is finalized, I will need to experiment with various ways a player can "play a hand" in blackjack. Other possibilities, such as playing multiple hands, using multiple decks, and having a varying number of people playing at a single table will also be considered to determine the optimum conditions for a blackjack player. Finally, by creating a computer simulation of a blackjack tournament, I will test my modifications and record as much data as possible regarding various probabilities and results. I will continue modifying the playing methods as my testing progresses, until I have finally achieved what I believe to be the ideal conditions.

Project Number: SCM009

Grade: 10

Title: Earthquakes on the Real Line

Abstract: The purpose of this project was to support the conjectures that geologists have made about ground relocations during earthquakes using a model equation that reflected the general idea of what happens to the debris in an earthquake. I applied the function $A(x - x_2)$, where A is the intensity of the earthquake and x is a point on the real number line. I used a spreadsheet to repeat the function until a constant term was reached. I discovered many relationships between the intensity of an earthquake, the number of tremors it creates, and how the debris is displaced when it occurs.

Project Number: SCM010

Grade: 11

Title: How To Read A Genome's Mind: A Prediction Model

Abstract: The purpose of this project was to create a program that would cluster viruses, using the complete genome and physical characteristics, to determine possible symptoms of an undetermined. These symptoms were determined based on which group the undetermined virus was classified into. The virus database consisted of data on 80 viruses. My program used Genetic Algorithms to find the optimal clustering. I created a function in MATLAB to classify the genome data by getting data from BLAST, a sequence alignment program. In the end, my program returned results with a high accuracy rate. This has many applications in biomedical engineering.

Project Number: SCM011

Grade: 9

Title: Steganography

Abstract: Please visit exhibit for student's abstract.

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Project Number: SCM012

Grade: 11

Title: The Applegate, Jacobson, and Sleator Conjecture

Abstract: The Applegate, Jacobson, and Sleator Conjecture concerns the game of Sprouts, developed at Cambridge University in 1976. It states that the winner in the game can be determined based on the starting state of a given game. My project was to prove that the Conjecture was true, and I was successful.

Project Number: SCM013

Grade: 11

Title: Parrondo

Abstract: The purpose of this experiment was to find out if you can actually mathematically combine two things into a winning solution. First I had to find formulas to do this with and use them in the right manner. When I found a computer program that ran an experiment on the Parrondo's Paradox, I used this to get my results. What I gathered is that when you randomly combine the two losing formulas you can end up with something that could come close to winning as much as you could have lost if you only stuck with one game.

Project Number: SCM014

Grade: 12

Title: Using Phytoremediation: A Meta-Analysis

Abstract: The purpose of this meta-analysis was to quantify the efficiency of phytoextraction for removing heavy metals from soil.

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Project Number: SES001

Grade: 10

Title: pH Neutralizer

Abstract: The purpose of the experiment was to determine the neutralization effectiveness of 1.5cm limestone gravel on different types of pH contaminants. Increased pH in water ways due to acid mine drainage, decomposition of organic materials and soil runoff. A model diversion well was constructed using a 20 liter bucket and a container to catch the drained water. The top bucket, A will have 10-6 mm holes drilled in the bottom and set on top of container B. The contaminated material was placed in bucket A, then the water was poured over the material, then the pH was tested. The contaminated water was poured over the limestone gravel.

Project Number: SES002

Grade: 11

Title: Stream Water Quality Analysis

Abstract: This experiment was to determine if streams in rural environments contained more acceptable standards of water quality parameters for aquatic life survival than urban environmental streams. Three trials were conducted at four different locations on Mingo, Pigeon, and Maple Creeks, as well as Pike Run, in order to test Dissolved Oxygen, Carbon Dioxide, Total Dissolved Solids, pH, Nitrates and Phosphates using a Hanna Instruments Water Quality Education Test Kit. Results indicated that although these parameters varied in all four streams, all levels were within the acceptable ranges for aquatic life survival, regardless of rural or urban environmental surroundings.

Project Number: SES003

Grade: 11

Title: Study of Acid Rain Corrosion

Abstract: The purpose was to determine which component in acid rain is the leading cause of corrosion. Pieces of iron, granite, marble, limestone, and wood were introduced to acid solutions for five days. Each day the substances were weighed and reintroduced into the solutions. The acids were titrated and disposed of properly at the end of the experiment. Weight loss for iron, granite, marble and limestone were greatest in Nitric Acid: 504.5 mg iron, 69.3 mg limestone, 36.4 mg marble and 6.5 mg granite; but Sulfuric Acid did for wood with 22.3 mg. Therefore, Nitric Acid is the greatest corrosive component.

Project Number: SES004

Grade: 10

Title: Amplifying Solar Energy

Abstract: The purpose of this experiment is to discover the amount of energy produced by the sun and how it can be augmented. The procedure of this experiment is: 1. Establish hypothesis. 2. Gather materials. 3. Decide on the levels to set the lamp and magnifying glass from the water. 4. Run 15 trials of each group. 5. Collect and analyze data. 6. Draw conclusions. This study has shown that solar energy can be amplified to produce steam. A mirror system was able to heat the water in 20.9 minutes. The amount of energy absorbed per minute improved by 90.2 joules.

Project Number: SES005

Grade: 11

Title: What H₂O Plant Removes hg Best?

Abstract: Recently, there was a story on the news about high concentrations of Mercury in the rivers. My experiment was to determine which aquatic plant can effectively remove Hg from water from fly ash deposits. I soaked fly ash in four containers of distilled water and of rain water. I placed parrot feather, water hyacinth, water celery, and water lettuce in their respective containers. I took samples from each container every hour for eight hours. I used an Analytical Atomic Absorber to determine the concentration of Hg in each sample. I found that parrot feather was most effective in removing Hg.

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Project Number: SES006

Grade: 11

Title: Plants in the Riparian Zone

Abstract: Riparian zones are important to the health of aquatic systems. This experiment is designed to determine if tobacco plantings in riparian zones is detrimental to the ecosystem. The first experiment was to plant tobacco plants into a bottle apparatus to simulate the effect of run off. Due to the death of the tobacco plants, a new experiment was designed. The new experiment involved dissolving the soluble chemicals into H₂O. This solution was introduced into the mesocosms in which the scuds were living. The effect was death of the scuds in less than five hours after the initial treatment.

Project Number: SES007

Grade: 11

Title: The effect of pollution on the growth of aquatic plants

Abstract: Please visit exhibit for student's abstract.

Project Number: SES008

Grade: 10

Title: The Dirt On Phytoremediation

Abstract: This investigation was performed to identify which mustard plant would perform the most successfully in the phytoremediation of lead. To complete 150 mustard seeds were planted in separate pots, and watered with variations of a lead solution. After 30 days the samples were cut, dried, and weighed. A calibration curve was constructed. Microwave digestion was performed on samples and then an AAS was used to analyze them. The Florida Broadleaf and Red Giant performed the best based on the P-test. Overall the null was accepted due to the small amount of statistical variations between results, when the Mizuna hypothesized to perform the best.

Project Number: SES009

Grade: 9

Title: Can Aqua Plant Imp pH Mine H₂O

Abstract: To determine if aquatic plants can improve the pH of mine acid drainage. I placed 211 G of H₂O Hyacinths in 4.2 L of mine water and determined and recorded the pH of 50 ml samples obtained at every half hour for 8 hours then once every seven hours for four days. The data obtained showed that during this period of time the pH of the mine acid water changed from a pH of 3 to a pH of 5. Therefore, I concluded that the H₂O hyacinths do improve the pH of mine acid drainage.

Project Number: SES010

Grade: 10

Title: Ice Treatment and the Effect on Grass

Abstract: Please visit exhibit for student's abstract.

Project Number: SES011

Grade: 9

Title: Decomposer

Abstract: Please visit exhibit for student's abstract.

Project Number: SES012

Grade: 11

Title: Keratin as a Fertilizer

Abstract: The experiment was performed to determine the effect of hair and fingernail clippings on the growth of lettuce. Lettuce was planted in soil with hair or fingernails and health and height of the plants

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were observed. Hair produced the best results. Fingernails grew about the same as the control. The hair was the better fertilizer because it decomposed and released the most keratin.

Project Number: SES013

Grade: 9

Title: Plants Effect on Soil Erosion

Abstract: The purpose of this experiment is to determine the effects of different plants on the erosion of soil. The procedure involved planting the plants on identical slopes and measuring the erosion of each slope. The data includes the amount of erosion for each slope after one week of watering, the amount of erosion after heavy watering, as well as the total percentage of soil eroded. The results show that English Ivy was the most effective at preventing erosion, followed by assorted foliage, Spathiphyllum, Maidenhair Fern, and the control, no plants.

Project Number: SES014

Grade: 12

Title: Heavy Metals in Soil

Abstract: Heavy metals can pose health risks. This experiment compared the concentrations of magnesium, zinc, arsenic, and lead in soils. Topsoil samples were collected: 5 from a switchgrass field, 5 from a row-crop field, 14 from a suburban residence, 14 from an urban residence, and 10 from an urban woodland. Samples were analyzed with a portable x-ray fluorescence device. When compared with the Pennsylvania DEP's medium specific concentrations for surface contact of residential soils, in case of ingestion, samples from all sites were at or above the arsenic regulation. Two of the urban residential samples were above the DEP lead regulation.

Project Number: SES015

Grade: 10

Title: Allelopathic Control of Invasive Aquatic Weeds

Abstract: The purpose of this experiment was to determine whether an allelopathic extract created from eucalyptus leaves could effectively control the growth of an invasive aquatic weed. To do this, an allelopathic extract was made by boiling, pulverizing, and straining twenty grams of leaves, then diluting them into one, two, three, four, and five percent solutions with spring water. These dilutions were added to the controlled environment of the aquatic weed, elodea. All the dilutions worked to kill the plants; the highest working the fastest. A natural herbicide could be a potential result of this experiment.

Project Number: SES016

Grade: 9

Title: Making the Fuel of the Future

Abstract: In my experiment I tested to see if there is a bacteria that can degrade cellulose, which is used to make cellulosic ethanol. I used Avicel, which is a microcrystalline cellulose, and compost since there are bacteria in it that degrade plant material. After incubating my plates with the Avicel and compost, I found that there were no bacteria or signs of clearing. I did find fungal filaments, yeast and spores. The first two are already used in some steps of making ethanol. From this experiment, I did not find any bacteria that could degrade cellulose.

Project Number: SES017

Grade: 9

Title: Is CO₂ Stealing Snow Cancels?

Abstract: Have you seen Al Gore's movie about global warming? It blames carbon dioxide (Co₂) for the world's warmer temperatures. Or is it because of something else? I decided to do my science project on how much Co₂ really is affecting the temperature. I built two contraptions one without Co₂ and one with Co₂ to contain air and carbon dioxide. I measured the Co₂ levels and the temperature and found that Co₂ has a small effect on the temperature. The difference is present, but it isn't the main contributing factor to global warming.

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Project Number: SES018

Grade: 11

Title: Effect annual temperature has on the East Australian Current

Abstract: The oceans are an important part of the Earth's climate system. But the climate is changing rapidly. This project explores the effects the average annual global temperature change has on the currents of the oceans; the East Australian Current in particular. The goal of the project was to determine if a correlation exists between global temperature and the current properties, including temperature and current strength by analyzing and comparing thermal and satellite images of the East Australian Current with average annual global temperature. The results were inconclusive, however; ongoing research may be necessary to reveal a trend.

Project Number: SES019

Grade: 9

Title: Thermal Influence on Algal Resistance to Acid Precipitation

Abstract: This project intended to determine the effects including synergistic effects of acid and thermal pollution on algae. 12 experimental tube sets were made differing in the type of algae, presence of acid, and the temperature they were kept at, either 20°C, 25°C, or 33°C. After the data was analyzed, graphed and statistical analyses were performed, it was found that acid and elevated temperature do affect the survivorship of algae, and there is a synergistic effect of acid and elevated temperature on algae.

Project Number: SES020

Grade: 9

Title: A Closer Look at Soil Compaction

Abstract: There are many properties of soil that affect the amount of compaction. Do areas of high moisture, compression, and well sorted particles make more compact soil? I inserted and measured a needle that I stuck in the ground to test different areas of soil. There is a direct relationship between the amounts of moisture in the soil. Rocky areas are considered not well-sorted particles. Soil is most compact in area with different sized particles, less moisture, and great amounts of compression.

Project Number: SES021

Grade: 9

Title: Water Absorption In Wood

Abstract: The purpose of this experiment was to find out which type of wood absorbs the most water. The steps in this experiment were to cut the woods into pieces of all the same length and diameter. Then the woods were weighed and taken inside to dry for 2 weeks. Then they were weighed again and then emerged in water for one week and then weighed and re-emerged in water for another week. The weights for Black locust increased and decreased. The data concludes that White Pine absorbed the most water after being emerged in water a total of two weeks, the total gain in water absorbed was 4 ounces, or 100%.

Project Number: SES022

Grade: 12

Title: Hunt For T-Tauri Stars

Abstract: In the region of space two degrees west of Rigel, the Witch Head Nebula is located. Spuck et al (2006) identified potential T-Tauri candidates in IC2118. In this study two of the 300 potential candidates were selected to conduct further analysis on in order to determine whether or not they are T-Tauri stars. In studying the nature of T-tauri stars, we can better understand how our own sun and solar system came into being. Light curves, H-alpha emissions, spectral energy distributions, and spatial analysis were used to determine the status of each star. My results support my hypothesis.

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Project Number: SES023

Grade: 10

Title: Water Quality and Brine Shrimp

Abstract: Brine shrimp are used as a bio-indicator to determine if water is safe to release back into the general water source. The project is to see if water in different areas of the Ohio River is up to standards. These standards are set by the Ambridge Water Authority. I believe the water nearest industries will have the poorest water quality and the water farthest away from the industries will have the best quality, thus the greatest amount of brine shrimp will survive. The standards I will use to compare my results are set by the Ohio River Valley Watchers.

Project Number: SES024

Grade: 12

Title: Phosphate/Glyphosate Loading

Abstract: This experiment is designed to determine if the combination of phosphate and glyphosate loading in an aquatic system is more detrimental than either alone. Although research by some indicates that Glyphosate is safe in small concentrations in aquatic systems, others indicate that with added stress factors the dangerous concentrations become much lower. After establishing the LC50 for each chemical on *Daphnia pulex*, combinations of phosphate and glyphosate at sub-LC50 concentrations were tested. Results indicate that there is a synergistic effect and the lethality of glyphosate is increased.

Project Number: SES025

Grade: 10

Title: Bioremediation of Oil

Abstract: The purpose of this experiment is to determine the concentration of nutrients that most effectively increases the ability of *Pseudomonas aeruginosa* to degrade oil. *P. aeruginosa* was added to test tubes containing motor oil and five different dilutions of Miracle Gro. After seven days, the amount of oil remaining was measured. The average measurements for the 1.000, 0.500, 0.250, 0.125, and 0.000 dilutions were 0.49ml, 0.55ml, 0.57ml, 0.58ml, and 0.68ml, respectively. The data showed a positive correlation between the concentration of nutrients and the amount of oil remediated. These findings could be used to improve the bioremediation of oil spills.

Project Number: SES026

Grade: 10

Title: The Study Of Water Filtration

Abstract: Water is a product that is used everyday. The purpose of this experiment is to find out what is really in the water we use and how it compares to other sources of water using home-made filters. Five different types of water were run through three different types of filter mediums. The results of the Ambridge water before and after it was filtered was then compared to the results of the other sources of water. It was determined that pre-filtered Ambridge water is most closely related to creek water and post-filtered Ambridge water is most closely related to well water.

Project Number: SES027

Grade: 10

Title: The Effect Of Biomes On Infection

Abstract: The purpose of my experiment is to see if environmental biomes aid or prohibit the spread of infection. I will do this by culturing paramecium. Once a significant number is cultured I will introduce them into different simulated biomes. After they accustom themselves to their new environments I will introduce *E. coli*. I will then count the cultures and determine how environmental biomes affect the spread of infection. In my experiment it will conclude that warmer, wetter conditions aid the spread while colder, dryer conditions prohibit the spread.

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Project Number: SES028

Grade: 11

Title: Should I Breathe Here?

Abstract: The purpose of this experiment is to test if not only urban location but geographic location plays a role in the amount of air pollution. For doing this experiment, determine locations for index cards. Staple and apply Vaseline to each card and place them at each location. Remove the cards after 24 hours and wrap with cling wrap. Draw five randomly placed squares on each card and count the particles in each square under a microscope. You will find that urban and low elevation areas have the highest amount of pollution particles, while wetlands have the lowest.

Project Number: SES029

Grade: 10

Title: The Presence of Ecoli in River Water

Abstract: Please visit exhibit for student's abstract.

Project Number: SES030

Grade: 11

Title: liquids in space

Abstract: The behavior of liquids in space was the focus of this research. This was done by constructing a tank simulator to monitor the meniscus of isopropyl alcohol. Forces being monitored were surface tension and gravity. By varying the angles of inclination of the tank a bond number was calculated. This number was used to interpret which force was dominant, (gravity or surface tension). If the value of this number was greater than one, gravity was dominant; if less than one surface tension was dominant. Multiple trials concluded that, in this simulator, gravity was not overcome by surface tension.

Project Number: SES031

Grade: 11

Title: Laser Printer Particle Emission

Abstract: The purpose of the experiment is to determine whether the major printer models that were measured emitted high numbers of molecular particles. To carry out this experiment, I used instruments that measured the number of particles in the air and the mass of the particles per meter cubed. I then measured these statistics at a present distance from the printer before and after printing. The results were that the Samsung and IBM printer models exhibited significantly higher levels of particles in the air than the HP and Brother models. Thus, the Samsung and IBM printers are potentially hazardous to the environment.

Project Number: SES032

Grade: 11

Title: Generation of Hydrogen Fuel by Bacteria

Abstract: Hydrogen shows great promise as a fuel of the future because it is renewable and does not cause global warming which is caused by fossil fuels. However, it is not available in a ready usable form and needs to be produced in expensively. In my project, bacteria present in two natural sources, sewage sludge and garden compost, were examined for their ability to produce hydrogen from cheap nutrients using a fuel cell. Although both sources contained bacteria, only those from garden compost generated hydrogen from the nutrients glucose and starch as measured by voltage and current recordings in the fuel cell.

Project Number: SES033

Grade: 9

Title: Growing An Alum Crystal

Abstract: This project is about using water temperatures and alum to make a crystal. It was interesting and fun because I got to grow a crystal which I have always been fascinated in. At first, it was really hard

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because the crystal wasn't growing properly. When it finally worked and I got a crystal to grow, it dissolved. I kept trying and finally got one to grow because the conditions were just right. Cold water did not work, but when using boiling water, it grew. The boiling crystal accelerated its growth for a time then stopped growing completely. Everyday switching of jars using the same for boiling and normal temperatures was necessary for the crystals to grow. The normal crystal grew the largest while the boiling crystal got bigger and then stopped growing. The hypothesis was wrong because I thought that the boiling crystal would be the largest.

Project Number: SES034

Grade: 10

Title: Effect Of Flyash On The Environment

Abstract: Fly ash, a coal combustion product, is the fine mineral residue resulting from the combustion of coal in electric generating power plants. Fly ash has brought up controversy about if it effects the environment. Through, testing and observation of soil and water, fly ash does show an environmental hazard, but not something of concern to the community. Fly ash causes lung problems if mixed into the air in large amounts. If someone were building property over the dump site, the fly ash composites still left in the area should be removed due to the length of time buildings last.

Project Number: SES035

Grade: 12

Title: Organic Pesticides and Algae

Abstract: The purpose of my project was to determine the minimum lethal dose of Carbaryl on Euglena. I hypothesize that the Carbaryl will be lethal to the Euglena at doses close to those recommended by the manufacturers. Euglena were placed into twelve separate test tubes in the proper medium. The test tubes were then sampled to determine the number of Euglena in each. They were treated with three different concentrations: 2.5%, 1%, and 0.5%. The test tubes sat for three days in the proper environment and were sampled again. The experiment was repeated with five new concentrations, 0.4%, 0.3%, 0.2%, 0.1%, and 0.05%.

Project Number: SES036

Grade: 12

Title: Juglans as a fugal control

Abstract: The purpose of my experiment was to observe the effects of Juglans on a fungus. First I prepared an extract from the hulls of a Black Walnut tree, then I selected a model fungus that was used to inoculate potato dextrose agar plates. The plates were then treated in various ways with the extract. My means for collecting data was by measuring the zone of inhibition. The results of the experiment proved to be quite conclusive in that Juglans does inhibit the growth of fungus. Juglans quite possible maybe used as a biological control for funguses.

Project Number: SES037

Grade: 9

Title: Effect Of Different Plants On Erosion

Abstract: The project, grass versus erosion, was designed to test the amount of soil erosion that occurs with different types of grasses. It was hypothesized that the type of grass that is planted on a slope will affect the amount of erosion that occurs because different types of grasses hold soil better than others. This study is important to help the loss of valuable soil. Four different warm seasonal grasses were grown and tested. The results supported the hypothesis that the perennial rye grass would prevent the most erosion. These findings could help prevent damaging soil erosion.

Project Number: SES038

Grade: 11

Title: SDS/P effects on aquatic systems

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Abstract: Most detergents either contain surfactants or Phosphorous. Deposition of these can have degrading effects on our waterways. Different concentrations of phosphorous and Sodium Dodecyl Sulfate (surfactant) were used in my experiment to determine the effects on macro-invertebrates, and phytoplankton at both healthy and toxic levels. Thus far, my research shows that higher phosphorous concentrations increased phytoplankton production and had very little effect on macro-invertebrates. The surfactant produced the greatest mortality of macro-invertebrates but reduced the phytoplankton. Future work is intended to determine if mixing a surfactant with phosphorous will result in little mortality of macro-invertebrates with no change in phytoplankton.

Project Number: SES039

Grade: 12

Title: All That Glitters Is Not Gold

Abstract: The purpose of this experiment was to find the best way to produce the rare gemstone, charoite. The correct triclinic structure was achieved and maintained. The first attempt at color was with the addition of Fe(+3) and PO₄(-3). Limestone rocks, incased in a tube, proved to be the best environment. Potassium permanganate was then used to create purple. As time progressed, the once purple solution turned brown as a result of the reduction of permanganate. The pH level was adjusted with Co(NO₃)₂. A pH of 10, combined with a cobalt solution, forced the purple color. The stone was successfully produced.

Project Number: SES040

Grade: 10

Title: The Bearing Capacit of Soil

Abstract: The purpose of this investigation is to determine which type of soil has the maximum bearing capacity, hence providing the most support for a structure. The hypothesis, if sand, loam, topsoil, shellrock, and clay are each tested for their bearing capacity, then clay will support the most weight because it is the least porous and most compact, was supported by the data. The clay proved to have the greatest bearing capacity since it had the least displacement of the dowel. This is because the characteristics of clay, such as its plasticity and small particles, made the clay most compact.

Project Number: SES041

Grade: 11

Title: The Effect of TAML Induced Degradation

Abstract: My project was conducted to determine the effect of TAML® (a green oxidative catalyst for H₂O₂) induced degradation of triclosan on algae, yeast, and E.coli survivorship. Data from the algae was obtained by growing algae populations, which had the variables (TAML® and H₂O₂) introduced, and recording absorption spectrometrically. Data from the yeast and E.coli was obtained by using culture plates and counting the colonies grown. The solution poured on the plates contained the variables along with the organisms. From the obtained data I had to accept the null hypothesis: TAML® had no effect on triclosan induced death in susceptible organisms.

Project Number: SES042

Grade: 11

Title: New Components in Accretion Disks- Evolution of the Lightcurve in WZ Sge

Abstract: Accretion Disks are ubiquitous in astronomy, being present in stellar formation, cataclysmic variables, super massive black holes etc. Through the use of time series photometric observations at 4.5 and 8 microns with the Spitzer Space Telescope, an optical light curve of WZ-Sge in quiescence, and a chronological timeline of WZ-Sge's lightcurve. This project provides evidence of previously undetected non-luminous matter consisting of an outer dust ring too cool to emit in optical wavelengths. This significantly amplifies the size of possibly all accretion disks, resulting in major implications on current models for the components of accretion disks and their evolution.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES043

Grade: 11

Title: Effect Of Organic Material On Water Absorption

Abstract: I researched and experimented to determine if various organic materials affected how much water would be absorbed. I used sand, manure and peat moss. Other materials used were plastic pots, spoons, saucers, a measuring cup of a one liter capacity, and seven liters of tap water. The tap water mixed with the different materials and after twelve hours I collected my results. I conducted this experiment seven times. My hypothesis was accepted. The three-quarters peat moss mixture absorbed the most amount of water, showing that different organic materials do affect the absorbency of water.

SENIOR DIVISION – ENGINEERING/ROBOTICS

Project Number: SER001

Grade: 12

Title: Sounds Good!

Abstract: This project monitors the timing of a chemical reaction using sound. The source of the sound used was that of a clarinet playing continuously. This was provided by a computer program. Likewise, an oscilloscope was simulated by a computer to measure the sound. A tank of water contained the reaction and the sound was provided by a speaker attached to one side of the tank. At the other end was, a microphone, which was the input device to the oscilloscope. Amplitude was measured before, during, and after the reaction. Time was measured in milliseconds. It was concluded that monitoring amplitude could be used as a timing device.

Project Number: SER002

Grade: 9

Title: Does Ratio Of Sand To Cement Affect Strength?

Abstract: Does the same to cement ratio affect the strength of concrete? The project tested the strength of concrete bricks each with a different ratio of sand to cement. This project is important because the strength of concrete is important to today's society. I predicted that the brick with an even amount of sand and cement would be the strongest. I found that my hypothesis was wrong. The brick with 30% sand and 70% cement was the strongest. I think if you like engineering you should try this project.

Project Number: SER003

Grade: 12

Title: Robotic Navigation 3: Taking Control

Abstract: This project deals with the development of an unprogrammed autonomous robot capable of using onboard sensors to override manual human control in order to protect itself from collisions. The robot was designed and built with a custom relay override interface and then tested in both a control straight-line test and a real-world obstacle avoidance course. Data collected demonstrated the robot's ability to avoid obstacles by overriding remote control using all of its ultrasonic and infrared sensing devices, supporting the hypothesis. This type of research could be a valuable basis for robotics research applicable to many industries and applications.

Project Number: SER004

Grade: 9

Title: Insulation Investigation

Abstract: Does insulation really matter? Does it really make a difference? The answer is yes. By having insulation in your house you are saving yourself a lot of money, and trouble. The problem was will store bought materials insulate better than home made ones? My hypothesis stated that store bought materials would insulate better. To find this out I tested ten different materials over a hot light bulb. After all my tests my hypothesis supported my results. The store bought materials had an average increase of 22.9 degrees. The home made materials had an average increase of 30.6 degrees. Store bought materials, although more expensive, will end up saving you more money.

Project Number: SER005

Grade: 12

Title: Easy Emeralds

Abstract: The purpose of this experiment was to produce a mineral with properties that are similar to that of natural emerald (beryl) without using Beryllium. Magnesium Sulfate was used in place of a beryllium compound that would normally be used to create regular emeralds with this same procedure. From the trials conducted, crystal structures that resemble emerald have been produced, although they are small. Thus, it can be concluded that it is possible to produce a mineral that resembles emerald yet had a different chemical makeup.

SENIOR DIVISION – ENGINEERING/ROBOTICS

Project Number: SER006

Grade: 9

Title: Trebuchet vs. Onager

Abstract: Please visit exhibit for student's abstract.

Project Number: SER007

Grade: 9

Title: Heat Produced By Lightbulbs

Abstract: The purpose is to see kind of light bulb gives off the most heat. The procedure was to assemble the box. Record the temperatures in Celsius with each light bulb every five minutes. Each light bulb was tested three times for thirty minutes each. The result for the fluorescent bulbs is an average of drop of .27 degrees. he results for the incandescent bulb s an average increase of 4.1 degrees. The result of the compact fluorescent bulb is an average rise of .84 degrees. The result of the halogen bulb is an average of an 8.6 degree rise. Therefore the halogen bulb gave off the least heat.

Project Number: SER008

Grade: 9

Title: Octane Effects

Abstract: What effects do octane levels in gasoline have on engine performance? The only independent variable was the octane levels in 3 different types of gasoline. The test was repeated 5 times with each gasoline type. The results showed no difference between the 87 octane gasoline and the 89 octane gasoline but the 91 octane consistently lifted 5 more pounds that the 87. The hypothesis was the higher the octane number the more power the engine will have. Therefore the data definitively shows that higher octane gas does provide more work and better performance out of an engine

Project Number: SER009

Grade: 10

Title: The Affects Of Blades On Revolutions Of A Windmill

Abstract: Purpose: If the number of blades affects a windmill's power. Procedure: Attach the blades to the hubs. Place fan in front, on high. Count revolutions for one minute. Data: 2 blades-200 RPM, 3 blades: 383 RPM, 4 blades-603 RPM. Conclusion: The hypothesis was correct. the four blade design had more power than the other blades. the average of the three trials for the propeller with two blades was 200 RPM. The three bladed design was 383 RPM. the four blades design was 603 RPM. Therefore, the data proves that the design with four blades produces more power.

Project Number: SER010

Grade: 9

Title: City of Bridges

Abstract: With its three rivers, Pittsburgh has more bridges than any other city in America. In San Francisco, California, residents have to worry about not one but two fault lines. This project looks at which type of bridge will withstand the destructive power of an earthquake the best. Three bridges were built to show the design features of each. Using an internet simulation model, I tested an arch, a cantilever, and a beam girder against the San Andreas Fault. I found that the beam girder with all possible safety features stood the longest.

Project Number: SER011

Grade: 12

Title: Soundproofing Materials

Abstract: Please visit exhibit for student's abstract.

SENIOR DIVISION – ENGINEERING/ROBOTICS

Project Number: SER012

Grade: 9

Title: Which Truss Design Is Strongest?

Abstract: This work tested the strength of three different house trusses. Everyday, engineers are working, trying to make house trusses stronger to withstand many outside forces including different types of weather. Twenty-four house trusses were built having eight trusses of each design. To the trusses, weight was added until the truss broke. Because of its triangular shape and the supports inside forming triangles, it allowed the common house truss to hold the most weight. The attic truss was triangular, but didn't have the support. Flat trusses don't have that triangular shape. When new houses are being built, depending on the location and average weather, common house trusses should be used.

Project Number: SER013

Grade: 12

Title: Solar Powered Water Generator

Abstract: Please visit exhibit for student's abstract.

Project Number: SER014

Grade: 9

Title: Applications of Robots in Agriculture

Abstract: Robotics, one of the fastest growing fields of technology today, can be applied in agriculture to decrease the need for human labor. In my experiment, I designed a robot to aid in the fruit-picking stage. Using a java code and camera, I applied vision processing algorithms to identify the location of an observed strawberry, developed control algorithms to direct the robot towards it, and constructed a robot mechanism capable of picking that strawberry. With few modifications, my product can autonomously perform laborious tasks currently performed by humans and, in turn, reduce the human factor from agriculture labor.

Project Number: SER015

Grade: 11

Title: Effect Of Weight On Hovercraft Height

Abstract: This project was to find out if the amount of weight effects how high a hovercraft hovers. It is important because it could be a form of transportation. I thought that the hovercraft would hover the same height until one hundred pounds, and then the height would slowly decrease. I made my hovercraft with simple materials and then added my family for the different weights. I found that the hovercraft hovered the same throughout my experiments. My results were not consistent with my hypothesis. In conclusion, I believe that this could become a great device for moving large objects.

Project Number: SER016

Grade: 12

Title: Constellation Cube

Abstract: Looking at the night sky it is hard to imagine that there is depth to what you see. As humans, we see the sky and imagine it as a flat plane with the stars neighboring one another. There are few devices available for astronomy educators to explain this phenomenon. The Constellation Cube is designed to produce a 360 degree view of a constellation or star group. The constellation Orion was selected as the initial prototype. The device is constructed of clear plastic, glow-in-the dark beads, and acrylic rods. The device will be submitted for patent review.

SENIOR DIVISION – MEDICINEHEALTHMICROBIOLOGY

Project Number: SMH001

Grade: 11

Title: Charged-Up Drinks

Abstract: Drinks like Powerade and Pedialyte are advertised as being electrolytic. To verify this, I decided to test these liquids, along with distilled water (a control variable) and two non-electrolytic solutions. I ran electric current through them via a 9-volt battery with a battery cap and alligator clips. The allegedly electrolytic solutions conducted much higher amounts of electric current than the other liquids. The Powerade (which contained anions, giving it a negative polarity) conducted between -65 and -92.1 microamps, and the Pedialyte conducted between 48.9 and 85.1 microamps. The others came nowhere near those numbers, proving Powerade and Pedialyte's electrolytic nature.

Project Number: SMH002

Grade: 12

Title: Reiki Effects on Cell Remediation

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH003

Grade: 12

Title: Effects of Laser Enhancement on Absorption

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH004

Grade: 10

Title: Complementary Cancer Therapies

Abstract: Childhood cancer treatment leaves its patients with many unpleasant side effects that can be treated with complementary therapies, though few patients know about their benefits. This project is intended to show the positive results of using complementary therapies in terms of the reduction of treatment side effects. This is done by gathering childhood cancer patients who experienced different levels of exposure to these therapies and having them fill out questionnaires concerning their treatment. It is hypothesized that the more exposure a patient had, the greater reduction of side effects they would have seen.

Project Number: SMH005

Grade: 10

Title: Microbial Survivorship in Rivers

Abstract: The purpose of this experiment is to assess the survivorship duration of a bacterial model, *E. coli*, and an eukaryotic model, *Saccharomyces cerevisiae*, in the Pittsburgh region, specifically in the Monongahela and Allegheny rivers.

Project Number: SMH006

Grade: 12

Title: Effects of Antibiotics on *P. acnes*

Abstract: Over 80% of adolescents in the United States have acne. Dermatologists recommend using an antibiotic or antibacterial preparation that targets the *Propionibacterium acnes* to treat acne. The purpose of this experiment was to determine which of the five most common medical preparations used to treat acne – minocycline, differin, salicylic acid, clindamycin, and benzoyl peroxide – is most effective at inhibiting the growth of *P. acnes*. Inoculating disks of the listed preparations were placed on the *P. acnes* and a zone of inhibition diameter was calculated to determine the most effective treatment. Minocycline had the greatest zone of inhibition of 30.6 mm, and therefore is the most effective preparation of the five.

SENIOR DIVISION – MEDICINE\HEALTH\MICROBIOLOGY

Project Number: SMH007

Grade: 10

Title: The Effects of Nicotine on the Heart Rate of Daphnia

Abstract: The purpose of my investigation was to explore the cardiac side effects of smoking, rather than the respiratory effects. While conducting the experiment, I placed daphnia into 4cm² plastic containers containing 1/2mL of either 0%, 25%, 50%, 75% or 100% solutions of nicotine. After counting the heart rate per 10 seconds, I found that the heart rates peaked at 7%% concentration, contrary to the hypothesized 25%.

Project Number: SMH008

Grade: 11

Title: Essential Oils in the Fight Against Staph Bacteria

Abstract: MRSA and Staph. infections have claimed many lives. In 2005, approximately 19,000 deaths resulted from the resistant super-bug, and about 94,000 were infected. Since this bacteria has developed resistance, I wanted to test homeopathic remedies as an alternative way to stop the spread of infections. I tested Tea Tree, Lavender, and Orange Oils at 25%, 50%, and 100%, using sterile beads as the means of providing a surface area for the bacteria. In conclusion, a 100% concentration of Tea Tree Oil worked the best, which reinforces that Tea Tree Oil is a natural antifungal, antibacterial, and anti-infection oil.

Project Number: SMH009

Grade: 10

Title: Effect of Fertilizer on Infectivity of T2 Phages

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH010

Grade: 12

Title: The Effects of Second Hand Smoke

Abstract: The purpose of this investigation is to determine the effect of second hand smoke on yeast cells. The percent of surviving colonies was found by taking the surviving colonies and dividing them by the original amount of colonies formed. The greatest percent decrease was shown by the Smoker's brand candle with only 43.7% of the yeast colonies surviving after 150 seconds of exposure. After 150 seconds exposure, the glade scented candle had 53.5% surviving yeast colonies. All the brands of cigarettes showed a similar reduction after 150 seconds, with the greatest reduction by the Newport with menthol cigarettes, with 46.4% reduction. When yeast are exposed to second hand smoke, their survival rate decreases within the first 30 seconds.

Project Number: SMH011

Grade: 10

Title: Risk Factors And Heart Attacks

Abstract: Myocardial infarction is the number one killer of both men and women in the United States, most people are unaware of their risk factor that contributes to this epidemic. This project is intended to make people aware of the high contributing risk factors. As a procedure, I will divide patients in their specific contributing risk factor groups and analyze the data for results. If we, as a society, do not take control and become more aware of these risk factors the death rate numbers will only increase.

Project Number: SMH012

Grade: 10

Title: The Effect Of Diet On Oral pH

Abstract: pH levels in the human body are often disregarded, however, maintaining proper pH levels is a vital part of good health. This project intends to determine how diet affects one's oral pH. Each subject is given two diets to follow for three days each. One diet consists of generally healthy foods and the other consists of unhealthy foods. At the end of each day, the subject's pH is taken and recorded. Results will

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show which types of foods alter pH. Further research will be done to link tooth decay and dental caries to pH changes caused by diet.

Project Number: SMH013

Grade: 9

Title: Does Animal Contact Effect Human Blood Pressure?

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH014

Grade: 10

Title: Bacterial Transformation

Abstract: My experiment tries to determine the most efficient amount of time that bacteria can be heat shocked. In order to transform the bacteria I must first make them competent to be able to take up a plasmid. To make the cells more permeable, I put the bacteria in a solution of calcium chloride, and then inserted the plasmid in this solution and heat shocked it at 42 degrees for a length of time. My experiment showed that bacteria heat shocked for 150 were able to take up the plasmid but the bacteria that were heat shocked for 50 seconds could not.

Project Number: SMH015

Grade: 12

Title: Exam. Correlation Btw Acad. Performance, Obesity

Abstract: Given the increasing prevalence of obesity, this study seeks to investigate the existence, strength, and implications of the little-explored relationship between academic performance and obesity within primary and secondary school-age children. Structurally, this study entails investigating a population of seniors within Baldwin High School and the population of all primary and secondary schools within Pennsylvania; the former to prove the existence of a correlation and the latter to examine the effects of lurking variables. Analysis is based upon basic statistical means, including Pearson's product-moment correlation coefficient, multicollinearity analysis, and other tests. Overall a weak negative correlation was observed.

Project Number: SMH016

Grade: 9

Title: Antibacterial Property of Copper

Abstract: The purpose is to determine if copper affects bacterial growth. E. coli were exposed to different concentrations of copper sulfate. The amount of bacteria was counted and recorded before and after exposure. The .02% solution was most effective at reducing bacterial growth while the 0% solution was least effective. Copper does have antibacterial properties through the oligodynamic effect.

Project Number: SMH017

Grade: 11

Title: Effect of Glucose Levels on Phenotype of Cardiac Progenitor Stem Cells

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH018

Grade: 9

Title: Analysis of Lunch Meat Microbial Contamination

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH019

Grade: 11

Title: Yeast Metabolism

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Abstract: The purpose of the experiment was to investigate yeast metabolism under aerobic and anaerobic conditions by measuring carbon dioxide output. Yeast was placed in aerated and non-aerated water infused with sugar and placed in a carbon dioxide measurement devise. The average amount of carbon dioxide collected in non-aerated water was 103.57 mL and 80.71 in the aerated. The average amount of carbon dioxide collected from the anaerobic (non-aerated) condition was greater than that of the aerobic (aerated) condition.

Project Number: SMH020

Grade: 9

Title: Clean with Green

Abstract: The purpose of the experiments is to dispel the doubt and fear that natural, homemade cleaning products don't work as well as commercial products. Natural products can cut the cost of cleaning and are also better for the environment. The hypothesis is that homemade, natural cleaners will work better than commercial cleaners. The procedures were to find natural recipes to compare against commercial cleaners. The ingredients were mixed together and tested. Each product was judged against a similar commercial product. The conclusion is that the natural, homemade cleaners did work just as well as the commercial cleaners.

Project Number: SMH021

Grade: 9

Title: The Dog-Tor is In

Abstract: The purpose of the experiment is to test if dog saliva can kill bacteria. This project can change the way people think of how dirty a dog's mouth is compared to a human's. The hypothesis is that dog saliva can successfully kill bacteria. The procedure was to inoculate a Petri dish with bacteria and add dog saliva and monitor to discover if the bacteria grew. After several days it was evident that the only area which grew no bacteria was where the dog saliva was added. The conclusion is that dog saliva can effectively kill bacteria.

Project Number: SMH022

Grade: 12

Title: Uric Acid & Preeclampsia

Abstract: Preeclampsia, a pregnancy disorder, is a leading cause of pre-term birth and fetal and maternal death. There is currently no cure for this disease. The purpose of this project was to investigate the effects of uric acid on trophoblast and endothelial cell types, the cell types involved in spiral artery invasion. Using cell culture methods and dye techniques the effects of uric acid on tubule and monolayer co-cultures were proven to reduce cell interaction.

Project Number: SMH023

Grade: 10

Title: The Effect Of pH On Oral Bacteria

Abstract: Each individual's saliva has a different pH level, and everyone's mouth contains different types of bacteria. This project intends to test how the pH level of an individual's saliva affects the type and growth of his or her own oral bacteria. A plaque sample is taken from each subject as well as a recording of the pH level of saliva. Once the samples are properly prepared and incubated, the bacteria grown is studied and compared to the coordinating pH levels. Results will show the effects of pH on the types of bacteria as well as how virulent they are.

Project Number: SMH024

Grade: 9

Title: Running Styles and Injuries

Abstract: Do different running styles, mental preparation, and physical preparation affect the possibility of injuries while running? To address this problem, 20 high school long distance runners were videotaped while running and then asked to complete a survey about injuries they have recently received. The

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videotape was analyzed by this researcher to determine the running style of each runner. Data from the surveys was compared to the different running styles identified. The data showed that a person's running style may have an effect on injuries obtained while running.

Project Number: SMH025

Grade: 11

Title: Does exercise effect basketball players' performance?

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH026

Grade: 12

Title: Resistance in smeg mc2 155

Abstract: Ethambutol is traditionally used for the treatment of tuberculosis, caused by Mycobacterium tuberculosis. Recent studies have shown that substituting Moxifloxacin leads to higher cure rates in a shorter period of time. Problems arise because of the ability of mycobacterium to become resistant to the antibiotics used to treat it. The effectiveness of Moxifloxacin could therefore be attributed to mycobacterium's lack of resistance to it. Using M.smegmatis mc2 155, a strain engineered for safe experimentation, it's possible to identify whether Ethambutol resistant mycobacterium are also resistant to Moxifloxacin. If the mycobacterium are not resistant, it could explain advantage of using Moxifloxacin.

Project Number: SMH027

Grade: 9

Title: Factors Affect Bacteria Growth

Abstract: I wanted to find out what factors affect the growth of bacteria. 100ul of overnight culture of DH5 Competent Cells was inoculated in 5mL LB until they reach the OD@600nm of 0.3 to 0.4. The factors tested were: temperature, pH, salinity, and oxygen. Temperature at 37oC and salinity of 0.3 NaCl and 0.5 NaCl had an OD reading over 1.0. Temperature at 37oC had the best growth and the rest of the factors slowed the growth of bacteria. In the future I will focus on antibiotics to check the growth of bacteria.

Project Number: SMH028

Grade: 10

Title: Effect Of Color On Blood Pressure

Abstract: This project aims to prove color affects blood pressure and pulse rate. Usefulness of the experiment lies in colors' ability to influence behavior. I predicted exposure to different colors would cause fluctuation in vital signs because color affects other areas. Seven colors were observed by each participant. Following every color, vitals were recorded. As a control, vitals were recorded before experimentation. The data supports my hypothesis. I feel that errors affect the data collected because of small uncontrolled discrepancies. One test subject became excited upon discovering their blood pressure was high which may have caused it to increase due to worry. A test subject's favorite color might warrant a different reaction than the color's ideological effect. I feel my results are inconclusive. More tests need to be conducted to average out discrepancies.

Project Number: SMH029

Grade: 10

Title: Exercise On Fast Twitch Muscle Proformance

Abstract: Athletes can be natural born runners, or they can adapt to certain situations to improve their abilities. This project is intended to learn if elite, specialized runners can improve their physical abilities in other areas than just their specialty. It is hypothesized that the different type of runners will increase their sprinting and endurance performance. Five sprinters and five distance runners will undergo controlled training regiments and later be tested in a short sprint and a long run. The times will be recorded and compared to average record times. It will determine that both groups will increase in both running areas.

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Project Number: SMH030

Grade: 10

Title: EGCG Binding To White Blood Cell Molecules

Abstract: The green tea component, EGCG, has been shown to bind to specific white blood cell molecules at the same spot as HIV. The purpose of this experiment is to observe binding of green tea extract concentrations when added to white blood cells. After making a serial dilution of the extract, read the concentrations in the spectrometer at 260 and 280nm. Use readings to find linear regressions. Isolate white blood cells from blood sample. Add chosen concentrations of extract to cells with varying incubation time intervals of 60, 30, and 10 minutes. Read absorption in the spectrometer and graph it as a function of time and concentration.

Project Number: SMH031

Grade: 11

Title: Effect of UV Light on Bacteria

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH032

Grade: 10

Title: Bioinformatics Analysis of Archaea

Abstract: The hypothesis stated that all organisms in archaea explored will exhibit multiple origins and termini. A set of three analyses was run on each archaeon. Observations were recorded and analyzed. Only one organism explored exhibited multiple origins and termini of replication.

Project Number: SMH033

Grade: 9

Title: Putting Antibacterial Soap to the Test

Abstract: The purpose of my project is to compare three antibacterial bar soaps in an exposed environment. Soap samples were left on a sink in a public restroom and the number of uses recorded. Soaps were swabbed on top and bottom and samples transferred to Petrifilms for incubation. Number of colonies was recorded. Procedure was repeated at regular intervals for several trials. Data indicated that Safeguard had the least bacterial growth and Dial the most.

Project Number: SMH034

Grade: 10

Title: Reduce Bacteria, Save Lives; Clean Your Stethoscope

Abstract: The purpose of this study was to determine if hand foam when used to sterilize the hands could at the same time also be used to cleanse a stethoscope, thereby decreasing the spread of bacteria between patients. The stethoscopes of 93 health care providers of various levels of training were cultured both before and after the use of hand foam. Colony counts and identification and isolation of bacteria were performed. The average colony counts before vs. after cleaning were reduced from 28 to 3 (reduction of 89%), p value $<.0001$. The intervention was successful.

Project Number: SMH035

Grade: 11

Title: Hot Water vs. Cold Water

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH036

Grade: 9

Title: Bacteria and Cell Phones

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Abstract: Are there chemicals that you can find around your house that will effectively rid your cell phone of harmful bacteria? To address this problem, three different cell phones were tested with 5 different household chemical. Every Monday, Wednesday, and Friday data was collected to determine not only the initial effectiveness of the chemicals but also the long term effectiveness of the chemicals. Data collection showed that the cell phone did not contain as many bacteria as previously predicted and that the effectiveness of the cleaners was inconclusive.

Project Number: SMH037

Grade: 9

Title: Natural Sugars vs Bacteria

Abstract: The purpose of this investigaiton is to determine the effectiveness of natural sugars at killing bacteria. Four natural sugars were tested against a control to see how effective natural sugars are at killing E. Coli. E. Coli bacteria were cultured on agar plates that had been sprayed with a sugar solution then a Luria broth was spread on the agar plates. Plates were incubated then percentage of bacteria covering plates were recorded. The control group in this experiment were ten agar plates only with the Luria broth and the nutrients in the agar plates. Demerera was the best sugar tested.

Project Number: SMH038

Grade: 12

Title: Just How Effective Are Toothpastes?

Abstract: Dental disease is the second most common infectious disease in the United States and almost every adult is affected by either periodontitis or gingivitis. The goal of my project is to evaluate four popular brands of toothpaste and determine which is most effective at inhibiting bacterial growth in the saliva. My experiment includes two sets of samples: one taken overnight and one after a 12-hour daytime period. I wish to assess the antibacterial performance of each formula in the presence and absence of certain stimuli such as eating, drinking, and active swallowing.

Project Number: SMH039

Grade: 9

Title: Effect of Honey on Bacteria

Abstract: The purpose of this experiment was to determine which concentration of honey best inhibited bacterial growth. *S. epidermidis* was grown in different concentrations of honey over 3 days. Bacterial samples were then analyzed with a Spectronic 20 to determine bacterial growth based on the amount of light blocked. The results showed that a 50% honey solution had the greatest antibacterial properties.

Project Number: SMH040

Grade: 10

Title: Magnetic Field Remediation of Stressed Cells

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH041

Grade: 12

Title: Cross-Contamination of Staphylococcus Epidermidis

Abstract: The purpose of my experiment is to test which type of athletic brace material will do best at eliminating cross-contamination of Staphylococcus epidermidis. I will contaminate five samples of various brace materials with the bacteria Staphylococcus epidermidis. Then, stamp the contaminated sample onto a Petri plate of agar, then remove. Incubate these plates for 48 hours. Count colonies, record, and analyze using a statistics program. The data shows the Antimicrobial Elastic performed the best, followed by the Antimicrobial Neoprene, Terry-Lined, Elasto-Preene, and Neoprene. My conclusion was partially supported.

SENIOR DIVISION – MEDICINE/HEALTH/MICROBIOLOGY

Project Number: SMH042

Grade: 10

Title: Investigation of Antibiotic Resistance

Abstract: Within my project I transformed E.coli cells with a plasmid that is resistant to the antibiotic Ampicillin. The purpose of my experiment is to test antibiotic resistance of transformed and non-transformed cells to various levels of Ampicillin. Shortened Procedure: 1. DMSO-competent DH5 alpha E.coli cells were transformed with plasmid A. (derivative of PGEM 7) 2. Grow two populations of cells: transformed cells and non-transformed cells 3. Prepare experimental tubes with the following concentrations of Ampicillin: 0x (control), .1x, .5x, 1x, 5x, and 10x. 4. Cells from both population were transferred to each of the experimental tubes 5. Cells were plated and incubated for 48 hours at 37 degrees c 6. Resulting colonies were counted

Project Number: SMH043

Grade: 12

Title: The Effect of Tea on Bacteria

Abstract: This project determines whether or not green tea, black tea, white tea, and/or red tea will inhibit the growth of different bacterial strains. This is a major practical application because the bacterial strains are present throughout different parts of the human body. To determine the amount of bacterial growth that was inhibited the absorbance of the tea-bacteria solution will be compared to the absorbance of the tea solutions. The findings will then be graphed and compared.

Project Number: SMH044

Grade: 10

Title: The Effect Of Night Time Snacks On Morning Glucose Levels

Abstract: It is common for type 1 diabetic children to eat a snack before bed. By having a snack it prevents blood glucose levels to drop during the night. By having certain types of food such as complex carbohydrates most often times the dose of insulin given does not completely cover the carbohydrate ratio. If foods that have a high concentration in fatty acid, or complex carbohydrates, are eaten before bed, then morning glucose will be higher than what it should be. For four consecutive nights, a diabetic will test their glucose before bed, and eat a snack with complex carbohydrates, the next four nights eating fatty acids, and the last four nights with eating nothing with fatty acids or complex carbohydrates. The next morning they will then record their numbers. The numbers will be higher on the nights they eat a foods with the complex carbohydrates or fatty acids, glucose levels will be significantly higher.

Project Number: SMH045

Grade: 12

Title: FTY720 Induces Immunosuppression

Abstract: FTY720, a new immunosuppressant, causes lymphopenia by affecting lymphocyte trafficking, which become sequestered in the lymph nodes (LN). However, this isn't FTY720's only effect. This study illuminates FTY720's effects on the dendritic cell (DC). In skin explants, mixed leukocyte reactions, and skin transplants, FTY720 inhibited donor-derived DC migration (increasing the number of potential migratory DC in the skin, meaning that FTY720's agonism for Sphingosine-1-Phosphate receptor (S1PR) causes an interference with DC's homing abilities to the LN), as well as induce tolerogenic DC, and prolong allograft survival. The results were analyzed using the flow cytometer and a β scintillation counter.

Project Number: SMH046

Grade: 12

Title: Gene Expr. Profile of PRKAG2 Mutation

Abstract: Please visit exhibit for student's abstract.

SENIOR DIVISION – MEDICINE\HEALTH\MICROBIOLOGY

Project Number: SMH047

Grade: 10

Title: Estrogenicity of BPA in Breast Cancer Cells

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH048

Grade: 10

Title: Energy Reactions

Abstract: For my project, I wanted to find out if energy drinks affect your reaction time. So I had five subjects each in the same grade. I had each of my subjects drink an energy drink and wait ten minutes and then I had them flip over five cups and move four chess pieces two spaces on a chess board. They did the trial three times and I averaged them. I then had them drink another energy drink and repeat the trial. I thought that the energy drink would have no effect on their reaction time. I found that all of my subjects improved by around one second after they had the second energy drink. My results did not support my hypothesis and I was completely wrong.

Project Number: SMH049

Grade: 11

Title: Bacterial Resistance to Triclosan

Abstract: Triclosan is an active ingredient in antibacterial products. Studies have linked triclosan to bacterial resistance. My intention is to demonstrate where or not triclosan causes bacterial resistance, using *Bacillus stearothermophilus* and Dial Liquid Soap, a triclosan-containing product. I plan to grow this bacteria on mediums containing weakened concentrations of Dial soap. I will subject bacteria from living colonies to mediums containing stronger soap concentrations. I will repeat this process until hopefully I can use a medium containing an undiluted concentration of soap. Data will be largely qualitative. Growth of colonies on mediums containing increasing concentrations of soap would demonstrate resistance. Conclusion: project ongoing.

Project Number: SMH050

Grade: 10

Title: Perilous Pennies?!

Abstract: For my project I wanted to see what types of bacteria grew on money. From doing previous studies on money I found that *Staphylococcus aureus* was mostly found on money. So for this experiment I wanted to see how much of the *Staphylococcus aureus* was found on the penny. So first I got two groups of pennies. The first group is pennies one to three years old, and the second group is four to ten years old. I decided to make these my groups because then I could find out what is has the most bacterial colonies the newest pennies or the older pennies. I then swiped the plates and then incubated them for 24-36 hours or until colonies were easily distinguished. Then in that amount of time I checked the plates and counted colonies and documented my data. Also, for this project I decided to use mannitol salt agar plates because they grow only *Staphylococcus* bacteria. Then I would be able from my data to see what group of pennies would have more bacteria the newer pennies or the older. In my hypothesis I think that the older pennies will have the most bacteria because they have been around longer and have been able to hold more bacteria.

Project Number: SMH051

Grade: 10

Title: Effect Of Diet And Meds On Elderly

Abstract: The goal is to determine whether diet, medication or both have a drastic positive effect on blood pressure in the elderly. I plan to compile data via looking at records from an anonymous thirty elderly residents at a nursing home pertaining to both their specific diets and medications received to aid the problems of both hypertension and hypotension. I hope to conclude that my hypothesized theory will be true. That the majority of the difference comes from medication because diet will have too many uncontrollable variables.

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Project Number: SMH052

Grade: 11

Title: The Effect of Ginseng on E. coli

Abstract: Please visit exhibit for student's abstract.

SENIOR DIVISION – PHYSICS

Project Number: SPH001

Grade: 10

Title: Gauging Radiant Energy of Bulbs

Abstract: The electromagnetic spectrum is range of all possible radiation. Light bulb boxes let you know the amount of lumens, the measure of what your eye perceives. So what about the other wavelengths of light? In theory, a silicon solar should accurately gauge radiant energy, which is radiant flux measured in terms of time. Incandescent, Full Spectrum, and Halogen lights sources will tested with this model, at different wattages. The Household Incandescent prevailed with the most brightness, and data can be related to the environment, photography, and your own circadian rhythm. Considering the effects of other wavelengths of light is imperative.

Project Number: SPH002

Grade: 11

Title: Should You Run or Walk in the Rain?

Abstract: A) The purpose of my project is to determine whether surface area affects how wet a person will become when walking or running in the rain. B) I placed sponge materials on a fixture, which were then placed on a conveyor belt. I tested various speeds to various downpours, taking into account surface area. I tested whether the size of a person affects whether or not they should run or walk in the rain to avoid getting wet. Lastly, using a Statdisk program, I ran a statistical analysis test to determine whether the results of walking versus running in the rain, having taken into account surface area, are significant enough to support my hypothesis. C) My results show that surface area does not affect how wet a person becomes when walking or running in the rain. D) I conclude that I support my hypothesis. Running through the rain will keep a person drier, than if they were to walk through the rain; also, surface area does not affect how wet a person becomes when running or walking through the rain.

Project Number: SPH003

Grade: 9

Title: Do EMF's Drain Battery Life?

Abstract: I conducted an experiment in order to determine whether or not an electromagnetic field would cause a discharge of energy in a battery. I performed five minute tests on four types of batteries, including one regular and one lithium ion AA 1.5V battery, a 9V battery, and a 12V battery. I discovered that electromagnetic fields don't affect any of the batteries I tested on. In conclusion, my hypothesis was false in saying that there may be a loss of energy, and in the end no reaction occurred and no energy was lost.

Project Number: SPH004

Grade: 11

Title: Peltier Junctions

Abstract: Peltier devices are used in many types of devices, including laptops and miniature refrigerators. They use electrical current to create a difference in temperature between the two sides of the junction – one side is hot and the other cold. A Peltier device was here tested to determine if higher voltage levels affect the difference in temperature between the two sides. Varying levels of voltage were run through a Peltier device in a stable environment of 67 degrees Fahrenheit. It was determined that at higher voltage levels, there is a greater difference in temperature between the two sides of the device.

Project Number: SPH005

Grade: 12

Title: Compressive Strength of Dental Porcelain

Abstract: The purpose of my experiment was to determine the compressive strength of dental porcelain based on the mixing components and maturation temperature. hypothesized that the liquid method porcelain will be able to withstand more compressive stress than the dry method porcelain. I wanted to test if the maturation temperature does have any effect on the porcelain's strength. I created two types of porcelain samples using Synspar porcelain - thirty dry samples and thirty liquid method samples. I fired ten samples from each method at the recommended firing temperature, then ten from each were under-

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fired and the remaining ten were over-fired. I then used an Instron Tester provided by Carnegie Mellon University to determine the compressive strength of each sample. The results showed that there was no statistical evidence stating that at a certain firing temperature the samples were stronger or that the method used to create the samples had any significant effect. My hypothesis was not supported.

Project Number: SPH006

Grade: 9

Title: Earthquake Bridge Shake

Abstract: Cable-stayed bridges play an extreme role when an earthquake hits town. Not only are they the only bridges to maintain the strength of an earthquake, but they hold an articulate and beautiful design. This experiment is putting the cable-stayed bridge to the test by creating an “earthquake in a tub”. Below the tub, a table is set, attached to an oscillator. The experimenter can control the frequency and amplitude of the oscillator and record the results when the cable-stayed bridge fails to stand. The actual “earthquake in a tub” has similar features to the surroundings of a real cable-stayed bridge. In the bottom of the tub a layer of bedrock, clay and sand mixture, and soft mud will be placed to support the bridge. The bridge itself will also have the same features that a real cable-stayed bridge has such as similar tensioning and cable design. This experiment will prove how sturdy and reliable a cable-stayed bridge can be when an earthquake hits.

Project Number: SPH007

Grade: 10

Title: Electrifying Attractions of a Homemade Electromagnet

Abstract: The purpose of this experiment was to generate experimental data in order to understand the theory of how electromagnets depend on the number of turns, thickness of wire and thickness of metal core.

Project Number: SPH008

Grade: 10

Title: Bullet Penetration

Abstract: Several movies, television shows, and stories have depicted people being shot and items in their pocket saving their lives. Experimentation was conducted, testing which common pocket item would be the best at protecting a human from a gunshot. A safety device was built to avoid injury and the penetration of a bullet was tested through seven items. A cell phone protected the best, followed by a wallet, a police badge, and a memo notebook. An eyeglasses case, pack of cigarettes, and an Altoids mints can did not protect against a gunshot.

Project Number: SPH009

Grade: 9

Title: Ramp Rolling

Abstract: The problem for the project was what is the effect of different types of lubrication on a skateboard bearing on the speed of the skateboard? The way that this was tested was there were three types of lubrication. They were WD-40, silicone, and official Element skateboard grease. Then using a ramp, the time to get from the top of the ramp to the 10 foot mark was collected. There were 5 sets of data collected for each lubrication. The conclusion was that the official Element skateboard grease was the fastest.

Project Number: SPH010

Grade: 9

Title: Does the Spacing of Magnets Affect a Gauss Rifle

Abstract: The purpose of my experiment is to determine if the spacing of magnets in a gauss rifle will have any affect on the speed the projectile leaves the rifle. I built a gauss rifle and installed a timer to it. I ran 100 trials for each of my 38.1, 30.5, 22.9, and 17.8 cm test groups and after each trial and into my

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notebook I entered the time it took for the projectile to travel 30.48 cm. After graphing the data I collected, I concluded that the closer the magnets are, the faster the projectile traveled.

Project Number: SPH011

Grade: 9

Title: Color by Numbers

Abstract: The purpose of my project is to discover if I can demonstrate that light is made up of waves and show its practical applications. Based on my research, I hypothesized that colored light can be combined to make up different colors of the visible spectrum. First, I used a prism to show the visible spectrum. Next, I developed an equation to predict the color resulting from a mixture of two other colors mathematically using their wavelength measurements. I tested this equation with electronic components, and except for the exceptions of extra-spectral colors, it was supported. Therefore, my hypothesis was supported.

Project Number: SPH012

Grade: 11

Title: Does the Length and Temperature of a Copper Wire Affect Its Electrical Resistance?

Abstract: A) The purpose of this experiment was to determine if the length and temperature of a copper wire affects its electrical resistance B) To perform this experiment I used an ohmmeter from my high school, copper wire, convection oven, ice, dry ice, and liquid nitrogen. I cut the wire into the desired sizes and measured their resistance at room temperature for the control. I then put them in the other substances, such as the ice, to; change the temperature and measured the resistance again. C) Once completed, the data showed that the length did affect resistance, as well as the temperature. As length increased so did resistance and as the temperature dropped the resistance did as well. The most significant change was when the copper wire was cooled in liquid nitrogen, which produced a very low resistance.

Project Number: SPH013

Grade: 9

Title: Rocket Aerodynamics

Abstract: Rockets were built, with the variables tested being nose cone and fin design. The nose cones and fins were built from information gathered in my research. The nose cones could be moved from rocket to rocket. Each rocket was tested in a wind tunnel using a drag measurement apparatus and wheeled stand. Mass was the variable that showed the greatest correlation to drag.

Project Number: SPH014

Grade: 9

Title: Temperature and Magnetic Strength

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH015

Grade: 9

Title: Maximizing Solar Panel Output

Abstract: Solar energy is a non-polluting, renewable energy source harnessed by solar cells. This work compared the power output of solar panels in different configurations. Power measurements were recorded between sunrise and sunset with different types of cloud cover. A panel mounted on a sun-tracking telescope output from 13% to 31% more power than a static angled panel. This increase shows how important it is to orient panels towards the sun. However the starting costs, ongoing energy costs, and maintenance costs for a tracking system are high, when using a slightly larger sun-angled panel can produce the same energy more cost-effectively.

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Project Number: SPH016

Grade: 11

Title: Gimme A Lift: Wing Sections

Abstract: The purpose of my experiment is to see if the shape of a wing section has an effect its lift, and if so, what is that effect? In order to test this I made 4 wing sections, each shaped differently. I put these wing sections in a wind tunnel and attached them to a scale. When the wind hit the wing, the reading of the scale changed. The wing that lifted up most on the scale had the most lift. If they are all the same, then I will know that the wing shape has no effect on its lift.

Project Number: SPH017

Grade: 10

Title: The Effect of Spin on Ping Pong Balls

Abstract: The purpose of this experiment is to find the effect of spin on ping pong balls in the air. Procedure: 1. Build a ping pong ball launcher which can control the spinning motion of the ball without changing the amount of force or the direction the ball is launched with. 2. Launch a ping pong ball 200 times in all, recording how far the ball went and, if it curved at all, how much it curved to the right or left. There will be fifty trials for each spinning motion: spinning upwards (topspin), downwards (backspin), clockwise, and counter-clockwise. 3. Analyze the results of the trials and see if the trials support my hypothesis. According to research I have done, the spin will cause the ball to curve in the direction that the ball is not spinning-for instance, an upward spin (topspin) will cause the ball to curve downwards due to the Magnus Effect.

Project Number: SPH018

Grade: 12

Title: A study and application of leaking solenoids

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH019

Grade: 10

Title: The Physics of Baseball

Abstract: An analysis of a baseball swing. This included the force and the distance. Also determining the location of the "sweet spot" on the bat and the ideal angle for it to be hit.

Project Number: SPH020

Grade: 9

Title: Electromagnet, Hall-Effect Gaus.

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH021

Grade: 11

Title: Mechanical Comparison

Abstract: This experiment was to determine what combination of adhesive and underlayment is most durable against humidity and moisture found in tiled shower enclosures. Two different adhesives were used to apply ceramic tiles onto three kinds of underlayment. Five ceramic tiles were used with each adhesive and substrate combination. The control group remained dry. The experimental group was exposed to moisture and temperature change. The adhesion was tested by the amount of force needed to separate the ceramic tile from the backer board. Mapei was the most durable adhesive and was optimum with HardieBacker underlayment in the experimental group.

Project Number: SPH022

Grade: 11

Title: Electrifying Crystals

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Abstract: Copper and aluminum are both used everyday to conduct electricity and pass it into our homes. Copper sulfate and aluminum sulfate both contain these metals. Each of these substances can be made easily from solution to form crystals. These substance can then be dehydrated and recycled easily unlike their metal counterparts. The purpose of this experiment will be to determine whether or not the crystalline form of these compounds can conduct electricity, and if so, how well? The crystals were attached to a DC power source, and after testing, it was determined that they didn't conduct electricity.

Project Number: SPH023

Grade: 10

Title: Doomed By Design

Abstract: Rogue Waves are a phenomenon that create waves more than two times the significant wave height (SWH) There are a number of theories as to how they form including strange currents, storms, winds, and several waves merging. The two test subjects chosen were the Queen Mary (which has survived being struck by a Rogue Wave) and the Edmund Fitzgerald which was sunk, quite possibly by a Rogue Wave. The ship's center of gravity was calculated and compared to the actual ships. The data supported the fact that the Queen Mary could survive a Rogue Wave while the Edmund Fitzgerald couldn't.

Project Number: SPH024

Grade: 12

Title: A Study of Lift and Drag on Sport Utility Vehicles

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH025

Grade: 11

Title: Aircraft Propulsion

Abstract: The problem: "Will the type of weather affect the time the aircraft can fly the distance?" It is hypothesized that it will take less time for the aircraft to travel in a breezeless environment than in a windy or snowy environment. A brief procedure is as follows. One motorized aircraft was purchased and assembled. The aircraft was flight tested and three tests were taken in each of the following: breezeless, windy, and snowy environments. Average results are as follows: breezeless, 8.74 seconds; windy, 12.37 seconds; snowy, 9.96 seconds. The breezeless environment enabled the aircraft to fly faster. Therefore, the hypothesis was supported.

Project Number: SPH026

Grade: 10

Title: Analysis of DC Circuit with Thevenin's Theorem

Abstract: My project's goal achieved trends and relationships between voltage, load resistance, and current in any DC circuit. My control was a DC circuit that consisted of three resistors and voltage sources, including load resistance. Thevenin's equivalent circuit was used to determine a) current vs. load resistance; b) current vs. voltage. After replacing load resistances and voltage sources, the results were graphed. As load resistance increases, current decreases, and as voltage increases, so does current.

Project Number: SPH027

Grade: 9

Title: Parabola Surface vs Heat Focus

Abstract: The object of this experiment is to determine whether the surface material of a parabola will have an affect on the amount of heat focused using only the sun as a light source. During the procedure of creating the parabolic reflector, three surface materials were tested; white paint, aluminum foil, and Mylar. The amount of heat focused is found by taking the gathered temperature and subtracting the air temperature. The results found show that Mylar was the best surface material for reflecting light because it has the highest gathered temperature at the focus when compared to the surrounding air temperature.

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Project Number: SPH028

Grade: 10

Title: Methods of Sound Control

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH029

Grade: 12

Title: Slippery When Wet

Abstract: Static friction is the initial frictional that works against an object trying to move. I went on to test varying surfaces for their static friction as to determine which one would be best different applications that require a smooth transition from rest to motion. My hypothesis is that the car on the wet glass surface will produce the results with the lowest static friction. After pulling a wooden block across six different surfaces my results concluded that the wet glass had the lowest coefficient of friction.

Project Number: SPH030

Grade: 9

Title: Effects Of CaCl₂ on Concrete

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH031

Grade: 9

Title: What Makes it Rain-Head, Chest, Chin

Abstract: This project was conducted to show the accuracy of a basketball shot beginning at three different body levels. Prior research showed that the higher the shot the more accurate result a shooter should achieve. Using a standard sized basketball, hoop, common distance from hoop, and 18 participants shooting five shots from each position, it was discovered that the initial hypothesis was correct. The relatively small differences between the shots were due to the various abilities of my participants. In the experiment, basketball players and non-basketball players were identified and tracked. Background research showed that more experienced players are better able to make softer shots through backspin and wrist flexion. Softer shots have the ability to correct some inaccuracy by bouncing off the rim into the hoop. The higher you start your shot, the closer and higher the arc of the shot is, and the further from the basket your projectile, the basketball, makes its trajectory, its path to the basket. This means the ball falls toward the hoop in a steeper path and has a better chance of going through the round rim, because there is more area of the total open rim that the ball can access. In basketball jargon, this explains why a flat shot is difficult to make consistently. The flat shot has a smaller area of the round rim to go through. The results of this experiment showed that technique and position improve the accuracy of basketball shots!

Project Number: SPH032

Grade: 9

Title: What Most Affects Strength of an Electromagnet?

Abstract: This experiment was to see which factor of an electromagnet was most important to its strength. I tested temperature, amount of turns in the coil, and wire length. First I made an electromagnet by taking a steel core and wrapping it with bare copper wire 50 times. To test the strength, I connected the wire to a 12-volt battery and dipped the electromagnet in a bowl of staples. I weighed the staples it picked up. I increased and decreased the factors I was testing from the control test. My results showed that increasing the coil turns was most practical solution.

Project Number: SPH033

Grade: 9

Title: Wind Power

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Abstract: The purpose was to determine which blade shape and angle will create the most electrical output from wind?

Project Number: SPH034

Grade: 11

Title: Degassing Water

Abstract: The purpose of this experiment was to investigate a method of degassing water that is inexpensive yet relatively unknown. It is, however, more energy-efficient and less time-consuming than the most commonly used method, boiling. I hypothesized that if the water was violently agitated, gas content would be dramatically reduced. I compared three samples of water: Boiled, Shaken, and Control. After one week the Control sample had a coating of 200 bubbles per in², while the Shaken and Boiled samples each had zero bubbles. I concluded that agitating the water by shaking reduced the gas content very effectively.

Project Number: SPH035

Grade: 10

Title: Which Type of Fishing Line Can Hold the Greatest Mass?

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH036

Grade: 11

Title: Magnetic Dissolution

Abstract: The solubility of a substance can be changed depending on a variety of conditions. Temperature, nature of solute or solvent, pressure, and magnetism all affect the solubility of a substance; magnetism affects the solubility of Iron (III) Sulfate by allowing a greater amount of the substance to be dissolved in a shorter amount of time. The degree of the magnetic dissolution is minimal, affecting the solution slightly. It has been found that, in a powerful magnetic field, the increase in solubility is approximately 8%. This has been found to affect only the visual difference, but not the statistical difference.

Project Number: SPH037

Grade: 10

Title: Pendulum

Abstract: The experiment's purpose was to determine how various weights can affect the period of swinging pendulums. The following procedure was used. Gather a pendulum of a specified design, add weights and swing with each weight; three times. Repeat three times with all ten weights and average. Record all data. After the completion of the experiment, the data revealed the following. The pendulum appeared as if it had an optimum weight. When the pendulum had three weights, it had the longest period. As more weights were added, the period became shorter. These results were an average of three trials.

Project Number: SPH038

Grade: 10

Title: Optics as a Grand Unified Theory. . .

Abstract: The purpose of this experiment was to theoretically prove the existence of antiphotons through Minkowski space, show that photons are the source of quantum gravity and electromagnetism, develop tensors to describe electromagnetism, gravity and the structure of the universe, determine the pattern of photon placement when emitted through a laser through single and dual slits, experimentally, and develop a Grand Unified Theory.

Project Number: SPH039

Grade: 11

Title: Sounds of the City

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Abstract: This experiment was meant to show the ability to create sound from a visual pattern or image. A piano and images of city skylines to four major U.S. cities as well as staff paper (or sheet music) were used. Through experimentation, it was discovered that not only could a musical composition be created from the images and patterns, but also that the visual image was responsible for altering the sound quality of the composition by correct placement of the pattern in the image and on the staff.

Project Number: SPH040

Grade: 10

Title: Factors Affecting the Flight of a Flying Disc

Abstract: The purpose of this experiment is to test the way slits cut into a flying disk will effect its flight. First construct a disk launcher that will throw all the disks uniformly. Then cut between 0 and 10 slits into 24 disks. Test three of each type and record the distance flown. My research indicates that the distance the disk flies will decrease as the number of slits increases, because the slits will add air resistance to the top of the disk, therefore decreasing lift.

Project Number: SPH041

Grade: 11

Title: Density and Liquid's Refraction

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH042

Grade: 11

Title: The Effect Of Wavelength On Heat

Abstract: Different colors of light have different wavelengths. This experiment was created to determine what wavelengths of light produced the most heat. The temperatures of four different colored light bulbs were taken. The blue light bulb, which had the lowest wavelength, produced the most heat.

Project Number: SPH043

Grade: 10

Title: Kickin' It Up A Notch

Abstract: The purpose of this experiment is to test if the distance a ball travels depends on the amount of momentum the leg has. I built a kicking machine out of K'nex, which included a motor. I kicked a ping pong ball into flour so I could get an accurate measurement. When the ball landed in the flour, it left an indent where it first touched the flour before it continued rolling, like a long or triple jumper lands in a pit of sand. I added hexagon nuts to the legs to make a light (no added weight), medium (2 hexagon nuts per leg) and a heavy (3 hexagon nuts per leg). I concluded that as the momentum increases, the distance the ball travels decreases.

Project Number: SPH044

Grade: 10

Title: Fracture Patterns of Glass

Abstract: This project involved the fracturing of glass under a given set of conditions for the purpose of prediction. The conditions were: weights were varied to provide impact; distance was measured and varied to determine the effect on impact; and the thickness of glass varied. The following things were observed: number of craters; number of veins; number of bridges; and the length between the veins. It was found that: the distance between the veins was directly related to thickness, and height and weight of impact object; number of veins was directly related to thickness, and height and weight of impact object.

Project Number: SPH045

Grade: 9

Title: Heat Generated by Light Bulbs

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Abstract: The project evaluated the heat generated by different types of the light bulbs that include incandescent light bulbs, halogen bulbs, compact florescent lamps (CFL), and light emitting diodes (LED) bulbs. The study showed that the energy saving light bulbs generated less heat than incandescent and halogen bulbs at same lumens because they consumed less energy and were far more efficient in transferring electricity energy to light. The CFL bulbs generated significant less heat than incandescent bulbs at the light output higher than 1600 lumens.