

68th
PITTSBURGH REGIONAL
SCIENCE & ENGINEERING FAIR
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SENIOR
DIVISION
ABSTRACTS



Pittsburgh Regional Science & Engineering Fair is a major event of the SciTech Spectacular

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SENIOR DIVISION – BEHAVIORAL AND SOCIAL SCIENCE

Project Number: SBS001

Grade: 9

Title: Anything You Do, I Can't Do Better?

Abstract: This experiment is one that seems to pique at the minds of many, and pertains to the nearly eternal question "Are boys better than girls?" In my experiment, I used a Gender Stroop Test to see if boys had better reaction time than girls did. The results of said test seemed to tip in the other direction; showing that girls had the upper hand in the situation. Everyone tested was within the same age range, only a few years apart, most students actually being the same age. Most of the results were within a similar range as well, but several students had outstandingly low scores, meaning that their reactions were quick, but very inaccurate. Tests like these will never truly be accurate, because reactions and other things as such vary from person to person, but the test is as accurate as can be. As said before, based upon this test, females seem to have a quicker, more accurate reaction to differences in colors and words.

Project Number: SBS002

Grade: 9

Title: Do Color & Illustration Enhance Learning

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS003

Grade: 9

Title: Colors

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS004

Grade: 12

Title: The Effect of Age, Gender, and IQ on the Stroop Effect

Abstract: The Stroop Effect generally delays and confuses specific thought processes. This project is intended to find out if a person's age, gender, and IQ has an effect on the Stroop Effect. It is hypothesized that younger females with a higher IQ are less affected by the Stroop Effect. Thirty volunteers will be tested individually. Each will take an IQ test and a Stroop Effect test using flash cards. Results will be scored for accuracy and efficiency. Using statistical analysis, correlations will be drawn between age, gender, and IQ.

Project Number: SBS005

Grade: 9

Title: Comparative Study of Bonnethead Sharks at The Pittsburgh Zoo and PPG Aquarium

Abstract: Comparing behaviors observed in the Bonnethead sharks at the Pittsburgh Zoo and PPG Aquarium to behaviors of those seen in a study done by S. Myberg and M. Gruber on Bonnethead sharks in near wild like conditions. To find if the Bonnethead sharks in captivity are displaying behaviors they would normally exhibit.

Project Number: SBS006

Grade: 9

Title: How Multitasking Affects a Homo sapien's Work Quality

Abstract: This experiment was to show if multitasking affected work quality of Homo sapiens. Thirty people in a classroom were given tests having 20 questions. They had six seconds per question. The next group tested while listening to music. The third tested while listening to

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another person speaking. The fourth tested while listening to the same music and speaking. Tests were corrected for accuracy percentage. The average percentage for the control group was 64% correct. Those listening to music scored 58.2%. Those listening to someone speaking scored 58.5% and those doing both scored 56%. Thus, more done at once decreases accuracy.

Project Number: SBS007

Grade: 12

Title: Can humans overcome their fear through the learning process?

Abstract: The purpose of this experiment is to test whether human can overcome their fear through the learning process. Procedure:- Fifty high school participants (35-experimental, 15-control). -Measure the participant's blood pressure and heart rate before the experiment. - Participants will see a rubber spider (experimental group) or a blank sheet of paper (control group). - Measurements are taken.- Experimental group will "play" with the rubber spider for a while and measurements are taken place again. Data:- Measurements decreased after training process. The conclusion is human can overcome their fear through the learning process.

Project Number: SBS008

Grade: 10

Title: The effects of handwriting on rating of content

Abstract: I tested to see if the handwriting of an essay effected the grade that it recieved, hypothesizing that essays which were written messy would recieve lower scores then essays which were written neat. 42 secondary school teachers recieved two essays: half a control essay and a neat essay, and the other half the same control essay, and the same (neat)essay only written messy.

Project Number: SBS009

Grade: 9

Title: Video Game vs. Reaction Time

Abstract: Subject will be divided into three groups. The first group is the control, consisting of subject who do not play video games and will not play them during the testing period. The second group is made up of subjects who do play video games and will continue to play. The final group is subjects who do not play but will begin to play daily. Reaction time will be measured weekly for each group. The data will be analyzed and conclusions drawn.

Project Number: SBS010

Grade: 9

Title: "Do The Eyes Have It?"

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS011

Grade: 11

Title: Do Young Children Show Racial Preference

Abstract: This project investigated whether racial stereotypes influenced social decisions made by 81 children in kindergarten through 4th grade. Each child was shown a poster containing pictures of Caucasian, African-American, Asian, Indian, and Hispanic children matching his or her gender. Each child was asked to choose which of the depicted children was the most/least athletic, most/least intelligent, most/least trustworthy, and best/worst friend. Children were then asked the reason for their decisions. My conclusion was that children relied on past experiences and perceived similarities instead of racial stereotypes to make social decisions.

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Project Number: SBS012

Grade: 12

Title: The Effect of Exercise on the Quality of Sleep

Abstract: The purpose of this experiment is to determine whether or not a correlation exists between exercise and quality of sleep. This will be tested by filming five females of similar ages and levels of physical fitness as they sleep, first to establish a behavioral baseline for individuals, then to follow one hour of aerobic activity prior to sleep. The trials will be reviewed. Any differences between the first and second trial of the individual will be dsdddddrecorded. The recovered results will be statistically analyzed to prove whether or not exercise has a direct impact on quality of sleep.

Project Number: SBS013

Grade: 9

Title: Color My World

Abstract: My experiment was to figure out if age had an impact on one's ability to have a low error rate and time when taking a color test. First I got 23 subjects in their freshman year of high school and tested each student individually. I kept track of the number of errors they made and how long it took them to complete the test. I then repeated this process with 23 students in their senior year of high school. I then took the data and put it into a graph and chart. I recorded the average time, the average number of errors, and the average percentage correct for each group. And I found that the seniors test takers had a lower time and lower error rate than freshman test takers.

Project Number: SBS014

Grade: 11

Title: The Effects of Gray and White Matter on Gender Related Variations in Cognitive Performance

Abstract: Do males and females vary in cognitive ability and performance? This experiment intended to ascertain if males and females fluctuated in scores on math and language tests as a result of gray and white matter. Thirty males and females were given two tests and the results were analyzed to determine any significant difference. My hypothesis was males would excel in mathematics and females would excel in language. Literature suggests that males have more gray matter, used for computation, and females have more white matter, used for making connections. Future work is planned to expand the test on a broader scale.

Project Number: SBS015

Grade: 9

Title: Do You See What I Hear?

Abstract: The purpose of this investigation was to determine if it was easier to remember visual or audio input. My hypothesis was that visual input would be recorded more efficiently than audio input, and would therefore be easier to remember. The results of my experiment support my hypothesis in that the number of words correctly remembered from the poster board was significantly greater than the number remembered from the audio tape. In order to conduct the experiment, I tested several human subjects by giving them words to memorize within 3 minutes. They then wrote down as many words as they could remember within a 3 minute time span. The only thing I changed in the experiment was was in which the subjects acquired the words. This was, however, somewhat difficult (changing just one thing) because every person is different and I could only find people close in age – not the exact same age. The results from the investigation showed that, out of the subjects that were tested, they all remembered the visual words better than the audio words. I can therefore assume that most people remember visual things better than audio things. This, however, does not mean that everyone does. One thing I noticed was that as the subjects were tested, even though the tests were done on different days, they

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generally remembered more of the words than on the last test. I did further research on the subject and found a bit of information I was missing the first time: short-term memory usually lasts no longer than 30 seconds before it is transferred to long-term memory. If I were to do this project again, I might wait a minute or two between the time the subjects had to study the words and the time they had to write them down. This would allow the subjects to think about other things, therefore testing whether or not they actually remembered the words. I might also allow for distractions in the testing area to see if that had any effect on the subjects' memory.

Project Number: SBS016

Grade: 10

Title: Does Music Help You Study?

Abstract: The purpose was to determine if it is best for students to listen to rock, classical, jazz, new age, or no music at all while studying. It was completed by testing a group of students. Some students listened to a specific genre of music while others did not listen to music at all. It was found to be the most beneficial not to listen to music. The group that did the second best was the group listening to classical music, followed by the group listening to new age music, the jazz music group, and lastly the rock music group.

Project Number: SBS017

Grade: 11

Title: Bone Decomposition

Abstract: I tested the effect of pH on the Decomposition of Bone. I made pH 4.0, 4.5, 5.0 and 5.5 solutions with a control of pH 7.0. The sections of beef bones were cut into 2cm sections, weighed to the nearest .01g, and left sit in the ph solutions for 10 days. They were removed and the final mass was measured tot he nearest .01g. The percent mass lost was then taken and my data was graphed.

Project Number: SBS018

Grade: 11

Title: Variation of the Stroop Effect

Abstract: The purpose of this experiment is to determine whether "conflicting directional stimuli" of words and symbols can produce "Stroop" type interference. In tests administered, subjects named locations of directional words, locations of directional symbols, and colors of words for both congruous and incongruous lists. The time taken to name items on congruous lists is compared to the time for incongruous lists and the results analyzed. The "conflicting directional stimuli" of words and symbols created interference similar to the conflicting word color stimuli in the traditional Stroop Effect, but the "conflicting directional stimuli" produced less interference than the conflicting color stimuli.

Project Number: SBS019

Grade: 9

Title: Pain

Abstract: Please visit exhibit for student's abstract.

Project Number: SBS020

Grade: 12

Title: The Effect of Light Deprivation on a rattus norvegicus' circadian rhythm

Abstract: Circadian rhythm effects living organisms and can be altered by an external cue, such as the amount of exposure to light and dark. The purpose of this experiment is to determine which of the five rattus norvegicus', being exposed to different amounts of light, will lose their memory concentration in a maze, due to the side effects of changing their "biological clock". It

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was hypothesized that the rat with the constant change in sleep patterns will perform slower than the rats exposed to a natural light cycle, constant light, constant dark, and an opposite light environment of its natural habitat.

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Project Number: SBI001

Grade: 9

Title: Organic vs. Inorganic Fertilizers in LPL

Abstract: The goal of this experiment was to resolve which fertilizer source, organic or inorganic, is superior for optimum growth and health. The test was carried out on *Lolium perenne* L.; a versatile grass used in all regions of the United States. For the testing, five samples were grown for each group. There were two groups with the addition of a control to provide a "reference point" for comparison. It was discerned that fertilizers had no significant effect on ryegrass and furthermore proved to be harmful. Further experimentation would be the testing of other grasses and plants as well.

Project Number: SBI002

Grade: 10

Title: Altitude Effect on Human SpO₂

Abstract: This experiment was to determine safety when flying a plane with a non-pressurized cabin in a low-pressure atmosphere. Three test flights were completed to record SpO₂ using pulse oximetry on three subjects every 152.4 meters on ascent and 304.8 meters on descent. Results indicated that SpO₂ levels decreased as altitude increased. Research supports this finding because higher altitude with lower air pressure causes a decreased amount of oxygen to enter the bloodstream through respiration. Further experimenting is planned to see if remaining at higher altitudes for longer intervals or reaching altitude by climbing or hiking will have any different results.

Project Number: SBI003

Grade: 12

Title: The Effect of Antioxidants on Free Radicals

Abstract: The purpose of this project is to determine which type of vitamin is most effective for protecting plant cells against free radicals. It is hypothesized that vitamin E will promote the most seed germination. This experiment involves placing seeds in an artificial environment, which contains hydrogen peroxide as a source of free radicals. Vitamin A, C, and E will then be added to groups of seeds to study their protective effects as antioxidants. The results will indicate which vitamin allows the most seed germination. This experiment will demonstrate the effects of free radicals and antioxidants on seed germination.

Project Number: SBI004

Grade: 11

Title: Are Our Foods Genetically Modified?

Abstract: With the many current advances in the field of recombinant DNA technology, plasmid vectors from *Agrobacterium tumefaciens*, have been utilized to transfer genes conferring desirable traits into crop species. However, there are many concerns associated with the consumption of genetically modified (GM) foods. Attempts were made using Polymerase Chain Reaction (PCR) to determine with relative certainty which foods are genetically modified. Of the foods tested, DNA isolated from several processed and non-processed foods including fresh vegetables and cereals contained foreign DNA sequences that were amplified and therefore, they can be considered to be genetically modified.

Project Number: SBI005

Grade: 9

Title: Which Taste Last the Longest?

Abstract: Please visit exhibit for student's abstract.

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Project Number: SBI006

Grade: 11

Title: Antioxidant Absorption

Abstract: The purpose of this experiment was to determine which cream: Prevage, Renova, or Vitamin E, would be most effective in penetrating the epidermis? To test this question, I developed a procedure in which I tagged the creams with Eosin dye so the penetration of the cream through a sample of human breast tissue could be measured. The samples were set in embedding compound and microscopic slides were made using a Cryostat. A micrometer measured a pink line formed by the penetration of dye through the sample. My conclusion showed Prevage was most effective, followed by Renova, then Vitamin E.

Project Number: SBI007

Grade: 9

Title: Effective Plaque Eliminator

Abstract: The purpose of this experiment was to determine whether the ingredient sodium fluoride or baking soda of toothpaste would decrease larger amounts of plaque. First, plaque scraped from the experimenter's teeth was streaked on eight Petri dishes of tryptic soy agar and nutrient agar. They grew for seven days and 25 mL solutions of 0.24 % sodium fluoride and 50 % baking soda were poured over them. A protein broth was made, using the experimenter's plaque, and poured over another set of eight Petri dishes. Solutions of the same percentages were also poured over them. The dishes were observed throughout the experiment.

Project Number: SBI008

Grade: 9

Title: DNA Extraction

Abstract: DNA stands for deoxyribonucleic acid. It is an extremely long macromolecule that is the main component of chromosomes and is the material that transfers genetic characteristics in all life forms. During experimentation, DNA was extracted from chicken liver using a process that includes adding detergent. The goal of the experimentation was to compare the amount of DNA extracted using six different brands of detergent. From the collected data it was determined that Woolite extracted the most DNA followed by Palmolive, Tide, Joy, Dawn, and Shout extracting the least amount of DNA.

Project Number: SBI009

Grade: 12

Title: The Effect of Plant Growth Hormones on Tardigrada hypsibius

Abstract: This project was designed to detail the effect of plant growth hormones on non-plant cells. This will be carried out by separating cultures of my test animal, Tardigrada hypsibius, and then administering the Indole-3-acetic, Abscisic, and Gibberellic acids. These acids need to be extremely low molarities, in order to not destroy the subjects. Each acid will be diluted to compensate for this fact. The results should then show whether or not plant growth hormones adversely or even begin to affect non-plant cells. The effect on the Tardigrada hypsibius will be a good indicator of actual effects on living things.

Project Number: SBI010

Grade: 10

Title: Can Low+ Lenses & Prisms Ease Your Mind?

Abstract: Please visit exhibit for student's abstract.

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Project Number: SBI011

Grade: 12

Title: The Effect of the Wavelength of Light on Pea Plant Health

Abstract: Pea Plants are a common type of plant grown. One factor to their growth is the amount of light that they receive. The purpose of this experiment is to determine if different types of light can affect the growth of pea plants. Pea plant seeds were placed into identical environments with varying wavelengths of light. The plants were to be grown under these conditions for a period of several weeks, but I have not yet finished this phase because of problems with the plants. After this time period, the plants will be ranked based on mass, color, and height.

Project Number: SBI012

Grade: 12

Title: The Effect of Energy on the Rate of Mutation in Carolina Drosophila

Abstract: I am testing the effects of energy forms such as Ultra Violet light, cell phone radiation, and magnetism on the rate of mutation in Carolina Drosophila, a type of fruit fly. I am mating the flies in controlled vials and adding a different energy form to each vial. I will be collecting and analyzing mutation rates among the Drosophila, and then, using a Chi Squared test, I am determining if the mutations were caused by my experimental variables or merely by chance.

Project Number: SBI013

Grade: 9

Title: The Growing of Grass

Abstract: The problem is to see what dirt does grass seed grow in better. The hypothesis is that Georges supply mixture would be the best, first the different types of dirt, fertilizer and mixture materials are bought. Place dirt, fertilizer and mixture materials in several different cups that are marked A through F. Place equal amounts of grass seed in each cup and water each cup with same amount of water. Place all cups in a sunny location and see what grass starts growing first and how well it grows.

Project Number: SBI014

Grade: 10

Title: Effect of Global Warming on Plant Growth

Abstract: In my project I will be testing the effects of global warming on plant growth through increased levels of carbon dioxide. I will grow a large sample size of radish plants due to their fast growth rate. The plants will be separated into different groups. Each group will be exposed to different levels of carbon dioxide and there will also be a control group. The only variable will be carbon dioxide so the temperature, amount of water, soil type, and light exposure will be constant. The carbon dioxide will be contained creating a maintained atmosphere for the plants to develop in. After the conclusion of the experiment, the plants will be dissected to find the carbon to nitrogen ratio. This ratio will help to determine the effects of increased levels of carbon dioxide on plant growth.

Project Number: SBI015

Grade: 12

Title: Elodea Cell Wall Tensile Strength

Abstract: The question being addressed in the project is how do different concentrations of NaCl affect the strength of the cell wall. My hypothesis is that the stronger the solution, the weaker the cell wall will become. I used the water plant Elodea, and hung increasing masses from a suspended sprig until the stalk snapped. My data points to the acceptance of my hypothesis.

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Project Number: SBI016

Grade: 9

Title: Do Plants Feel Beat?

Abstract: The purpose of the experiment performed was to identify whether or not music played from a trumpet had any effect on plant growth. I did this by gathering 20 bean plant seeds. I planted the first 10 in Styrofoam cups and marked them A for non-music. Then I ordered them 1-10. The next 10 I planted in the exact way only this time I marked them B for music. Then I ordered them 11-20. Each day I played to the B plants a more "lively" tune, "Swing Low, Sweet Chariot." Every 2-6 days I watered the plants and recorded how many tablespoons they received. At the end of each day, I recorded the growth of all of the plants. These are my results for the experiment still in progress. The non-musical plants' growth in total is 177 and 8/16 inches when combined as of January 28, 2007. The musical plants' growth in total is 206 and 9/16 inches when combined as of January 28, 2007. The plants were watered a total of 14 tablespoons from the start of the experiment, January 1, 2007, through January 28, 2007. My conclusion is that music could possibly have an effect on plant growth because the musical plants grew a total of 29 and 7/16 inches more than the non-musical. The conclusion matches my hypothesis.

Project Number: SBI017

Grade: 12

Title: Motility of Sea Urchins

Abstract: The purpose of this experiment was to determine if cryopreservation and different thawing temperatures affects the motility rate of sea urchin sperm. In the procedure, I first extracted sperm from a male sea urchin, observed its motility rate under a microscope, separated it into 3 vials, stored it in liquid nitrogen for 24 hours, and repeated for 2 additional urchins. I then thawed one vial from each urchin in a 4 degree C refrigerator, one vial from each urchin in a 15 degree C water bath, and one vial from each urchin at 24 degrees C room temperature. I thawed each vial for 15 minutes, then observed its motility rate under a microscope again to see if it had been reduced. For all 3 urchins, 24 and 15 degrees C were considered successful thawing temperatures, because less than 40% motility was lost during cryopreservation. But statistically, however, 24 degrees C produced a significantly greater motility rate.

Project Number: SBI018

Grade: 9

Title: Osmosis in Cells

Abstract: When testing on cells in laboratories, scientists need to make sure that the solution they place cells in has exactly the same ionic compound concentration as the water inside of that cell. The purpose of this experiment was to determine the tonicity levels inside the vacuoles of several species of plants. The three species of plant seeds that were tested were the Brassica Rapa, the Spinacica olcerela, and the Phaseolus vulgaris. Afterwards, plants were grown, to see if they could verify the results of the previous part of the experiment. The Phaseolus vulgaris had the lowest ionic compound concentration.

Project Number: SBI019

Grade: 9

Title: The Effect of pH on Lemna minor

Abstract: The purpose of the experiment I conducted was to test the effect of pH on the survival and reproduction of duckweed. This benefits both those who wish to reduce and those who wish to increase it's growth. I tested this by making solutions with pH values from 4-10, placing a fixed number of duckweed fronds in each. After observing duckweed activity and counting the number of healthy fronds at the end of the week, I found that duckweed thrives in more neutral pHs and suffers in more extreme pH values.

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Project Number: SBI020

Grade: 11

Title: The Effect of pH on the Rate of Cytoplasmic Streaming in Elodea

Abstract: The problem will be testing the effect of pH on the rate of cytoplasmic streaming in Elodea cells. To test this, the Elodea will be exposed to solutions of a pH of 4, 5, 6, 7, 8, 9, and 10 using sodium hydroxide (NaOH) and hydrochloric acid (HCl), measuring the time it takes for a chloroplast to travel from one part of the cell to another. The hypothesis is: If elodea cells are exposed to solutions with a pH range of 4-10, then the rate of cytoplasmic streaming will be highest in a pH of 7-9.

Project Number: SBI022

Grade: 11

Title: Effect of Ultraviolet Radiation on Bacteriophage Replication

Abstract: The purpose of this project was to determine whether ultraviolet radiation affected the replication of bacteriophages as measured by the number of plaques. I subjected coliphages to radiation for varying lengths of time. these phages were plated with E. coli bacteria and incubated for three days. My results were inconclusive due to lack of plaque formation on any plate, including the control.

Project Number: SBI023

Grade: 11

Title: Ident Opsins in Inia geoffrensis-Year 3

Abstract: Cellular anatomical analysis of the retina of the Amazon river dolphin, Inia geoffrensis, reveals the presence of rods and cones, and therefore the potential for color vision. A molecular approach was used to identify the dolphin's rhodopsin sequence using procedures (PCR, gel electrophoresis, and DNA sequencing) for characterizing the dolphin's visual pigment gene. The Inia rhodopsin identified appears to be shifted towards longer wavelength sensitivity due to the dolphin's adaptations to life in a shallow nutrient-rich freshwater environment. This indicates Inia's rhodopsin is spectrally tuned similar to that of terrestrial mammals and not blue shifted as in more closely related oceanic cetaceans.

Project Number: SBI024

Grade: 9

Title: Carboniferous Crickets 2

Abstract: Can arthropods decrease in size due to a lack of oxygen?
I hypothesize that because a higher oxygen level increases the size of crickets, that a lower oxygen level will cause a dwarf effect. Last year, there was a 16.7% growth increase due to a 14% higher oxygen level. Last year's experiment's purpose was to prove if a higher oxygen level stimulated growth. This year, the purpose is to find the other end of the spectrum. This experiment is not yet complete because of experimental problems.

Project Number: SBI025

Grade: 9

Title: Hydroponics and Aeration

Abstract: Hydroponics has been utilized to grow plants for centuries. Modern Hydroponics uses aeration in the process. This investigation determined whether aeration is needed for the plants to thrive. Marigold seeds were started in sand and then transferred to a hydroponics mixture. A mixture of Epsom Salts, Calcium Nitrate and Fertilizer Formula 3-15-26 were used for all plants. Over seven weeks, Group A Marigolds received aeration from aquarium pumps and Group B Marigolds did not. The experiment was repeated four times. The non-aerated group in all four trials actually grew taller and weight on average more than the aerated group.

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Project Number: SBI026

Grade: 12

Title: The Effect of Various Liquids on Blood Sugar Level

Abstract: Levels of blood sugar pose as a vital statistic in the lives of many Americans. The purpose of this experiment is to determine which of six different liquids has the greatest effect on human blood sugar level. It was hypothesized that Pepsi would cause the greatest effect, followed by Nestea iced tea, Diet Pepsi, whole milk, Tropicana orange juice, and finally 2% milk. Blood sugar level for each subject was tested prior to consuming one serving of a specific liquid and after a twenty-minute digesting period. Each liquid was tested on each subject.

Project Number: SBI027

Grade: 12

Title: Effects of Amylase on Carbohydrates

Abstract: What effectiveness does amylase have in certain doses on carbohydrates? The experiment involves testing the effectiveness of amylase at certain concentrations on different carbohydrates, including glucose, fructose, polysaccharides, and starches. The procedure involves placing 5.00 g of the specific carbohydrate and 10 mL of distilled water in a test tube, stirring it in with a stirring rod, and adding the desired concentration of amylase into the test tube. Concentrations will be made by adding water to dilute the amylase. After allowing the solution to settle, a bromine indicator will be used to test the effectiveness of the concentration of amylase.

Project Number: SBI028

Grade: 12

Title: Greenhouse Cover vs Plant Growth

Abstract: In my experiment I tested pea plant growth with greenhouse coverings. I grew pea plants in a greenhouse with a traditional clear plastic covering, and one with a thicker plastic covering. For my control I grew pea plants with out a greenhouse, using the same procedure. I wish to show that the pea plants in the greenhouse with the clear plastic covering grew the tallest. Data analysis is still under progress.

Project Number: SBI029

Grade: 11

Title: Responsiveness of Dermal fibroblasts To Growth Factors

Abstract: Normal wound healing is a complex, highly regulated dynamic process requiring coordinated responses of epidermis, dermis and signaling growth factors. Adult wounds heal with scar, but fetal skin wounds heal scarlessly. My aim was to study the cell migratory behavior of fetal fibroblast and adult fibroblast on a fibronectin coated surface and to investigate the stimulatory effects of growth factors on these two cell populations. I found that fetal and adult fibroblasts migrate faster in response to growth factors, EGF and PDGF, whereas basal cell migration was inhibited by TGFb1 and TGFb3 in fetal fibroblast but not in adult fibroblasts.

Project Number: SBI030

Grade: 10

Title: Chlorine and Germination

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI031

Grade: 9

Title: The Effect of E. coli on the Survival Rate of Daphnia

Abstract: The purpose of this experiment is to determine if E. coli have a detrimental effect on the survival rates of Daphnia. The procedure involved isolating separate cultures of daphnia and added

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varying amounts of E. coli bacteria. I then timed each population until 50% of the Daphnia died. I concluded that the presence of E. Coli did pose a threat to the survival of Daphnia.

Project Number: SBI032

Grade: 9

Title: Grass Growth Using Red Worms and Manure

Abstract: The purpose of this experiment was to find out how red worms and manure had an effect on grass growth and soil nutrients. Also, to determine how long there was a depressing effect on the red worms. To perform this experiment five pans of grass were grown adding leaf matter (red worm food) manure, and red worms to each pan. Grass was measured and biomassed and nutrient tests were done. The pan of grass grown with manure and red worms has the greatest average grass growth, root length, and biomass. Red worms add potassium to the soil and manure adds phosphorus to the soil. The pan of grass grown with manure and earthworms did not have a significant difference in the average grass growth and root length, but the nutrient amount did increase.

Project Number: SBI033

Grade: 9

Title: Phototropism vs. Gravitropism

Abstract: This investigation was conducted to determine if either phototropism or gravitropism has greater influence on plants if the two are in direct opposition to each other. The hypothesis stated that either phototropism or neither would have greater influence. Both situations would have the same result: ryegrass would grow in its normal manner. Ryegrass was grown in socks. The manipulated group socks were placed upside-down with their sole light source directly below. The control group socks were placed upright with the sole light source directly above. After 21 days, each grass blade was evaluated. The hypothesis was supported by the data.

Project Number: SBI034

Grade: 10

Title: Crosslinking of ECMs

Abstract: The purpose of my project was the measurement of crosslinking of Procine Extracellular matrices. I did three separate experiments. The variables were changing ECM mass, crosslinking the ECM's and using commercially available ECM's. In the first experiment, I changed the mass of samples of ECM, between 2 and 6 g. In the 2nd experiment, I soaked ECM in chemicals to cross link them. In all three experiments, I tested the effects of three chemicals to better crosslink ECM's.

Project Number: SBI035

Grade: 9

Title: S.cervisiae on Iron

Abstract: S.cervisiae is grown in solutions with different concentrations of iron. Iron remaining is measured by titration after two days of incubation with yeast to determine bioremediation of iron Fe(II). Survival rates of yeast in different iron concentrations are also measured after incubation by subculturing.

Project Number: SBI036

Grade: 11

Title: HPV and E6 Gene In Cancer Cells

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI037

Grade: 11

Title: Phytopollution

Abstract: The project studies the effects of several types of phosphates and nitrates on the growth of the freshwater algae, Chlorella.

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Project Number: SBI038

Grade: 11

Title: Effect of Vitamin C on Planaria Regeneration

Abstract: The purpose for this experiment is to see if Vitamin C actually repairs tissue. The project is still a work in progress at the time of writing. My hypothesis states if planaria are cut and exposed to Vitamin C will have a quicker regeneration process.

Project Number: SBI039

Grade: 9

Title: The Effects of Saline Soil on Plants

Abstract: The purpose of this investigation was to determine which plant would grow the best in saline soil. Peas, barley, and wheat were grown in both a none saline soil and a saline soil. They were grown for 4 weeks, then removed from the soil, patted dry, weighed, and compared. It was hypothesized that peas would grow the best. It was shown in results that the barley grew the best.

Project Number: SBI040

Grade: 12

Title: The Effect of Antioxidants on Free Radicals in the Tardigrade Hypsibius

Abstract: This project was enstated in order to test the effect of antioxidants on free-radicals. A free-radical is an oxidized molecule which is seeking to bond with another electron, hence destroying the invaded molecule. Antioxidants are essential in stopping free-radical destruction because they donate an electron, without actually becoming a free-radical themselves, since they are stable in both forms. Vitamin E was proved to be the most effective because it safely neutralizes more free-radicals at a more effective number. Destruction of free-radicals helps to prolong the life of the being, which makes it an optimal study amongst researchers.

Project Number: SBI041

Grade: 10

Title: Test of Catalase Activity

Abstract: The purpose of this experiment is to see how temperature affects the activity of all enzymes, with catalase being used as an example. This project will also be useful to see how effective catalase is at decomposing hydrogen peroxide at different time intervals. This was done by allowing the catalase reaction to occur for varying periods of time and then stopping it with sulfuric acid. After the reaction was stopped, potassium permanganate was titrated into the solution of catalase, hydrogen peroxide, and sulfuric acid, and the amount of potassium permanganate added was recorded as the amount of hydrogen peroxide left undecomposed by the reaction with catalase.

Project Number: SBI042

Grade: 11

Title: The Effect of Allium Extract on Lipids

Abstract: The purpose of my experiment is to see whether or not the compounds in garlic will help break up fats. To perform my experiment, I first created allium extract from garlic. I then followed by massing out samples of lard and letting them soak in allium extract for 24 hours. Once this was completed, I vacuum filtered the extract from the lard and let any excess extract evaporate. I then recorded the mass. In conclusion, there was a significant decrease in mass, proving that the allium extract did in fact help in breaking up, or dissolving, the fats.

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Project Number: SBI043

Grade: 11

Title: The Proper Nitrogen Level for Venus Flytrap Tissue Culture

Abstract: The purpose of this project is to find the proper nitrogen level in the food solution that gives the most benefits to the Venus Flytrap (*Dionaea Muscipula*) by using tissue culture. Because the Venus Flytrap is a carnivorous plant which needs higher nitrogen level to grow and develop, they attain it by catching flies and absorbing some from the soil. This project attempts to prove the theory and tries to find the exact nitrogen level that the Venus Flytrap needs, Independent of other factors such as time, temperature, humidity, and others nutrients in the stock solutions.

Project Number: SBI044

Grade: 9

Title: Which Works Better?

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI045

Grade: 9

Title: The Tobacco Mosaic Virus

Abstract: The purpose of this investigation is to determine which plant is more affected by the Tobacco Mosaic Virus. It was hypothesized that when bean and pea plants were infected with the virus, both would display visible effects, but the bean plants would display more decay because of their bigger leaves. This project was conducted by mixing a solution of tobacco with a buffer and then applying it to the abraded leaves of the experimental groups. The hypothesis was supported by the data. The bean plants displayed more decay while the pea plants displayed less.

Project Number: SBI046

Grade: 9

Title: Relating Mortality to Nutrition in Rabbits and Cavies

Abstract: It is generally accepted that feed formulation is critical to animal health. There are very few published studies that include a large enough population to link specific formulations to specific diseases. This study of over 1000 animals found a linkage between a feed formulation and a disease, however, the results may have been skewed by problems with the data collection process.

Project Number: SBI047

Grade: 12

Title: A Tale of Two Keyboards: Trial Two

Abstract: Sickness spreads at epidemic rates through everyday products, like phones, door handles, keyboards, and many others. Even though products like, disinfecting sprays help, many germs are still spread from simple contact. Ultraviolet rays, though a new form of disinfection, are used in many situations to sterilize drinking water, among many other necessary things. The purpose of this project is to develop a keyboard, which would be sterilized safely by a UV light after every use. Expectantly, this product can be used in public settings such libraries, universities, and laboratories without the fear of spreading germs.

Project Number: SBI048

Grade: 11

Title: Shampoo and Fruit Flies

Abstract: The purpose of my experiment was to see if shampoo use attracts fruit flies. To carry out my experiment, I created a box out of a Tupperware container with two open-ended tubes connected to either end, with the tubes being separated from the box by screens. Then I put fruit flies into the box. Next, I applied shampoo to one of my hands and placed each hand in a separate tube on the box. I counted the

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number of flies on each side of the box. My experiment showed that there was no attraction of flies to shampoo use.

Project Number: SBI049

Grade: 11

Title: Do Butterflies Prefer Colors?

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI051

Grade: 9

Title: Fertilizer Effect On River Shrimp

Abstract: Please visit exhibit for student's abstract.

Project Number: SBI052

Grade: 12

Title: What is the optimal pH of alpha-amylase

Abstract: What is the optimal pH of a-amylase? a-amylase is an important enzyme that is found in a wide variety of organisms. It hydrolyzes starch, a glucose polymer that is an integral part of the diet consumed by many organisms. Finding the optimal pH of a-amylase can be used as necessary data for several industries, including the textile and pharmaceutical industries. 15 buffer solutions were made; smaller intervals between pH levels are to be tested in accordance to the hypothesized optimal pH level, which should be between 6.8 and 7.0. Data is being retrieved during February and March.

Project Number: SBI053

Grade: 9

Title: How Clean Is it?

Abstract: The purpose of the experiment was to see which items in your classroom has the most bacteria. Some things I did to complete this experiment was to think of some items that would have a lot of bacteria. I thought of a cell phone, computer keyboard, purse, table, and then you have to have control. So I then used distilled water and wiped each item with a different Q-tip. I used a different petri dish for each item. I took each different Q-tip and wiped the different petri dishes, which had a nutrient auger. After I wiped each dish I then incubated them for 48 hours. At 24 hours I checked each dish, and counted the colonies, and did the same on the second day. After the 48 hours were over, I then gram stained. I found out that it was gram-negative. In my conclusion, I found that my hypothesis was incorrect. Before doing my experiment I thought that the computer keyboard would have the most bacteria. I found after completing the experiment that the table had the most bacteria. The table had more then 350 different colonies of bacteria. I think this was a good topic to choose because in a way it actually could help you. It could let you know what is the dirtiest things in your class room. So overall I think this was a good project.

Project Number: SBI054

Grade: 9

Title: Effect of Catechol. on Stem Cells

Abstract: In this study, different catecholamines were given to bone marrow Mesenchymal Stem Cells (MSC's) in order to find the effect on the motility of MSC's. MSC's have been shown to migrate into the myocardium in the post-infection state and differentiate into cardiomyocytes. In a series of wound healing and transwell assays, the motility of MSC's were studied and quantified in order to measure the motility of the MSC's. Catecholamines which attach to the alpha-adrenergic cell receptors inhibited the migration of MSC's, whereas the beta-adrenergic agonists barely affected the migration of MSC's.

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Project Number: SCH001

Grade: 12

Title: Salinity Analysis of H₂O by Ion Exchange

Abstract: This project investigated the affect that salt from de-icers used to melt snow on roads has on the salinity of streams near these roads. An ion exchange column was built and used to exchange the sodium ions from the salt in the stream water for hydrogen ions. The sample was then titrated to determine the concentration of salt in the streams. Three streams were tested along with a control solution. The data supported the hypothesis that salt used to melt snow on roads in the winter is increasing the salinity of nearby streams.

Project Number: SCH002

Grade: 9

Title: The Effect of Oil on Fuel Efficiency

Abstract: The purpose of this experiment was to determine if synthetic oils versus regular motor oils would improve engine output. A gasoline generator was connected to a light bar and a clock. Two types of oil were chosen for testing, regular and synthetic. 100mL of gas was used in every trial of the eight test groups, based on combinations of octane rating and oil type. The average output of the generator was calculated for each test group and it was found that the 94 rated gasoline and the synthetic oil produced the most output and was the most cost effective.

Project Number: SCH003

Grade: 11

Title: Oral Abrasives

Abstract: This project evaluates which common chemical abrasives in toothpaste cause the most damage based on daily brushing procedures. I chose the five most common abrasives, which were sodium metaphosphate, calcium sulfate, calcium phosphate tribasic, sodium bicarbonate, and calcium phosphate dibasic. I created a machine that tested the abrasive nature of each chemical uniformly. The machine consisted of a hand-held motor with a dental tooth cleaning mandrel attached. I created 20%, 30%, and 40% concentrations of each chemical combined with a basic toothpaste solution. I measured 0.5 grams of each chemical solution and applied it to a glass. When the motor began the brush rotated clockwise at three rpm against the glass square for three minutes. In conclusion, the chemical abrasives all showed a sign of mass loss, but only at the thirty and forty percent concentrations was there any statistical significance. Overall, sodium bicarbonate showed the most abrasion.

Project Number: SCH004

Grade: 11

Title: Active Ingredients of Aloe Vera

Abstract: Aloe Vera is a plant attributed with many therapeutic properties, ranging from laxative effects to ceasing inflammation, yet the active ingredients attributed to these properties are still the topic of many research projects today. The advantage for identifying and isolating these chemical components is the possibility of increasing the therapeutic effects. Thus, the purpose of this project is to identify the active ingredients of Aloe Vera via NMR Spectroscopy and FTIR Spectroscopy. Based on the results, there was no presence of a glycoprotein (as hypothesized by prior research), yet there was the presence of anthraquinones, which naturally possess laxative effects.

Project Number: SCH005

Grade: 11

Title: Rennin Isozymes in Cheese Production

Abstract: Please visit exhibit for student's abstract.

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Project Number: SCH006

Grade: 10

Title: Comparing Storage Risks of Rocket Fuel and Common Flammables

Abstract: To determine if the stringency of storage regulations for flammable materials is consistent with their fire risk. Procedure: Test ammonium perchlorate composite propellant (APCP), black powder, and gasoline. Perform two experiments with three trials each for the substances. Experiment 1: ignite each substance with Post-it notes hanging at different heights above the burn site and a backboard grid behind the burn site. Take a video of combustion. Rate the singe marks on each Post-it from one to five for each substance. Examine the video to find the burn duration and the blast cloud size. Experiment 2: place each substance on a hot plate and measure how long it takes for it to ignite. Data: The black powder had the lowest singe rating followed by APCP then gasoline with the highest singe rating. Gasoline had the longest burn duration followed by APCP then black powder with the shortest burn duration. Black powder had the biggest blast cloud size followed by APCP then gasoline with the smallest blast cloud size. On the hot plate APCP took longer to ignite than black powder. Gasoline didn't ignite at all; it just boiled off. In conclusion, the regulations aren't consistent with the fire risk.

Project Number: SCH007

Grade: 11

Title: Effects of Impressed Current Cathode Protection

Abstract: The purpose was to determine which anode, of iron, graphite, or platinum, prevents corrosion the most in carbon steel using impressed current cathode protection. A circuit was set up using a rectifier to provide a current from the anode to the cathode. The coupons were submerged in salt water for four weeks. Masses were compared before and after. The carbon steel paired with platinum lost the least mass at .0537 grams. The platinum protected the carbon steel best because it completed the circuit the entire time, unlike the iron and graphite, allowing electrons from the current to be oxidized.

Project Number: SCH008

Grade: 9

Title: Biogas: A Renewable Energy

Abstract: Humans are depleting the sources of non-renewable energy very fast. Biogas, a renewable energy source, is produced by the anaerobic digestion of organic matter like animal manure. The composition of Biogas is mainly Methane and Carbon Dioxide. Construction of a homemade Biogas digester was successful. It produced ~ 16 Liters of Biogas from 2 Kilograms of cow manure in 7 months. From 10% of dairy cows in the US, we could potentially save half a million dollars and supply electricity to more than 41,000 families everyday. This experiment demonstrates that the world should move to a renewable and reliable energy source like Biogas.

Project Number: SCH009

Grade: 9

Title: The Effect of Various Solutes on the Conductivity of Water

Abstract: This experiment's purpose was determining how various solutes affect the conductivity of water. An electrical circuit was set up with water in a beaker completing the circuit. Each of the solutes was dissolved in this water and the current flowing through the circuit was measured and recorded. The average electrical current conducted by each aqueous solution was 15 micro-amps for sodium chloride, 6 micro-amps for acetic acid, and 0 micro-amps for sucrose and no solute. From this I concluded that strong electrolytes like sodium chloride increase water's conductivity more than weak electrolytes like acetic acid and non-electrolytes like sucrose.

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Project Number: SCH010

Grade: 11

Title: Enviromental Dissolution

Abstract: Environmental dissolution is a process by which a reaction is prevented from occurring, by the presence of an ion in the solution preventing the formation of the products. Solutions of Magnesium, Iron, and Ascorbic Acid were used to inhibit Calcium Oxalate crystal growth. Concentrations of these solutions were varied from high to low. The two chemicals used to form the Calcium Oxalate crystals were Oxalic Acid and Calcium Citrate. Iron and Magnesium are effective in preventing Calcium Oxalate from crystalizing providing they exist in high concentration. Vitamin C has no effect in preventing the formation of Calcium Oxalate.

Project Number: SCH011

Grade: 12

Title: Trust Me, It's Tourmaline

Abstract: The goal of this project was to produce pink tourmaline synthetically. The process was complex because appropriate solvents had to be found to dissolve the reagents. Two things needed to be established; adequate growing environments and the addition of reagents in a specific order. To prove tourmaline was produced, the shape and color was observed for verification. The results were that tourmaline was produced. However, the color pink was not evident since the sample was exposed to air. It was later found that the oxidation state of Mn will shift in air, thus changing the color of the sample.

Project Number: SCH012

Grade: 10

Title: Role of Solvents in Chromatography

Abstract: The purpose of this experiment was to determine which solvent is most effective and efficient in separating ink through chromatography. Paper chromatography was utilized to test the following solvents: hexane, ethanol, isopropanol, water, vinegar, household ammonia (10%), and 10% NaCl solution. Data indicates that water is the most effective solvent, averaging with more separation and higher Rf values than any other solvent. Further research may be conducted.

Project Number: SCH013

Grade: 11

Title: Capillary Action in Narrow Gap Space

Abstract: Capillary rise is known inversely proportional to tube diameter. The goal of this project is to investigate whether this inverse relationship still holds true or not in the narrow gap space. A wedge-shaped apparatus was devised with glass plates, with gap size ranging from the millimeter to micrometer scale. In the narrow gap regime (< 30 micrometer for alcohol or water and < 160 micrometer for oil), the capillary rise is found to significantly fall off from the inverse relationship. The result is explained by the increase of the contact angle of a liquid to the walls for smaller gap.

Project Number: SCH014

Grade: 11

Title: Alcohol Fermentation

Abstract: Testing the affects of different types of sugars and sugar substitutes on fermentation of yeast. By making 10% concentrations of the sugar solution, and then allowing the solutions to metabolize the yeast, the output of carbon dioxide was found.

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Project Number: SCH015

Grade: 11

Title: Increasing Patina Growth on Copper

Abstract: Copper will be sprayed with measured amounts of sulfuric acid, hydrochloric acid and urea solution to determine the most economic method for developing patina. Color of patina will be described and patina volume measured by increases in mass.

Project Number: SCH016

Grade: 9

Title: Insights into electrochem cells

Abstract: My past research determined that electric current through an electrolytic solution increases slower than the electrolyte concentration. The objective of this research is to determine if the reason for this phenomena is slow transport of ions to electrodes or slow discharge of ions at electrodes. The experimental procedure consists of the current measurement through different concentrations of NaOH, CuCl₂, and oxalic acid solutions with variable temperature and electrode surface area. The results suggest that current is determined by the rate of ion discharge rather than by ion transport. The results of the investigation can be used to better electrochemical batteries.

Project Number: SCH017

Grade: 12

Title: Biofuel Boom: Oil as Biodiesel

Abstract: Creating biodiesel via transesterification is the one of the leading process for creating renewable biofuels. Using the process, I created three different biofuels from three everyday oils: corn, vegetable, and peanut oils. After I produced these biodiesels, I tested them in a Parr 1261 bomb calorimeter and determined the heats of combustion. Combining this data with gelling points and productions costs, I was able to determine the most plausible and efficient biofuel. As this process becomes popularized, hundreds of thousands of people will be converting to biodiesel, and ultimately contributing to a cleaner earth.

Project Number: SCH018

Grade: 10

Title: The Creation of Hiddenite

Abstract: Hiddenite, due to its characteristics of light sensitivity and susceptibility to fracture, remains strictly a gemstone for the collector. This stone has been found as gray, white to green, colorless and has a prismatic shape and a hardness of 6.5 to 7.0. Its formula is LiAl(Si₂O₆). To date it was considered impossible to synthesize. However, using solutions chemistry and approaching synthesis of a compound rather than a gemstone, it was possible. Verification of its production was confirmed by shape, streak color and chemical formula giving evidence that synthesis was accomplished.

Project Number: SCH019

Grade: 9

Title: The Effect of Sodium Chloride Concentration on the Conductivity of Water

Abstract: The purpose of this project is to determine the effect of sodium chloride ions on how conductive water is. I decided to do this because I was curious about ways to manipulate water's conductivity, and I already knew that temperature was one way. I used a conductivity probe to collect my data and found that a higher concentration did increase conductivity.

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Project Number: SCH020

Grade: 10

Title: Analysis of Metabolites in juices by NMR

Abstract: The purpose of this experiment was to identify low-molecular weight compounds (sugars and organic acids in fruit juices by NMR and PCA.) The procedure consisted of the standard sample preparation, the fruit juice sample preparation and the actual experimental procedure. The samples were made and inserted into the NMR magnet. The data was then displayed on a computer in terms of a graph or an NMR spectrum. The conclusion consisted of an evaluation of the validity of the hypothesis, effectiveness and applications of NMR, errors that could have affected the results and future plans and investigations. NMR is a very effective tool and is used in the medical field. It can potentially be very helpful in disease diagnosing and thus disease preventing situations especially for humans.

Project Number: SCH021

Grade: 12

Title: Rockin' with Rhodonite

Abstract: As a mineral, Rhodonite has been one of the world's best kept secrets. Derived from rhodon, meaning "rose", rhodonite is a metamorphic product of Rhodochrosite. Not only it is unique in structure, but also, it comes in colors of yellow, orange, pink, red, brownish red and even black. The formula is $Mn(Mg, Ca, Fe)SiO_3$. All of the elements have no definite proportion because nature allows the components to be obtained from the environment. The product was produced using solutions chemistry. Crystallization was done in rocky environments. Rhodonite was verified by checking streak, structure, angles, and hardness.

Project Number: SCH022

Grade: 12

Title: Caffeine Content in Energy Drinks

Abstract: 50 mL of energy drink are placed in a separatory funnel and 10 mL of methylene chloride is added. Gently swirl the funnel so the layers form. Drain the lower layer and put it into a clean beaker. Add another 10 mL of methylene chloride. Again, swirl and allow layers to form, removing the lower layer and adding it to the first draining. Add anhydrous sodium sulfate and let sit for 5-10 minutes to remove any water. Use vacuum filtration to remove the anhydrous sodium sulfate and the liquid left over will be methylene chloride with caffeine. Evaporate the methylene chloride under a fume hood and the caffeine will be left. Mass the extraction and repeat this procedure five times for each energy drink.

Project Number: SCH023

Grade: 9

Title: Ready for the Race

Abstract: Athletes, especially those in a race, need to be hydrated and have enough electrolytes in their bodies. This is primarily accomplished by water; however, there are many sports drinks that both hydrate and provide electrolytes. Water, sports drinks (Gatorade and Powerade), and juices (orange and apple) were tested to see which would be most beneficial to athletes. This was done by boiling all drinks and comparing the evaporation rates. The results are beneficial to all athletes hoping to have a drink hydrate and help them.

Project Number: SCH024

Grade: 9

Title: The Effectiveness of Water Repellents

Abstract: The purpose of my experiment is to determine the effectiveness of water repellants on materials. I sprayed leather and canvas samples with silicone based, polymer based, and oil based water repellents, leaving some for control. Samples were placed over cups with water. I timed the penetration of water through the samples. I washed the materials, then tested penetration for longevity.

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Silicone was most effective for the leather penetration test. Oil was most effective for the leather longevity test. Oil was not effective for the canvas penetration test. Polymer was the most effective for the canvas longevity test. Statistics were performed on my results.

Project Number: SCH025

Grade: 11

Title: Comparison of Dietary Calcium

Abstract: Sources of calcium from whole food sources and dietary supplements will be compared and measured by titrations to determine the best sources.

Project Number: SCH026

Grade: 11

Title: Is It Worth It?

Abstract: The purpose of this experiment is to see whether spending more on professional conditioners is worth it, or if cheap brands have the same result. I used three different hair types: color-treated straight blonde, naturally straight light brown, and naturally curly dark brown. I tested two professional conditioners and two cheap brands to see which ones produce the most shine, smoothness, softness, and lack of frizz in the hair being tested. The professional conditioners had a consistent affect on all hair types, while the cheaper brands improved the straight hair, but left the curly hair frizzy.

Project Number: SCH027

Grade: 12

Title: Oxi. in Various Nut. Caused by EMR

Abstract: This experiment will examine one of the health concerns related to microwave use, oxidation in nutrients. The concern is that upon being oxidized, an oxidation chain reaction will occur that will eventually cause oxidation in the lipids of the cell membrane, making them brittle and ineffective at transferring nutrients. This experiment tested for oxidation in 5 nutrients, one from each category. Three indicators with different Electrode Potentials (E) were put in solution with the tested nutrients, which were then exposed to microwaves for 60 seconds at 10-second intervals. Oxidation was detected in Calcium and Thiamine.

Project Number: SCH028

Grade: 12

Title: The Efficiency of Alternative Fuels

Abstract: I tested the efficiency of alternative of E85 compared to that of 87 octane gasoline and to pure ethanol. To do this I first set up a calorimeter and found the heat each produced. I was then able to calculate the efficiency by dividing the heat by the change in mass of the fuel.

Project Number: SCH029

Grade: 10

Title: Sugar Vs. Water in Fruit

Abstract: Try to find the relationship between Sugar and Water in Fruit. Use calorimeter to calculate the energy content. Dissolving sugar into methanol. Put silver nitrate into fruit solution, then recrystallize.

Project Number: SCH030

Grade: 10

Title: Ice Nucleating Protein

Abstract: Testing the effect of ice nucleating protein on distilled water and various salt concentrations.

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Project Number: SCH031

Grade: 10

Title: The Creation of Flourite

Abstract: Although Flourite does not have a complicated chemical formula, it was difficult to produce in lab. The primary problem was to find a suitable solvent which would not react with the calcium flouride, thereby producing new products. Time for crystalization was given, producing very small crystals. Flourite was confirmed with the presence of cubic structures. To increase the size of the crystals recrystalization was necessary. The first sample of Flourite produced was used as seeding. This proved to be successful. Recrystalization and seeding together will be repeated until the desired size is achieved.

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Project Number: SCM001

Grade: 10

Title: RSA and Huffman Encryp for Anon Web Comm

Abstract: Purpose: A simple method of anonymous, secure internet communication using steganotext. Procedure: Tried solitaire encryption, then switched to RSA. Used Huffman trees to convert encoded RSA bits into keywords with pre-made tree. Data: Encryption and decryption successful. Conclusions: Experiment successful. had friend uplaod generated keywords to blog. No suspicious data trafficked. WAP monitoring showed an extra packet flow., keyword tags looked normal, successful decryption. If for network used, complete anonymity on both ends (sender & receiver.)

Project Number: SCM002

Grade: 9

Title: The Divine Soccer Ball

Abstract: The purpose of this math project was to find the golden ratio in a soccer ball. Through using the skills of measuring, cosine, and tangent, I experimented to find the golden ratio within a soccer ball. Unfortunately after experimenting with different methods, I failed to find the golden ratio within the soccer ball. The closest ratio I found to the golden ratio was 1.516:1, which is the ratio between the volumes of the pentagonal and hexagonal pyramids in a soccer ball.

Project Number: SCM003

Grade: 10

Title: Is Uncertainty Principle Right/Wrong

Abstract: A. To determine if the Heisenberg uncertainty principle is always true. B. Obtained all materials, choose a point to represent a particle, calculated velocity and distance, located where other particle would be. C. I was able to find exact location and velocity of a particle. D. The Heisenberg uncertainty principle is not always true.

Project Number: SCM004

Grade: 9

Title: Are Dolls Body Parts Struct Proport

Abstract: The purpose of my project, entitled "According to DaVinci's Vitruvian Man, are Barbie Dolls' or MyScene Dolls' Body Parts More Structurally Proportional?", is to determine if Barbie dolls' or MyScene dolls' body parts are more structurally proportional. My experiment included measuring the Barbie and MyScene dolls. After measuring, I used Leonard DaVinci's Vitruvian Man drawing to calculate their measurements that would be proportional to their height. In the conclusion, I found Barbie dolls' body parts are proportioned closer to their height than MyScene dolls.

Project Number: SCM005

Grade: 9

Title: Web Site 'Privacy Policies' - No Privacy?

Abstract: Most Web sites have privacy policies which imply that personal information is protected. Despite posted privacy policies, many sites make email addresses available to spammers resulting in unsolicited email. For example, two music sites with privacy policies appear similar. Both offer free music. Yet one is a spam trap. Using the Yahoo email service, 30 new email addresses were registered at Web sites. The spam generated was calculated by monitoring the bulk folders for each Yahoo address. The study determined that at least 20% of 'popular' Web sites with privacy policies sent spam.

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Project Number: SCM006

Grade: 9

Title: Volume of Icosehedron

Abstract: My project was finding the volume of an Icosehedron. I thought of ways to find it and used an equation I made to find the height of a tetrahedron. I used this to first find the volume of the tetrahedron. I then thought of how the tetrahedron related to the icosehedron. Then I taped twenty tetrahedrons together and it was an icosedron. So, I went back to my equation and found the volume of a tetrahedron with the same side length and multiplied by twenty to find the volume of the icosehedron.

Project Number: SCM007

Grade: 9

Title: Too Many Sites!

Abstract: Please visit exhibit for student's abstract.

Project Number: SCM008

Grade: 11

Title: Flight Simulation

Abstract: Create a realistic software-based flight simulation of a Cessna aircraft using Newtonian rigid body dynamics, an accurate flight model, and my own three-dimensional graphics engine. The aircraft will be partitioned into simplified lifting surfaces, such as elevators and wing sections. Empirical wind tunnel test data for cambered airfoils will be used to calculate velocity, attack angle, and lift and drag coefficients. The lift, drag, thrust, and gravitational forces will be numerically integrated to determine the position of the airplane. The results will be graphically rendered onto the screen in real-time, responding to user input via keyboard controls.

Project Number: SCM009

Grade: 11

Title: How long does it take to STOP!?

Abstract: Can math equations apply to people's daily driving practices? This experiment studied how a vehicle's size and velocity affects collision prevention? The investigator created models of stopping distances for a car, an SUV and a tractor-trailer when stopping for a stationary object, another of the same vehicle and a different vehicle. The results were unexpected. A vehicle's velocity affects collision prevention nonlinearly when stopping for a different vehicle or a stationary object. A vehicle's velocity affects collision prevention linearly when a vehicle is stopping for another of the same vehicle. The size of a vehicle affects collision prevention directly.

Project Number: SCM010

Grade: 9

Title: Model of Air-to-Air Combat

Abstract: Using C++, a simulation of air-to-air combat will be programs. Empty classes for the aircraft and missiles will be created. Requisite information from accurate sources will be added to the classes. Probability functions will be programmed and serves as the skeleton code for the program. Equations and values will be added so values can be calculated. The program will be compiled and debugged. The data will by analyzed and final conclusions drawn.

Project Number: SCM011

Grade: 11

Title: BioPass

Abstract: The Purpose of BioPass is to create a password system which uses the biometric data of an individuals keystroke patterns to test if a password is entered by the correct user. This Password system

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is programmed in Microsoft Visual C#. The software collects the Biometric data and then does statistical tests on the data to check if the password is correct.

Project Number: SCM012

Grade: 11

Title: Task Division Using Multi-Threading

Abstract: The purpose of my project was to discover whether using multiple processors to solve a single task was more efficient than using one processor. To make the project more specific and easier to work with, I solved Sudoku Puzzles (inefficiently) by trial and error, something that cannot be done easily with one computer. I coded a solution, executed my program using a variable number of computers, and recorded the execution times. Lastly, I used that data to conclude that it is possible to solve a task using multiple computers, but it is less efficient than using a single processor.

Project Number: SCM013

Grade: 9

Title: The Fibonacci Factor

Abstract: The purpose of this project was to discover patterns between the prime factorizations of Fibonacci numbers. By finding relationships, the goal was to eventually answer questions such as: What is the first term in the sequence that is divisible by all primes less than 50? To answer questions like this, various data tables were created relating, for instance, the fibonacci term numbers to their prime factorizations. The main discovery made was that prime numbers occurred in special increments in the prime factorizations of Fibonacci numbers. By using this knowledge, the data tables, and simple mathematics, the questions were answered.

Project Number: SCM014

Grade: 10

Title: Alg. Viral Analysis - Classify and Counter

Abstract: The purpose of my project was to create a program that would enable rapid development of counteractants to new viral diseases. This included a feature extractor, which found patterns within given nucleotide sequences, and a classifier, which used the extracted data and other physical characteristics of the viruses to categorize them into clusters. I started by using the program on a pre-classified set of data to determine its accuracy before running it on my virus dataset. When provided data for a specific virus along with the other dataset, the program was able to classify it in one of the groups.

Project Number: SCM015

Grade: 11

Title: Isolation and Analysis of Alternation in T-waves of EKGs

Abstract: The purpose of this project was to create software that enables evaluation of possible variations in T-wave amplitude between heart cycles in subjects with arrhythmias. A computer program was created and written in MATLAB language that reads an electrocardiogram (ECG) signal from a database maintained at Physionet.org. An existing program from Physionet was modified to read and view the signals. An original algorithm was developed that isolates the R-wave and T-wave, and calculates the magnitude of the T-waves for various heart cycles. The Pan-Tompkins algorithm was modified to first find the QRS complex and then to isolate the T-wave.

Project Number: SCM016

Grade: 12

Title: Comparing Investment Alternatives

Abstract: In my experiment I compared the returns of three types of investment; stocks, managed mutual funds, and index funds. I tracked the values of portfolios over the course of three years. After the three years had past, I calculated the Average Annual Growth Rate of each of the portfolio, and compared them to each other. I had hypothesized the managed mutual funds would yield the highest

SENIOR DIVISION – COMPUTER SCIENCE/MATH

average annual return, stocks the second most, and index funds the least. However, index funds actually yielded the most, managed mutual funds second most and stocks the least.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES001

Grade: 12

Title: Global Warming and Marine Life

Abstract: This project simulated the effects of melting Antarctic ice caps on copepods, a large food source in the ocean. Ratios were determined for a ten percent, fifty percent and hundred percent melting of freshwater in Antarctic ice, and fresh water was added to copepod colonies in gallon jugs. Measurements were then taken using a spectrophotometer of the growth rate of three colonies of each simulation, and three control colonies. Averages were calculated to determine trends. Overall, the higher the amount of fresh water added, the greater the disruption on growth rates of the copepod colonies although no colony was destroyed.

Project Number: SES002

Grade: 12

Title: The effect of Common Fertilizers on Algae Growth

Abstract: Please visit exhibit for student's abstract.

Project Number: SES003

Grade: 12

Title: Effects of Lithium on Euglena

Abstract: The purpose of this experiment was to determine if lithium inhibits the growth of Euglena. The concentrations of LiCl were created based on that 900 ug/L is the maximum amount of Li/L allowed in human drinking water. NaCl acts as a secondary control to demonstrate that the chloride ion has no effect on Euglena. Absorbance at 430nm was recorded daily for the 20-day duration of the experiment. The data suggested that increasing concentrations of lithium decreased the absorbance of Euglena after 20 days. There is no statistical evidence to support that lithium had any effect on the Euglena.

Project Number: SES004

Grade: 9

Title: Effects of Pesticides on Algal Populations

Abstract: The purpose of this experiment is to test the effects of pesticide runoff on algae. There are 32 test tubes. Different combinations of pesticide and water along with 2 mL of algae and 1 mL of spring water will be added to each tube. The absorbances will be tested each day. The data strongly suggests that the null hypothesis can be rejected except for the control.

Project Number: SES005

Grade: 9

Title: Do gas stations affect the soil?

Abstract: Please visit exhibit for student's abstract.

Project Number: SES006

Grade: 12

Title: The Effect of Various Sanitizers on Pool Water

Abstract: There are many types of sanitizers for pool water and consumers usually use one type, chlorine. I thought it would be interesting to find out which prominent sanitizer would be the best based off of pH, alkalinity, algae control, and cost. Chlorine, bromine, and ozone were put in three containers. I hypothesized ozone would be the best sanitizer and tested my variables by checking on the water once a week four times and took samples to a lab where I measured algae. Ozone was the best sanitizer. If I could expand, I would use more sanitizers and larger pool models.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES007

Grade: 12

Title: The Effect of Landscaping and Insulation on Energy Consumption

Abstract: In my project I am testing the effectiveness of landscaping and insulation on energy consumption. I am using two scale model houses and seeing which one, landscaping and or insulation, is going to keep the house cooler in the summer time and warmer in the winter. I did three trials recording each temperature in degrees Celsius. The insulation does help keep the houses warmer in winter and the landscaping does keep the houses cooler in the summer.

Project Number: SES008

Grade: 10

Title: Effect of NaHCO₃ and Temp on O₂ Production in Elodea

Abstract: This experiment was carried to study the effects of temperature and CO₂ on the rate of photosynthesis (PS) of Elodea (Anacharis). Using 2%, 5% and 10% bicarbonate solutions as a source of CO₂, a statistically significant difference was shown between the control and experimental groups in the 2% (p-value < 0.0008), 5% (p-value < 0.008), but not the 10% (p-value = 0.157). In addition, the pH and temperature were studied. There was a positive relationship between temperature and the oxygen concentration. The pH was significantly different between the two groups, i.e. as the rate of PS increased, the pH increased (p-value < 0.0001).

Project Number: SES009

Grade: 9

Title: Water Quality

Abstract: The purpose of this experiment was to determine how factors in the environment contribute to the contamination of raw water. I collected water samples from Little Buffalo Creek (rural area), Pine Creek (suburban area), and the Allegheny River (urban area). I tested each sample for bacteria, pesticides, nitrates, hardness, and pH. I compared the results to the EPA maximum standard to determine if the contaminants were present at a relatively safe level or not. I then traced each water source and was able to conclude what environmental factors could be contributing to each source's specific type of contamination.

Project Number: SES010

Grade: 11

Title: SOM and Soybean Fields

Abstract: Soil organic matter (SOM) can be a source or sink of greenhouse gasses. This experiment compared the SOM in a perennial switchgrass field and annual row-crop field with soybeans. 30 samples were collected from 5 locations in each field and 3 depth intervals at each location. Soil color, texture, and SOM were determined using a Munsell color chart, texture-by-feel method, and loss-on-ignition method. Data was compared with Penn State's 1939 soil survey. More switchgrass than soybean samples had higher SOM than expected from the survey, suggesting that more carbon was sequestered in the switchgrass than the row-crop field since 1939.

Project Number: SES011

Grade: 12

Title: Herbicides and Soil Enriching Bacteria

Abstract: I tested the effects of the insecticide Tryclopyr on the soil enriching bacteria, Bacillus subtilis. I did this using sterile vials filled with sterile soil. I introduced the bacteria, Bacillus subtilis. I then introduced the herbicide and plated samples from the vials to see the effect of the herbicide. I found that the herbicide actually had no effect negatively or positively on the bacteria, Bacillus subtilis. I ran a statistical analysis and found that my results were true and not due to chance and that the results I found were proved to be true statistically.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES012

Grade: 9

Title: Volts vs. Wave Frequency

Abstract: This experiment involves using a stroboscope to measure the wave frequencies. The purpose of this experiment is to find out if the magnitude of the earthquake affects the velocity of the wave. First, I set up the generator, and then used the stroboscope to measure the frequency of the wave. My data was supported; the increase in voltage does affect the wave frequencies. My conclusion was supported by my data and my experiment was successful.

Project Number: SES013

Grade: 9

Title: Changing Salt Water to Freshwater

Abstract: The purpose of this experiment was to change salt water into fresh water. The procedures of this experiment included building a glass contraption that would enclose a small bin of salt water. The salt water would then take on both the processes of evaporation and condensation that would then remove the fresh water, but leave the salt. For two consecutive weekends the project was conducted, but only a teaspoon of fresh water was collected. In closing, if the glass contraption would have been sealed better, perhaps more fresh water would have been collected.

Project Number: SES014

Grade: 11

Title: CO₂ and the Greenhouse Effect

Abstract: Please visit exhibit for student's abstract.

Project Number: SES015

Grade: 11

Title: The Effects of Deicers on the Growth of Chlorella

Abstract: I tested to find the effects of Sodium Chloride, Calcium Chloride, and Safe Paw Ice Melter on the effects of algae. I made 1, 5, and 10% concentrations of each deicer and measured the absorption of light through each concentration at various wavelengths.

Project Number: SES016

Grade: 9

Title: Temp. Affects Frog Spawn Metamorph

Abstract: Please visit exhibit for student's abstract.

Project Number: SES017

Grade: 9

Title: Global Warming : CO₂ and Mold

Abstract: This experiment simulated changing environmental conditions to determine how an increased concentration of CO₂ in the atmosphere might effect the growth of simple life forms. It used small-scale models contained in canning jars with either an ambient gas blend, 50% CO₂, or 100% CO₂. Nonphotosynthetic bread mold was measured in each jar. Mold grew significantly in the ambient gases at a reduced rate in the 50% CO₂ samples and not at all in an all- CO₂ environment. Temperature changes were insignificant. The experiment indicated that CO₂ deters or prevents the growth of mold.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES018

Grade: 11

Title: Nematomorphology

Abstract: The purpose of this experiment is to investigate what effect a nematomorph has on the behavior of a living creature. The procedure used was: gather information on nematomorphs, create two identical habitats, place an equal amount of the creature into each habitat, place the snails into the other environment, and observe the difference in the behavior of each group. From the minimal data collected, it can be concluded that in the beginning stages of infection, nematomorphs have no effect on the chirping rate of a cricket.

Project Number: SES019

Grade: 11

Title: Arsenic Removal From Water

Abstract: The purpose of this experiment is to determine if aquatic plants can be used to remove arsenic from the water, which drains from fly ash deposits. I placed water hyacinth and water lettuce into distilled water and rainwater, each containing arsenic. I then removed samples every thirty minutes for eight hours in my first experiment and every four hours for thirty-two hours, changing the test water every eight hours. In my second experiment, I determined the concentration of arsenic in each sample. Both the water hyacinth and water lettuce significantly reduced the concentration of arsenic from the contaminated water.

Project Number: SES020

Grade: 9

Title: Hot House 2

Abstract: Please visit exhibit for student's abstract.

Project Number: SES021

Grade: 11

Title: Energy Efficiency of Sedum Roofs

Abstract: The purpose of this experiment is to test the abilities of a sedum roof to efficiently maintain a cool internal building temperature while the external environmental temperature increases. Five wooden boxes were constructed with black control roofs. An additional five boxes were created using green roof materials. Each roof top was exposed to an external temperature of approximately thirty degrees Celsius for ninety minutes. The internal temperatures were recorded, showing a greater increase among the control roofs. A statistical analysis of the data proved that the sedum roofs maintained a significantly lower temperature than the flat black roofs.

Project Number: SES022

Grade: 9

Title: The Effect of Acid Rain on Chlorella

Abstract: My purpose for doing this experiment is to see what effect acid rain would have on freshwater ecosystems. To conduct my experiment, I first set up the colorimeter to measure absorbance. I made simulated acid rain with sulfuric and nitric acids. Finally, I measured the percent absorbance of the chlorella after it was exposed to each acid rain solution. After conduction my experiment, I came to find that the sulfuric acid showed the highest absorbance, followed by the nitric acid, and then regular rain water.

SENIOR DIVISION – EARTH/SPACE/ENVIRONMENT

Project Number: SES023

Grade: 9

Title: Effect of Salt on Photosynthesis

Abstract: Each year, tons of salt is put on roads in the winter in order to melt snow and ice. This salt is washed off of roads and goes into the surrounding waterways. Salt pollution can have a variety of effects on plants and animals in aquatic environments. In my project, I am testing the effect of salt, NaCl on the photosynthesis of elodea leaves. The two experimental groups consisted of 50 samples in concentrations of 0.3M and 0.6M and a control of 50 samples in demonized water. Elodea plants of similar size and number of leaves were placed in 50ml test tubes and sealed with rubber stoppers in which pipets were inserted. As the plants inside the test tube photosynthesized, oxygen was produced displacing water, which traveled up the pipet. By observing the difference in water level of the pipet, the rate of photosynthesis can be determined. Each trial consisted of 10 experimental samples, 5 of 0.3M salt water and 5 of 0.6M salt water, and 5 control samples. The trials lasted two hours, with the rate of photosynthesis recorded for each sample every 30 minutes. As a result, I found that increased salt concentration had a detrimental effect on phosynthesis of Elodea plants.

Project Number: SES024

Grade: 12

Title: The Effects of Soil Pollution on the Surrounding Environment

Abstract: Through experimentation I hope to confirm the presence of fly ash in my community's soil. In order to obtain these results I shall collect soil from the pre-existing fly ash dump and the surrounding community. These samples will then be tested to detect the presence of fly ash. By confirming or disproving the presence of fly ash in the soil I hope to be able to make a judgment bout the safety of having a fly ash dump so close to a town.

Project Number: SES025

Grade: 12

Title: Ecological Water Quality Test Through Necturus m. maculosus

Abstract: The purpose of this experiment is to demonstrate the quality of Pennsylvania's waterways through the Mudpuppy, Necturus m. maculosus. Being amphibians, these animals are closely related to the environment and their presence is synonymous with a healthy ecosystem. I used six specimens, separating two to each five gallon aquarium, which contained Allegheny River water, Ohio River water, and Lake Arthur water, respectively. I allowed the animals to live in the tanks for two months. I fed the animals and changed water regularly as well as noting growth and changes throughout the experiment.

SENIOR DIVISION – ENGINEERING/ROBOTICS

Project Number: SER001

Grade: 11

Title: Sustainable Solar Water Generator

Abstract: A sustainable solar powered water generator was constructed from a Peltier cooler, a fan, a 12-volt battery and a 40 watt photovoltaic solar panel. Repeated outdoor tests were used to prove that the system is capable of collecting water from the atmosphere at a rate of 7 ml/hour. Improved system performance was achieved as the dew point approached ambient temperature. System power demand and solar panel performance were evaluated to show that a total of 80 watts of solar panel are required for assuring sustainable performance over a wide range of solar exposure conditions.

Project Number: SER002

Grade: 11

Title: Robotic Navigation 2: Sensing Danger

Abstract: This project focuses on development of an autonomous robot utilizing multiple sensing systems to interactively detect and react to objects. I designed interfaces for ultrasonic and infrared sensing devices, built the robot, and tested it multiple times in different environments. Multiple tests showed that the robot used both sensing devices, providing accurate ranged detection in multiple trials, as well as interactive handoff of the robot's drive mechanism. In free-running tests, it responded in a similar fashion to the controlled experiments. This research aids development of unprogrammed robots capable of using multiple sensory devices to detect objects in their paths.

Project Number: SER003

Grade: 12

Title: Linaritis

Abstract: Synthesizing Linarite was the focus of this research. The chemical formula for Linarite is $Pb,Cu(SO_4)(OH)_2$. Characteristic color is navy blue. The approach was that of solutions chemistry. Appropriate solutions had to be prepared, concentrations calculated, and the solutions had to be combined in an effective sequence. Approximate time for the mineral was 21 days. Inclusion of a common ion proved to be inadequate, and therefore was discarded. The existence of Linarite was proven by confirming that it had the correct color, structure, streak, and composition. Synthetically, Linarite was produced.

Project Number: SER004

Grade: 10

Title: Faux Snow

Abstract: The purpose of this project was to evaluate the characteristics and behavior of artificial snow. Samples of sodium polyacrylate were used. Visual and quantitative observations were made on the sodium polyacrylate. It was found that rehydration extended normal evaporation time. It affected the appearance of the snow in that it looked more like ice. Rehydration decreased compressibility and photo sensitivity, it did not evaporate as much as the hydrated. Rehydration also prolonged the usage time of the faux snow making the need for replacement less frequent. Although water is necessary to form faux snow rehydrated once for maximum efficiency.

Project Number: SER005

Grade: 12

Title: Tampering with Topaz

Abstract: The mineral Topaz has been known for at least 2,000 years. It is one of the gemstones which form the foundations of the twelve gates to the Holy City of the New Jerusalem. To date, Topaz has been found in various shades of yellow-brown, blue, and green. Color varies by impurity and/or irradiation. This research involved the synthesis of Topaz in these various colors. The chemical composition is

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$\text{Al}_2\text{SiO}_4(\text{F},\text{OH})_3$. The solutions had to be prepared, irradiated, and combined in an appropriate sequence. The production of Topaz was verified by confirming range of luster, crystal habit, and streak.

Project Number: SER006

Grade: 12

Title: Naval Architecture - Hull Resistance

Abstract: "It is the duty of the naval architect to design ships with hull forms having low resistance when they move through water" (Harvland 1). The inverted-vee hull-form provides a stable and maneuverable platform supported by hydrodynamic lift. An alteration in deadrise angle relates directly to hull-shape, yielding a corresponding effect on carrying capacity and power requirements. A study of deadrise effects is imperative to the optimization of such a hull-form and analysis is conducted both mathematically and experimentally. Resistance testing within a re-circulating water channel reveals a direct, quantized correlation between deadrise angle and residuary resistance.

Project Number: SER007

Grade: 12

Title: The Effect of Residential Roof Truss Designs on Structural Efficiency

Abstract: This experiment was designed to test structural efficiencies of different truss designs and pitches used in residential housing. Models of three different truss designs - the Howe, Fink, and King Post - will be built and crushed by a testing rig to determine efficiency. Each model will be built in four/twelve, five/twelve, and six/twelve pitch. The Howe will be the most efficient structure. Because of trusses' foundation in low-pitch roofs, the four/twelve pitch will work best; therefore, the Howe truss with the four-twelve pitch will be best overall. Results will show the accuracy of my claim.

Project Number: SER008

Grade: 10

Title: If it were done differently

Abstract: The purpose of this project was to simulate the effects of impact on a building and to improve on that structure to minimize damage. A scale model of the N.Y. Trade Center was built and a weight was used to simulate plane contact with the structure. The damage done to the model was similar to the actual event. Only 25% of the building remained standing. When the structure was modified and retested only 33% of the original damage reoccurred. As a result, necessity dictates that architects are required to consider the possibility of impact into their designs.

Project Number: SER009

Grade: 12

Title: A Proposed Design for a Longer Lasting, Rechargeable Battery

Abstract: The common rechargeable battery has been used as a reliable source of power for many years. During my research on this project I discovered that while rechargeable batteries can be recharged, they lack the power of traditional "primary cell" batteries. It was my goal to design a rechargeable battery that lasts longer than other rechargeable batteries thus bringing the usage of rechargeable batteries into regular practice. I primarily used the internet as my key resource to determine the materials and design of my battery. I am still designing the battery and future work includes possibly constructing my designed battery.

Project Number: SER010

Grade: 11

Title: A Robotic Arm

Abstract: Legos will be used to build a robot that functions like a prosthetic arm. It will be programmed to perform various movements and functions. Its ability to perform these functions will be tested. The robot will be adapted to improve function.

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Project Number: SER011

Grade: 9

Title: 3 Penny Radio

Abstract: My project is the three penny radio and here is what it is and how I made it. It is a radio that uses three pennies to stabilize itself. I made it by first getting all the materials that I need. Then, I printed off the instructions off line to make the base the base model of the radio (the purpose of this project is to build the base model and then improve on that base model.) Next, I made sure that the base model worked before I improved on it. Then I added a loop antenne to give the radio better reception. Next, I added an on and off switch so that when you want to turn off the radio you don't have to take the battery out or put it back in to turn the radio on. Then, I mounted the radio in a wooden box. Next, I made a mount for the antenna so I could put that on the box also. Then, put the tuner on the box too so that everything on the radio is accessible from outside the box. Then, I found a conch shell and drilled a hole in it so that I would be able to stick an earphone in the shell and it works like an amplifying system. Finally, I painted my poster and then printed out all of the paperwork that had to go on it and then glued everything on. That is what my radio is and how I made it.

Project Number: SER012

Grade: 12

Title: Nanotechnology vs. Nature

Abstract: The project is to test just how far man has come in the field of material sciences. My hypothesis is that The Nano-Tex™ will drastically out perform the natural fabrics, wool, cotton, linen, and silk, that that the wool will be the most absorbent, and that the ethanol will be the most greatly absorbed of the chemicals. The experiment will be conducted finding the volume absorbed of each chemical by each fabric through numerous tests. The data will then be statistically analyzed to determine to what extent, if any, the Nano-Tex™ is superior to the natural fabrics.

SENIOR DIVISION – MEDICINE/HEALTH/MICROBIOLOGY

Project Number: SMH001

Grade: 12

Title: The Effect of the Reuse of Various Plastic Bottles on Bacteria Growth

Abstract: Many people believe it is more efficient to reuse their plastic bottles over and over again, but are they really just harming themselves. The idea behind this project is to figure out whether or not it is healthy to reuse plastic bottles. Four different types of drink bottles were used which were water bottles, soda bottles, sports drink bottles, and iced tea bottles. To find out which bottle grows bacteria the bottles were swabbed and then refilled with tap water. Though the experiment is still in the process, this project could open a new way of thinking for some people.

Project Number: SMH002

Grade: 9

Title: Which Disinfectant Inhibits Bacteria Best?

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH003

Grade: 9

Title: Dirty Pop

Abstract: Is there more bacteria on a soda can rim from a vending machine or a can from a 12 pack bought in a store? I predicted there would be more bacteria on the rim of a soda can from a vending machine than from a can out of a 12 pack bought in a store. I used four cotton swabs to swipe the rims of the four cans, two from a pop machine and 2 from a cardboard box. I wiped each cotton swab in a Petri Dish and stored the dish in an incubator at 37 degrees for five days. Plates were evaluated and photographed after 24 hours, 48 hours, and 120 hours. (5 days) I selected one culture for gram staining. A survey was distributed to 100 high school students about how they drink soda, how often and where from. My conclusion to this experiment was that there was more bacteria on the soda can from the vending machine than the soda can from the 12 pack.

Project Number: SMH004

Grade: 9

Title: Whitest of the White

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH005

Grade: 9

Title: The Eff. of Diff. Forms of Antibiotics

Abstract: The purpose of this experiment was to find out which antibiotic was more effective, liquid or pill. For this experiment, I used tryptic soy agar and Staphylococcus epidermidis. First, I created the well for the antibiotics using a straw tip. Next, I applied bacteria to the surface of the remaining agar. I then filled each well with 100 mg of the antibiotic that was marked on the plate. Finally, they were taped shut and placed in an incubator, set at 27 degrees Celsius, for 48 hours. After this, a zone of inhibition was taken for each section. When I looked at the plates, I could see very little bacteria on the two antibiotic sets of plates. My control plates (the saline solution) was covered with bacteria. After running statistics, I found that there was a difference in the two antibiotic's zone of inhibitions, but not a significant one. So to summarize, the pill antibiotic was a little more effective than the liquid antibiotic, but the margin was too small to make any difference.

Project Number: SMH006

Grade: 10

Title: Can E. Coli be Resistant to Triclosan?

Abstract: Please visit exhibit for student's abstract.

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Project Number: SMH007

Grade: 12

Title: The Effects of Soy on Psoriasis

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH008

Grade: 11

Title: Simple Mask for Flu Protection

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH009

Grade: 10

Title: VSV Treatment on Prostate Cancer

Abstract: The purpose of my project was to experiment with VSV F and GFP on prostate cancer cell line DU145 to evaluate which VSV is a more potent thereapeutical agent. -Procedures used include cell recovery, cell planting in welled plates, cell counting, observation of cell morphology under microscope, MTT assay, and DNA laddering. -Data include diagrams of cell morphology, line graphs representing apoptosis comparisons, DNA laddering charts, and also tables of spectrophotometer measurements after MTT assay. In conclusion, the VSV F was a much more efficient oncolytic agent due to its glycoprotein F that aids in cancer treatment.

Project Number: SMH010

Grade: 9

Title: E. coli Outbreak!

Abstract: The FDA hypothesized causes for the outbreak of E. coli in spinach. This experiment was designed to prove which of these hypothesized causes is most likely. In my hypothesis, I trusted the FDA stating that unwashed produce was the most probable cause of the outbreak. The experiment was conducted in two phases. The first phase was growing spinach plants (24) in separate groups (4), some with E. coli, some without. The second phase of the procedure was to transfer the bacteria onto agar plates and then culture the bacteria. In the end, the conclusion was that washing predominantly reduces the bacteria level on the exterior of produce, but there can also be E. coli within the plant.

Project Number: SMH011

Grade: 11

Title: Energy Drinks Effect on Heart Rate

Abstract: This experiment was done to show that energy drinks really do lower a person's heart rate after exercise compared to water or a sports drink. I ran on a treadmill for ten minutes, then drank a half a cup of liquid, then ran another ten minutes, after running my pulse was checked. Red Bull kept the heart rate the lowest, water kept it the highest. The only problem was that the energy drinks will wear a person out. In conclusion the hypothesis was correct by saying that energy drinks lower heart rate but the effects of them are highly dangerous.

Project Number: SMH012

Grade: 9

Title: The Effect of Salinity on Infectivity of T2 Phages

Abstract: The question addressed was that would changes in salinity of sea water, brought on by the rapid melting of sea ice, affect the infectivity rates of T2 bacteriophages. The hypothesis was that changes in salinity would affect the infection rates of T2 phages. To test this hypothesis, T2 phages were suspended with E. coli B on sterile plates in agar. I concluded that changes in salinity will affect the infectivity of T2 phages. This was based on the data collected, and the ANOVA statistical analysis. As the concentration of the sea water decreased, the infection rate increased.

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Project Number: SMH012

Grade: 9

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Project Number: SMH013

Grade: 12

Title: Baby Food Genetically Modified?

Abstract: The purpose of this investigation is to determine if baby foods contain genetically modified. If baby foods are tested for genetic modification, then the foods labeled as “Organic” or “No Genetically Engineered Ingredients” will not contain genetic modification because the Food and Drug Administration (FDA) specifically requires accurate labeling of food products. Gather all materials. Mass out 0.1 g of each product in weigh boat. Grind each product into a fine powder with mortar and pestle, and then place into microcentrifuge tube. Add 200µL of ultra pure sterile water into tube. Add 100µL of extraction buffer to each sample. Heat at 60 C for 10 minutes and then incubate on ice for 10 minutes. Centrifuge 10 minutes 15,000 RPM. Remove supernatant and add to a spin column. Centrifuge at 10,000 RPM for 10 minutes. Remove supernatant and add to a fresh spin column. Add 2mL of 70% ethanol to the spin column and centrifuge at 10,000 RPM for 10 minutes. Add 50µL of ultra pure sterile water to the spin column and allow for it to incubate for 10 minutes. Spin at 10,000 RPM for 5 minutes to pellet the DNA at the bottom of the tube. Take one PCR bead in a 0.5mL PCR tube. Label tube and place in rack. Add 5µL of each food product DNA to the tube. Add 2µL of primer to the tube. Add 18µL of ultra pure sterile water to the tube. Add one drop of mineral oil. Place in the PCR cycler machine. Heat the samples at 90 C for 5 minutes. PCR cycle is 94 C for 20 seconds for denaturation, 54 C for 40 seconds to allow the primer to bind to DNA, and 72 C for 1 minute for synthesis of DNA fragment. Run for 40 cycles. Take a 1% agarose gel in a gel box containing 1XTBE buffer. Take 5µL of each sample and mix with 2µL of loading dye. Load each sample and DNA markers into the wells of the gel. Attached gel box to the power supply and run at 100 volts for 1 hour. Photograph gel on UV light box. Look for presence of Soy lectin gene, indicating genetic modification has taken place. The originally hypothesis, if baby foods are tested for genetic modification, then the foods labeled as “Organic” or “No Genetically Engineered Ingredients” will not contain genetic modification because the Food and Drug Administration (FDA) specifically requires accurate labeling of food products states was not supported by my data. The Organic Rice stated that it was not genetically modified but was found to have some sort of genetic modification. Perhaps some genetically modified soy product got mixed in with the organic soy.

Project Number: SMH014

Grade: 11

Title: Affect of Texture on 5 Sec. Rule

Abstract: Have you ever wondered if the 5 second rule works? Well that's what I've decided to test. I used baking flour, Swedish fish and different textured surfaces to perform my experiment. My data shows that the smoother the texture the more baking flour that transfers. In conclusion I've proven that the 5 second rule does not work, and would advise no eating off of dirty objects, especially smooth ones.

Project Number: SMH015

Grade: 12

Title: pH and TAML Antiviral Efficacy

Abstract: The purpose of this investigation was to determine if pH affects the ability of TAML, and environmentally friendly catalyst, to deactivate T2 phages. It was hypothesized that increasing pH

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increases viral inactivation. To test the hypothesis, TAML and hydrogen peroxide were combined in various concentrations with T2 phages. After 5 minutes, the reaction was quenched with catalase. All appropriate controls were performed to show that the variables without hydrogen peroxide did not affect inactivation. Aliquots of T2 phages were combined with E. coli and top agar and spread on sterile LB agar plates. The results of this study indicated that TAML optimally deactivates viruses at a neutral pH.

Project Number: SMH016

Grade: 9

Title: You Are My Sunshine

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH017

Grade: 12

Title: A Novel Antiparasitic Sterilization Technique for Contact Lens Cases

Abstract: This project was designed to simulate novel prevention techniques to inhibit Acanthamoeba keratitis from entering a human cornea through a contact lens/case related medium. The purpose is to find the most efficient technique to prevent the disease from affecting a human individual. Procedures involving anti-microbial solutions as well as superheated steam will be tested on a surrogate disease in a laboratory. Data on zones of inhibition, growth curve effects, and survivorship will be compiled and analyzed to find the most efficient solution. The solution may be implemented as a publicly used product.

Project Number: SMH018

Grade: 9

Title: Antibacterial Prod and Antibiotic Res

Abstract: This experiment sees if bacteria become resistant to antibiotics when exposed to antibacterial agent. I autoclaved agar, infused triclosan into it, and then put it onto plates. Then I swiped e-coli onto the plates. I incubated plates for 24 hours and took the bacteria from plates and put it on new plates. Then I will test different antibiotics discs against the bacteria to see if the bacteria is resistant to the antibiotics. Data was gathered and recorded and statistics tests run. At this time conclusions are indefinite and further research and discussion will be completed with microbiologist.

Project Number: SMH019

Grade: 12

Title: A Study of Arthroscopic Knee Surgery

Abstract: Through this experiment, I hope to prove whether or not professional physical therapy produces a shorter healing time for recovering surgery patients than home physical rehabilitation. Also, I will determine whether or not the particular procedure performed has any effect on recovery time. To come to this conclusion, I plan to first gather information and categorize patients by the severity of injury. Then I will determine which ones will go through which type of surgery. I will measure range of motion and effusion before and after surgery. With this data I will be able to make a conclusion.

Project Number: SMH020

Grade: 9

Title: Chocolate Anyone?

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH021

Grade: 11

Title: The effect of UV light on DNA mutation

Abstract: UV light has an effect on DNA, but I wanted to test to see if the amount of time exposed to UV light made a difference. I statistically proved that the Serratia marcescens exposed for forty-five minutes

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was affected more than all the other time slots. Not all time increments had a significant change. The increases in time of five minutes did not have a significant effect. Therefore, it can be seen in this experiment, that the time must be increased by at least fifteen minutes to be significant.

Project Number: SMH022

Grade: 10

Title: E. coli Detection with LAMP

Abstract: I tested an innovative assay using LAMP (Loop-mediated Isothermal Amplification) technique for detection of Escherichia coli (E. coli). Seventy urine samples previously tested for E. coli by standard bacterial culture method constituted the study material. Genomic DNA was extracted from each sample. I then performed LAMP reactions using E. coli-specific primers. LAMP data, compared with culture results, yielded a sensitivity of 82.4%, specificity of 100% and accuracy of 95.7%. The test's specificity and accuracy were above the 95% threshold for a reliable test, but the sensitivity was below. Possible reasons include DNA degradation, reaction inhibitors, and gene mutations.

Project Number: SMH023

Grade: 12

Title: The Effect of Different Exercises on Carbon Dioxide Output

Abstract: This experiment is being conducted to determine which type of exercise or combination of exercises has the greatest carbon dioxide output. The test subjects will engage in various exercises and then breathe into respirometers to determine the amount of CO₂ in their breath. The amount of CO₂ will be determined by a pH colorimetric test. The time recorded for the test subjects to breathe into the respirometer and change the color of the pH solution will determine how much CO₂ is in their breath. Heart rate will also be recorded to compare with the CO₂ output for a relationship.

Project Number: SMH024

Grade: 10

Title: The Effect of Various Contact Lens Solutions on Fungal Candida Albicans

Abstract: In April 2006, Bausch and Lomb removed its ReNu MoistureLoc contact lens solution from American shelves because of its linkage with a recent outbreak of fungal keratitis caused by fusarium. In my experiment, I will test the antimicrobial effectiveness of said solution, along with three others in inhibiting the growth of candida albicans. I will treat potato dextrose agars with contact lens solution, and will then attempt to culture said fungus on the treated petri dishes. The effectiveness of the solutions will be tangibly measured by the number of colonies as compared to cultures that are allowed to grow uninhibited.

Project Number: SMH025

Grade: 12

Title: The Effect of Various Electrical Currents on E. coli

Abstract: This experiment will determine the effect of various electrical currents on Escherichia coli bacteria. This will be investigated by inserting inert electrodes into the agar of prepared E. coli cultures, and transmitting a broad range of electrical currents across the plates. Four variables will be employed during this experiment, individually testing the effects of high-volt AC, low-volt AC, high-volt DC, and low-volt DC on the E. coli growth. The control group will not be exposed to electricity. This project has potential medical applications in sterilization, as it could yield bactericidal results. All results will be analyzed statistically to determine the effect of electrical current on E. coli.

Project Number: SMH026

Grade: 10

Title: Effect of Antibiotics on Bacteria Count

Abstract: Ampicillin has been used to inhibit the growth of bacteria. The purpose of the experiment was to better understand how various concentrations of ampicillin would inhibit the growth of E. coli and find

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the optimal concentration of ampicillin to use. An experiment was designed to test the effect of ampicillin on bacteria growth. Two methods were used for the experiment; one used Luria-Bertani (LB) agar, the other used LB broth as a growth medium. The result showed that the amount of E. coli growing decreased as the concentration of ampicillin increased. Results were consistent in all trials of both methods.

Project Number: SMH027

Grade: 12

Title: Salvinorin A and Learning

Abstract: Study to determine if a relationship exists between high-dose administration of the active compounds of Salvia Divinorum and performance on reinforced spatial memory tests by rats; a decrease in performance is taken to signify acute neurological damage.

Project Number: SMH028

Grade: 10

Title: Tea Effects on Prostate Cancer Cells

Abstract: Cancer is one of the leading causes of death in the U.S. If only a simple habit, such as drinking green tea, could actually prevent a person's chances of being diagnosed with cancer, then the overall health and longevity of people could increase. In this study, I examined the toxicity of green tea against prostate cancer cells by quantifying the cell survival with hemocytometry and examining the cell deaths with flow cytometry analysis. I found that green tea induces concentration-dependent cell death. Apoptosis is the primary form of the tea-induced cell death.

Project Number: SMH029

Grade: 9

Title: Staph vs. The Staff

Abstract: My project was done to determine if the sanitizer a school uses effectively cleans dangerous bacteria from the football equipment from my school and if the bacteria remains on the playing field after games. I hypothesized that there would be a presence of Staphylococcus aureus on the equipment and on the playing surfaces from four schools. I took a type of growth plate and inoculated them from different places on the helmet and shoulder pads of the players and the field. They were then placed in an incubator at 35 degrees Celsius and observed after 24 and 72 hours.

Project Number: SMH030

Grade: 11

Title: The Use of Natural Products Synergism to Control E. Coli

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH031

Grade: 9

Title: Iron In Cereals

Abstract: "Do all cereals that say they have 100% US RDA for Iron really have the same amount?" That is my question. I hypothesized that the cereal "All-Bran" would have more or less Iron than the other cereals. A description of the procedure is that I would first measure out 1½ cups of cereal that has already been crushed, and 1½ cups water. Then mix the two together and put a magnet into the mixture for five minutes. I would then move the magnet throughout the mixture and weigh the magnet before and after. The results did not support the hypothesis.

Project Number: SMH032

Grade: 10

Title: Oral Hygienics

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Abstract: I wanted to know if using a basic water rinse, tooth brushing with tooth paste and then a rinse of mouthwash would continually reduce the amount of bacteria in the mouth. Petri dishes with agar were used to identify bacteria from the three samples. The inoculated petri dishes were placed in an incubator for three days allowing the bacteria to grow. The bacterial colonies decreased with each additional cleaning of the mouth. My hypothesis was accepted. I enjoyed doing this experiment as it required many more petri dishes to be used. I began finding ways to do this more efficiently.

Project Number: SMH033

Grade: 9

Title: How Clean Are Your Hands?

Abstract: The purpose of my experiment was to see if hand sanitizer or hand wipes worked best. For my procedure, I put glow gel on 30 people's hands, and then I put them under a black light to see how many germs were on their hands. Then they rinsed them off with water only and then put their hands under the black light again to see how many germs were left. Then they put hand sanitizer on their hands, and then put them under a black light to see how many germs were left after that. Finally, they rubbed hand wipes on their hands and put them back under the black light to see how many germs were left after that and then I compared which product worked best. My conclusion was that Hand wipes work better than hand sanitizer on killing germs on hands.

Project Number: SMH034

Grade: 11

Title: Exercise Effects Body Temperature

Abstract: The problem that I wanted to find out was what the differences in body temperature would be when I ran for different amounts of time. I would take my temperature, wait for 5 seconds, run for the amount of time, wait another five seconds, and then re take my temperature. I imagined that when I ran for ten minutes my temperature would have the greatest increase, I was correct. The greatest temperature change was 1.3 F. Just running for those short amounts of time has increased the amount of time I can run.

Project Number: SMH035

Grade: 12

Title: Comparing sequences of PA Strains

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH036

Grade: 10

Title: How our Health is affected from being physically active in the Modern World.

Abstract: The project that I am doing is based on the comparison of physically activity that occurs in our human society. Our world has changed by numerous reasons about people not doing physical work or activity. The reasons would be the increase of technology that we use that make us to less physical work, people don't have the time, they don't know what to do, they become to lazy to do it, etc. Also, the change of our human society in physical activity changed from the past till now, and we try to find out what caused the change how we don't change it in the future. The purpose of this experiment is to try and understand the comparison of human society in physical activity, what are the causes of lacking physical activity, and the importance of physical activity in our daily lives. The procedures are researching the cause of physical activity, like diseases and disorders in your body. Finding articles and related research in dealing with physical activity. Also, seeing the change of our human societies in physical work or activity. It has been said in data that the past had more physical work than we do now because of an increase of technology, and the laziness we are. All in all, my project shows the differences of our human health in being physically activity form the past till now. The changes in our society in being more physically active instead of us being coach potatoes. Doing physical activity or work makes you a healthier person.

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Project Number: SMH037

Grade: 11

Title: Antioxidant Properties of Resveratrol

Abstract: Observing the antioxidant properties of resveratrol in liver microsomes using spectra analysis

Project Number: SMH038

Grade: 10

Title: The Effect of Plant Extracts on Cancer Cell Proliferation

Abstract: Cancer is one of the leading causes of death in the world. The current treatments of cancer such as radiation and chemotherapy are associated with very harmful side effects. Thus, there is an ongoing interest in using natural products for medicinal purposes, such as the treatment of cancer. I tested three potential anti-cancerous plant extracts (Crocetin, Curcumin, and Mistletoe Lectin) on the growth and viability of breast cancer cells. Different concentrations of the plant extracts were added to cell culture plates containing growing breast cancer cells. The plates were incubated in a humidified atmosphere at 37°C in a cell culture incubator. As a negative control, a culture plate with no added plant extract was included. The cell proliferation was measured by MTT assay. The experiment was repeated once and included a total of six trials. The data was then analyzed and the statistical significance was determined. Of the three plant extracts, Curcumin had the greatest effect on the growth of the cancer cells. It inhibited cell proliferation in a dose dependent manner, which is standard for biologically active substances. The other two extracts, Crocetin and Lectin, had no significant effect. The results supported my hypothesis.

Project Number: SMH039

Grade: 11

Title: Food Preservatives and E. coli

Abstract: Certain strains of E. coli are serious pathogens to humans. Food products may become contaminated with these bacteria despite preservatives used to inhibit growth. This study was conducted to determine the effective concentrations of the common food preservatives, sodium nitrate and lemon juice (citric acid), in suppressing E. coli growth. E. coli were cultured in the presence of varying concentrations of these preservatives. Sodium nitrate was effective but lemon juice was ineffective. Most likely, the citric acid content of the lemon juice was insufficient in deterring bacterial growth.

Project Number: SMH040

Grade: 10

Title: Role of two bacterial promoters in biofilm formation by Escherichia coli

Abstract: Urinary tract infections are painful and recurrent often caused by Escherichia coli which form biofilms in the epithelial lining. Biofilms starts with cell aggregation followed by surface adherence. I hypothesized that in biofilm mode, two E. coli promoters of genes, identical to pslA and lasR from Pseudomonas aeruginosa shown to be involved in biofilm formation, may be turned 'on'. However, no difference was seen in the fluorescence intensity under confocal microscope when E. coli, harboring the plasmid with promoters cloned upstream of a red fluorescent gene, was grown in a biofilm versus a non biofilm mode thus contradicting my hypothesis.

Project Number: SMH041

Grade: 11

Title: Sneeze On Your Sleeve

Abstract: The purpose of this experiment was to find if bacteria died in cloth, thus supporting that sneezing into your sleeve is better than sneezing into your hand. This experiment also tested which cloth the bacteria would die more quickly. To perform this experiment a nutrient broth was inoculated with Staphylococcus epidermidis. After being incubated, this broth was sprayed on to squares of polyester and cotton. The squares were then placed on a nutrient agar immediately after being sprayed and every fifteen minutes after for one hour. Different squares were used in each time frame. The agar plates were

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incubated and the bacteria colonies were counted. There was a significant drop in the number of colonies on the cotton.

Project Number: SMH042

Grade: 9

Title: Nature's Secret Medicine

Abstract: Please visit exhibit for student's abstract.

Project Number: SMH043

Grade: 10

Title: Dilutions on Bacterial Resistance

Abstract: Bacterial resistance makes disinfectants less effective. Prepare dilutions of bleach and triclosan. Inoculate plates with *E. coli*. Put each solution into a filter disk. Place disks in plates. Incubate for 24 hours. Take bacteria from the edge of the zones of inhibition, repeat making five trials, and record data. Bacteria in the nalidixic acid, 3.125% solution of triclosan, and 12.5% solution of bleach developed resistance. Lower concentrations killed fewer bacteria, increasing chances of mutations that would make them resistant.

Project Number: SMH045

Grade: 11

Title: Arsenic Exposure Activates Liver Stellat

Abstract: Excess extracellular matrix protein generated by activated hepatic stellate cells (HSC) is a major pathologic component of environmentally-derived liver diseases. My experiments tested whether relevant concentrations of arsenic activate HSC. After 24-hour exposure to varying concentrations of arsenic, cultured HSCs were immuno-stained for smooth muscle actin, a marker of activated HSCs. The staining was imaged by confocal microscopy and protein expression was quantified by morphometric analysis. Results showed that arsenic caused a dose dependent activation of HSC with increasing amounts of smooth muscle actin. These data suggest that pathologic HSC activation may contribute to the non-cirrhotic fibrosis observed in humans exposed to arsenic.

Project Number: SMH046

Grade: 11

Title: Effect of Temperature on Infection of *S. Marcescens* by Phages

Abstract: *Serratia marcescens* is a commonly found bacterium in soil, water, and intestines of animals and humans. It is harmless to most people, but can serious illnesses, such as meningitis and pneumonia, in newborns and people who have a weakened immune system. Since most antibiotics are ineffective in treating *S. marcescens* I found a phage that can kill *S. marcescens* by collecting environmental samples from areas rich with *S. marcescens* and isolating phages. I let the phages infect at 4 different temperatures. I concluded that 25 C is the optimum temperature and that the phage infect at the host cell's optimum temperature.

Project Number: SMH047

Grade: 11

Title: Omega-3 Attenuates the Growth of Tumors

Abstract: The purpose of this experiment is to determine whether or not Omega-3 attenuates lung carcinoma cells. First, the carcinoma cells were incubated and separated into 80 cell colonies in a multi-cell plate. Then, the Omega-3 was added at different concentrations, and next, a dye was added to the carcinoma cells. Lastly, the plate was put into and Elisa reader and the light absorbency of the live cells were obtained. The data shows that the higher the concentration, the less absorbency was present. Thus, it is safe to conclude that Omega-3 does attenuate the growth of lung carcinoma cells.

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Project Number: SMH048

Grade: 11

Title: Inflammation and Bone Disease

Abstract: Osteoporosis is a prevalent disease in the United States that is caused by over-activation of osteoclasts, bone-eating cells, and results in a fractured skeleton. Interesting studies have discovered chronic inflammation can cause bone disease, meaning that signals used in inflammatory response activate osteoclasts, which is the essence of the hypothesis. Using careful culturing procedures, inflammatory factors were placed with undifferentiated osteoclasts. After experimentation, it was found that the inflammatory factors did, indeed, differentiate osteoclasts, and upon differentiation, the osteoclasts absorbed bone that was also used in the procedure, thereby proving the hypothesis correct.

Project Number: SMH049

Grade: 12

Title: The Effects of Soda Pop on Teeth

Abstract: Soda pop is one of the most consumed beverages in America. This project was aimed to find out if drinking soda pop really damages one's teeth, colorwise or the enamel. Four different soda pops were used in a fountain system, two of which were diet, to help determine if one factor of the possible decay could be sugar. The soda pop flowed over the teeth for a period of 2 days each. The conclusion was that there was minimal effect on the enamel of the teeth but there was much discoloration.

Project Number: SMH050

Grade: 11

Title: Omega-3-PUFAs on Liver Cancer Cell Growth

Abstract: Omega-3 polyunsaturated fatty acids (omega-3-PUFAs) have been reputed to lower cholesterol, prevent inflammation, and reduce cardiovascular diseases, but the molecular mechanisms for their actions are not known. This study was designed to investigate the effects and mechanisms of omega-3-PUFAs in human hepatocellular carcinoma (HCC) cells. Following treatment with omega-3-PUFAs, the growth of liver cancer cells was analyzed and the cellular proteins were subjected to immunoblotting for cyclooxygenase-2 (COX-2) and beta-catenin. Omega-3-PUFAs inhibit HCC cell growth at least in part through inhibiting beta-catenin and COX-2. Consequently, omega-3-PUFAs may represent an effective nontoxic means for the chemoprevention and treatment of human HCC.

Project Number: SMH051

Grade: 12

Title: High and Die: Inhalant Use

Abstract: Inhalant use is a growing problem among teenagers because common household products that can be inhaled are cheap and easily available. The purpose of this project is to show inhalants on crickets. Increasing doses of gasoline Formula 409 cleaner and Febreze were introduced to the crickets' environment, allowing them to breathe the fumes. Cricket lifespan and other observable behavior were recorded. On average the most lethal substance was gasoline, followed by Febreze, then Formula 409. The deadliest dose of Febreze was 11.7 grams, Formula 409 cleaner 15.3 grams, and Gasoline 13.5 grams; the greatest behavioral change was the Formula 409 Cleaner.

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Project Number: SPH001

Grade: 9

Title: Temperature and Tuning

Abstract: For my Science Fair Project, I decided to find out if when a piccolo gets colder, if it gets sharper or more flat. My hypothesis was that the piccolo would get more flat as it got colder. The materials I needed for my experiment were a piccolo, a tuner, a refrigerator, a plastic baggie, a writing utensil, paper, a timer, a thermometer in degrees Celsius, a room with a thermostat, and a centimeter ruler. I started my experiment by gathering my materials. Then I put the piccolo together and, using the tuner, saw how flat or sharp it was at room temperature. I adjusted the piccolo head so that the piccolo was in tune at room temperature. After that, I found out what temperature it was in the refrigerator, using the thermometer. Then, I put the piccolo in the refrigerator for 10 minutes and recorded how sharp or flat it was. I repeated this, but put the piccolo into the refrigerator for 20, 30, 40, 50, and 60 minutes at a time. After every time it was in the refrigerator for a certain length of time, I would check, using the tuner, how sharp or flat the piccolo was and I would record that on the paper. My hypothesis was correct. The piccolo did get more flat as it got colder. I found that the piccolo got increasingly more flat as it was in the refrigerator for longer lengths of time.

Project Number: SPH002

Grade: 10

Title: Should You Run or Walk in the Rain?

Abstract: The experiment was done to answer the question of which would keep a person drier: running or walking in the rain? I placed pieces of sponge material on a carrier fixture on a conveyor belt that was run at two different speeds: one at a walking pace (2mph) and the other at a running speed (3.5 mph). I tested to see which speed caused more water absorption in the sponges: the walking or the running speed? After experimentation, my results showed that running in the rain keeps you drier.

Project Number: SPH003

Grade: 9

Title: The Adhesive Force of Comm. Packing tapes.

Abstract: The purpose of my project is to compare the adhesive forces among four different commercial packing tapes (Duck, Office Depot, Scotch and Shurtape). I hypothesized that Duck tape was the strongest based on ranking the adhesiveness of the tapes with my index finger. By measuring the distance the ball can travel on packing tape after the ball is released from an incline plane and travels on a horizontal plane covered with the different adhesives, I could quantitatively determine which tape had the strongest adhesive force. Based on results, my hypothesis was correct, Duck tape had the strongest adhesive force.

Project Number: SPH004

Grade: 9

Title: MVP

Abstract: I had a hard decision on what to pick for the science fair. I had to think of ones to choose from, and it was hard to choose from them. Being the competitive athlete that I am, and with me loving to play video games, I wanted to see if videogames could help me be able to hit a baseball better, since that is the next sport that I am going to play. I knew what to do, but I was not exactly sure how to do it. I decided to make it a one day process to see if video games could help your hand eye coordination, and see if it could make you be able to hit a baseball better in one day. According to my results, it actually does make you a better hitter in one day. I almost knew it would help you over a span of time, and my research helped me see that, but my true goal was a one-day thing. Also, I could not do it over days, because the experiment takes time, and I don't have enough time on my hands to be able to complete the experiment in one day. As I earlier stated, the experiment was a success. It kind of makes me wonder about the future of baseball. This could be a whole new training. It takes hand eye coordination for a number of sport skills. I video games can improve that, it could ultimately help you be able to be a better athlete. If your parents greatly support you in sports or other things that require hand- eye coordination, it gives

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them a reason to buy video games for you. You still have to practice, but according to my experiment, it helps. With your practice of the skill and if you play enough videogames, you could turn you into a MVP. I would like to look into this further more, but I neither have the time or money to be able to do it. This something I am greatly interested in.

Project Number: SPH005

Grade: 10

Title: Just Winging It:How Winglets Affect the Lift of a Plane

Abstract: The purpose of my experiment is to find if winglets on a plane affect lift. In order to test this I made one plane with winglets and one without. I put these planes in a wind tunnel and attached them to a scale. When the wind hit the plane, the reading on the scale changed. The plane that pushed less on the scale had more lift. In all of the trials except the two where the results were the same, the plane with winglets lifted up more. Based on my experiment, winglets on a plane do provide extra lift.

Project Number: SPH006

Grade: 9

Title: Which Material Blocks Sount Best?

Abstract: What I did for this experiment, is I took three materials: ceiling tile, glass, and wood, and I tested how well they block sound. I used puretones as they are the easiest to work with sound wise, with frequencies: 1,000 Hz, 200 Hz, 400 Hz. I used the decibel reader to get a base reading of how many decibels each frequency had, and then used the materials to cover the speaker. After this I used the decibel reader to get another reading with the materials covering the speaker, and then recorded the results.

Project Number: SPH007

Grade: 11

Title: A Unification of Gravity and E/M

Abstract: This study attempts to unify electromagnetism and gravity at the macroscopic level by establishing symmetry between the static and relativistic forces with respect to charge and mass, yielding a new force: a mass-oriented analogue of magnetism. The perihelion precession of Mercury, on which the hypothesized force had an effect, is analyzed using a FORTRAN program. The force law is validated through comparison of observed and expected rates of precession. Because of the accuracy of input data and the nature of the programs utilized, the results are inconclusive. However, conclusions on the nature of forces, mass, and charge are made.

Project Number: SPH008

Grade: 9

Title: Airfoils and Lift

Abstract: My project's purpose was to observe the effects of an airfoil's camber on its lift and to determine the best angle of incidence for highest lift. I tested three airfoils at various angles and measured lift using a wind tunnel. I found that the airfoil with the highest camber created the most lift and best angles of incidence varied between airfoils. I concluded that each airfoil had a unique best angle of incidence, depending on its camber. The higher the camber, the larger the best angle of incidence. I also concluded that the higher the camber, the more lift generated.

Project Number: SPH009

Grade: 9

Title: Drum Pitch vs. Temperature

Abstract: The purpose of my experiment is to prove that when the temperature changes the pitch of a drum head changes. The colder the temperature the higher the pitch will be from the head. The higher the temperature the lower the pitch will be from the head. To do my experiment I barrowed a marching snare and bass drum from the school, I also barrowed a drum tuner. I also used my 11inch tri-tom drum.

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Then I tuned the drums, to the temperature of my room, until the drum tuner said that it was tuned right. Then I recorded what the tuner said. Then I took the drums outside, and let the heads settle. Next I played straight 16th notes on each head and recorded what the drum tuner said. I did this four times to make sure my findings were correct. When I finished my experiment I found out that the pitch of the drums got higher as the temperature got lower. The pitch got higher because as the temperature get lower the fibers in the heads got tighter. Just like when people, in a crowd, get cold they huddle closer together to get warm, making the crowd tighter. Just like the drum heads get tighter in the cold. In conclusion the temperature around the drum heads does affect the pitch of the heads. There for proving that my experiment was correct.

Project Number: SPH011

Grade: 12

Title: Electrical Energy from Sound Waves

Abstract: The goal of this experiment was to design a generator that converts noise into useful electrical energy. It was hypothesized that the inductor built would produce enough voltage and energy to light an LED. Sound waves induced a current in a vibrating inductor near a magnet. The current passed into a transformer, rectifier, and then a capacitor. Voltage across the capacitor was monitored, averaging 1.3mV (8.5×10^{-11} J of energy) when noise was played and 0.4mV (8×10^{-12} J) without noise. The low voltage was unable to light the LED, but the experiment confirmed the possibility of sound energy conversion.

Project Number: SPH012

Grade: 11

Title: Wind Load and Flow on Roofs

Abstract: The purpose of my project is to test to see which type of roof shape had the lowest ambient force exerted upon it and the greatest wind flow over it. I chose to test four roof shapes: a pitched roof, geodesic dome, cylinder, and pyramid. I hypothesized that the pitched roof would have the greatest force and least amount of air flow and that the geodesic dome would have the greatest flow and least amount of force. To test my hypothesis, I will build a wind tunnel and test each model inside using a flow sensor and force sensor.

Project Number: SPH013

Grade: 9

Title: Duck!

Abstract: For my 2006 science fair project, I choose to see if the speed of a paintball gun has an affect on the height of impact of a paintball on a target. The reason I picked to do this experiment is I always wanted to know if the speed of the gun has an affect on the height of impact. I have a paintball gun, and I found out that if you turn the speed up, the less accurate it is on that target. So I thought of this idea, and I decided to go with it and actually test it out the right way. There were a lot of procedures to do, but a lot of them are repeated. I will go to the shooting steps. You want the paintball to hit the box five times. Take five shots at a time to see the least number of shots it takes to hit the one speed five times. There is four speeds that you use. After you hit the box 10 times, measure each shot form the ground and record it. Do these steps all over again for another 10 shots. After your done, clean up everything and start your show board. I found out that the highest speed, was the less accurate, # 3 speed was the 3rd less accurate, the #2 speed was the most accurate one, and the lowest speed was the 2nd most accurate. I say that my Hypothesis is half right. Thank you for taking time to read this.

Project Number: SPH014

Grade: 11

Title: Best Roof Pitch for a SolarCell

Abstract: The purpose of this experiment was to determine the most effecienroof pitch at which to place a solar cell. To do this, a solar cell, attached to a motor, was rotated 180 degrees at three different roof pitches: twenty, twenty-six, and forty-seven degrees. The specific amounts of voltage and amperage were nmaesured to allow the calcuation of watts. The results of the twenty and twenty-six degree

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itches showed similar bell-shaped curves, unlike the straight line of the forty-seven degree pitch. Therefore, the best pitch of which I tested would be somewhere between the twenty and twenty-six degree angles.

Project Number: SPH015

Grade: 11

Title: Cost Effectiveness of EM Core Materials

Abstract: I find both the theories of why electromagnets and dynamos work and their ever more present application to the world equally fascinating. This project is to determine how various alterations in electromagnet design will effect its strength. Many of these changes will also be applied to a "shake" flashlight to show whether the same laws govern both it and an electromagnet. Some of these alterations will include changing the material of the core, changing the length of the core, smaller and larger number of coils, and various combinations. Experimental data as well as magnetic flux and other relevant calculations will be performed to show change in performance.

Project Number: SPH016

Grade: 12

Title: Efficiency of Power Drills

Abstract: Drills will be tested in five trials to determine revolutions per minute. Drills will then be examined to determine gear ratios and energy transfers. A drill will be constructed using Legos to determine ideal mechanical advantage.

Project Number: SPH017

Grade: 9

Title: When Water Meets Wood

Abstract: The problem statement is, "Which type of wood absorbs the most water?" The procedure, in brief, is as follows: Two pieces each of pine, oak, and poplar wood were cut. They were each put into its own separate container with an equal amount of water and soaked for 72 hours (three days). The weight of each wood block was recorded in grams every 24 hours on a triple beam scale. Pine absorbed the most weight in water, and poplar absorbed the least. Data is shown through pictures and graphs. The results do not support the hypothesis.

Project Number: SPH018

Grade: 10

Title: Emulsify!

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH019

Grade: 9

Title: The Quantum Dilemma

Abstract: The purpose of my experiment was to determine the pattern of photon placement on a polarizer with two equal slits from a light source, and whether or not equal amounts of photons would appear on each slit of the light source. I made seven aluminum polarizers, and exposed each to light for nine hours. After, I observed that the photons on five polarizers traveled to the top and bottom of the polarizer, where they were concentrated, and to the middle, where they were spread out. All photons were assembled in a wave-like pattern. The two other polarizers showed an oblique pattern. My hypothesis was correct.

Project Number: SPH020

Grade: 10

Title: Decoding the Stradivarius

SENIOR DIVISION – PHYSICS

Abstract: Antonio Stradivari's violins are of a quality that has never been duplicated. Many theories have arisen but one recent theory proposed by Joseph Nagyvary, that storing wood in the Siene changed the composition of the wood, has promise. The purpose is to determine if the microorganisms in the river also had an effect on the wood composition and therefore affected the sound. Two types of water will be tested - sea water and river water. The wood will be soaked in different types of water for a month, dried, and then taken out and tonally examined on a computer.

Project Number: SPH021

Grade: 9

Title: How Strong is Your Hair?

Abstract: Please visit exhibit for student's abstract.

Project Number: SPH022

Grade: 9

Title: Batter Up

Abstract: The purpose of this experiment was to find out which bat, metal or wooden, hit the baseball the farthest. I rolled the baseball down a ramp that was constructed out of packing tubes, a rain gutter and other pieces that worked for keeping the ramp stable. The ball was timed from its release until it hit the bat. The ball was then timed from the moment it hit the bat until it rolled to a complete stop. Measurements were read and recorded, along with the times to add to my project data book. I then took the averages of the ball time, roll time and the distance hit. My hypothesis did prove to be correct, that the baseball traveled the farthest when hit off the metal bat.