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Animal Behavior and Psychology

Musical Memory Lauren Komer

Studies have shown that music can help memory become better. With their memory enhanced, people would be able to remember objects easier. The experiment was conducted to see if playing a musical instrument could increase memory; the instruments group was divided into four sub-groups (brass, string, percussion, and woodwinds.) The procedure was carried out by having the control group look at 20 objects for 30 seconds, and then writing as many as they could for another 30 seconds. The music groups did the same thing, but first they played their instrument for 5 minutes. There were 5 volunteers for the control group and for each music group. The average number of objects remembered was 7 for the control group. The percussion group remembered 9 objects on average, and the woodwind group remembered 8 objects on average. The strings and brass both had an average of 7 objects remembered. The results showed that two music groups had better averages than the control group, but the other two had the same average. The percussion group had the highest average of them all.

Seeing is Believing? Tessa Parker

This project was to determine if people would visually notice differences in a common phrase, word, or picture by having ten seventh grade girls look at five experimental and control cards. It was hypothesized that the experimental cards would have a lower percentage of correct answers. One card was shown to one girl for two seconds, and then removed. Then the girl was asked what she saw on the card, and the answer was recorded. This was repeated for the next nine cards, this sequence was repeated for nine other girls. The experimental cards had an average of 6.6 correct answers. The control cards had an average of 9.4 correct answers. Therefore, the hypothesis was accepted.

Cold Hearted/Warm Hearted? The Effect of Temperature on a Beating Heart Nathan M. Gray

This experiment tested the effect of water temperature on the heart beat rate of brine shrimp. Brine shrimp can live in water that ranges from 4C to 40C. If brine shrimp are placed in water at 9.5C, 12C, 14.5C, 17C, 19.5C, 22C, 24.5C, 27C and 29.5C then the hypothesis is the cooler the water gets the slower the heart will beat and the warmer the water becomes the faster the heart will beat.

Relieve My Pain

Derek Skillett

Pain relief is an important concern for many people. Part of the effectiveness for fast relief is how quickly the pain medicine is absorbed into the body's system. The type of pill, whether caplets, rapid release, gel tabs, or tablets, may make a difference in how quickly the pill dissolves and is absorbed. If four different types of Tylenol are placed in water and also in hydrochloric acid, then the Tylenol Rapid Release will completely dissolve the quickest. Four different types of extra-strength Tylenol (caplets, rapid release, gel tabs, or tablets) were purchased for this experiment. Each tablet was dissolved ten times in water, the control, and ten times in hydrochloric acid. The liquid was heated to 35 degrees Celsius, the tablets were then placed in 50mg of the liquid in a glass beaker, and the dissolution process was timed until the pills were completely dissolved. The times were recorded in minutes using a timer. Based on the data collected in this experiment, the caplet dissolved faster than the gel tab, the tablet, and the rapid release, with an average dissolution time of 1.23 minutes in water and .97 minutes in Hydrochloric Acid. Therefore, the hypothesis was not accepted.

Second-Hand Smoke: Nuisance or Health Risk?

Allison M. Williams

Many concerns have been raised about second-hand smoke. Many public places have banned or considered banning smoking. However, many remain unconvinced as to the adverse effects of second-hand smoke exposure. Does the performance of recent aerobic exercise adversely affect pulmonary vital capacity of teens living in homes with smokers compared to those living in none-smoking homes? Subjects with smoking parents and non-smoking parents' air capacity were tested. They would blow into a spirometer and the measurement would be recorded. Then they would ride on an elliptical bike for ten minutes between 47 and 53 rotations per minute. They would then again blow into the spirometer and the measurement would be recorded. Wait five minutes, then blow into the spirometer again and record the measurement. This was conducted for both the smoking and non-smoking subjects. The control group was the students that live in houses where the parents didn't smoke. The average air capacity before exercise was 359. The average air capacity directly after exercise was 387. The average air capacity 5 min. after exercise was 364. The overall average was 370. The students with smoking parents had an average air capacity of 304 before exercise. The average air capacity directly after exercise was 328. The average 5 min. after exercise was 323. The overall average was 318. Based on the data collected in this experiment, the subjects with smoking parents had the lowest results, while the subjects with non-smoking parents had the highest results. This was because the students with smoking parents had smaller airways. Therefore the hypothesis can be supported.

Animal Physiology

Effect of Glucaro 1, 4-Lactone and Potassium-Glucarate, on Hormone-Dependent Prostate Cancer (LNCaP) cells Keshav Ramaswami

This research was concerned with the viability of a prostate cancer cell line (LNCaP) in the presence of potassium glucarate and glucaro-1,4-lactone. In mammalian cells glucarate is converted to Glucarolactone, which is an inhibitor of b-glucuronidase. That enzyme catalyzes the de-conjugation of cancer causing and promoting chemicals. [The reverse process is known as glucuronidation.] 1. An extract was made from the albedo of an orange because it is known to have a high glucaric acid concentration. The potential effects of other compounds in the extract were not studied. 2. Reagent grade commercial preparations of potassium D-glucarate and D-glucaro-1,4-lactone were used. Different concentrations [1, 0.1, 0.01, 0.001, 0.0001, 0.00001 millimolars] were prepared and incubated with LNCaP cells for 24, 48, 72, and 96 hours and the resulting viability was measured. No increases in mortality or apoptosis rates were observed compared with untreated control cultures. The test compounds apparently did not inhibit the production of vital proteins to result in apoptosis. This does not mean that the compounds did not shut off other proteins. Glucuronidation was not measured in this experiment. Others have found glucuronidation within cancer cells, but the type of cell line and stage of development we used may have had effects on the outcome of my trials.

What is the Effect of Red Bull on Heart Rate Landry Cordes and Jessica Thompson

The problem being studied was, "What is the effect of Red Bull on heart rate?" The researchers hypothesized that if students drank Red Bull before exercising then their heart rate would be higher than if they did not drink Red Bull. The hypothesis was not supported. After conducting the test the researchers concluded that Red Bull made the students' heart rates decrease while exercising. Without drinking Red Bull the students' heart rate increased by 71.17 bpm. When the students drank Red Bull prior to exercising their heart rates increased by only 62.33 bpm. This shows a decrease of about 9 bpm. The researchers also found that Red Bull did not affect boys and girls differently. The researchers thought the caffeine and sugar in the Red Bull would make the heart rates increase. The independent variable for the test was Red Bull. The dependent variable was the heart rate measured in beats per minute. The constants were surroundings, amount of Red Bull, exercise time, the heart rate monitor, the exercise bike, and the rotations per minute. The materials used for the test included Red Bull, a stationary bike, three junior high girls, 3 junior high boys, and a heart rate monitor.

A Pinch Of Salt
Ty Thompson

Planaria have the ability to regenerate. By using planaria as an indicator species, they can help determine any kind of chemical intrusion by looking at the planaria's regeneration. This experiment was conducted to determine what effects salt intrusion would have on planaria's regeneration. The procedure was performed by having a control group of water with no salt concentration. Five other containers were filled with water and 0.1, 0.2, 0.3, 0.4, or 0.5 grams of salt per container. Each container was gently stirred and each planaria was carefully cut lengthwise. One half of a planaria was placed in each container. Data was collected every day for two weeks by seeing how much the planaria regenerated, when it started to regenerate, and how long the planaria survived. This procedure was repeated five times. The five trials within the control group averaged 2.6 days for regeneration to begin, and had an average of 12.8 days for complete regeneration. Throughout the 14 days, there was no mortality of the brown planaria. The first experimental group averaged 2.6 days for regeneration to occur, and had an average of 12 days for complete regeneration. Throughout the 14 days, two planaria died and three survived. The second experimental group averaged 2.8 days for regeneration to begin, and had an average of 14 days for complete regeneration. Throughout the 14 days, four planaria died and one survived. The third experimental group averaged 2 days for regeneration to begin, and had an average of 0 days for complete regeneration because all the planaria died of increased salinity. The fourth experimental group averaged 0 days for regeneration to occur, and had an average of 0 days for complete regeneration because all the planaria died of increased salinity. The fifth experimental group averaged 0 days for regeneration to occur, and had an average of 0 days for complete regeneration because all the planaria died of increased salinity. The data indicated the planaria in the control group and the 0.1 gram of salt had the fastest regeneration rate and greatest survival rate. The control group, 0.1 gram and, 0.2 gram had the only complete regeneration of planaria. The 0.3 gram, 0.4 gram, and 0.5 gram of salt had the least regeneration and only survived for 2 or 3 days due to the high salt concentrations.

Aviation

Bi or Mono Which is the Alphaplane
Logan Coffman

Planes are used a lot, they are used to travel, ship things, and for entertainment. There are many types of planes that have been invented like the biplane or monoplane, each having many advantages and disadvantages. A research project could be conducted to find out which of these different types of planes, the biplane or monoplane can fly farther. If each type of plane is tested to find the farther average of distance flown, then the biplane will fly farther. Two planes were launched, in a controlled environment from a stationary wooden ramp by a rubber band. Each plane was launched from the ramp ten times to find the average distance traveled in meters. When comparing the two averages of the distance in meters traveled by both the monoplane and the biplane, the monoplane traveled an average of 5.6 meters and the biplane traveled an average of 3.1 meters. Based on the data collected from this experiment, the monoplane will travel greater distances than the biplane when launched from a ramp. Therefore the hypothesis cannot be supported.

Botany/Plant Physiology

Goin' Bananas
Morgan Terrill

Bananas are one of the most common fruit known around the world. They grow on trees in tropical climates. Because this fruit is so popular, this research has been conducted to determine if three different surfaces, tile, granite, and wood have different effects on how fast bananas ripen. The procedure was carried out by having five bananas ripen on each surface. Data and results were collected based on a scale of one to five one being yellow, five being black and rotten. Data was recorded six times at one-day intervals. The rate of the ripening process of the bananas varied for each of the different surfaces. The granite surface showed the fastest ripening of the bananas. After day six, it ended up being almost black. The tile group came in second. The banana had brown on the sides and black tips. The wood group had the least amount of change. It ended up being spotted. The data indicated a significant change in the bananas. The banana on the granite ripened the fastest and the banana on the wood ended up ripening slower than the tile and granite group.

Fertilizer Fun
Michaela Schick

Fertilizers can be used to help plants grow. They help plants by instilling nutrients in the soil that the soil may be missing. What effects do different types of fertilizers have on the growth of plants? If different kinds of fertilizers are used on plants then the granule fertilizer will be more effective in increasing the heights of plants because it contains greater amounts of nitrogen, phosphate, and potash. During the experiment, radish seeds were given the same amounts of water, sunlight, and soil. They were given 35ml of soil when planted and 10ml of water every other day throughout the experiment. The plants were divided into groups based on which fertilizer they were going to receive and given numbers so that they could be kept track of to prevent mistakes in measuring heights. After seven days of being planted, the plants were measured and given fertilizer. Plants 101-110 were given Osmocote granule, plants 201-210 were given Schultz liquid, plants 301-310 were given Jobe's stake, and plants 401-410 were given no fertilizer and were kept on the water schedule like all the other plants. All plants were given the amount of fertilizer per the directions on the packages of the fertilizer. After six days the plants were measured for final heights. The stake fertilizer proved to increase height in the plants by a larger amount than the other fertilizers and the control group (plants 401-410) increased plants by the least amount. The stake fertilizer increased heights by an average of 2.29cm. The granule fertilizer increased heights by the second most with an average of 2.11cm. The liquid fertilizer increased growth by an average of 1.93cm, which was more than the control, but none of the other fertilizers. The control group increased heights by an average of 1.64cm. Based on the data, the stake fertilizer had the greatest average change in height, while the control group had the least average change in height. Therefore, the hypothesis cannot be supported.

Pyrotechnic Pesticide Cameron Bock

Because pesticides and insecticides are common and widely used, this project was carried out to conclude whether or not the application of pesticide makes leaves more flammable. The hypothesis predicted that the experimental group with pesticide applied to them would burn faster. Eleven oak leaves were collected. Two identical strips were cut from each leaf. One strip from each leaf was sprayed with pesticide and allowed to dry for 20 minutes. The other halves of the strips were used as a control group. Next each of the leaves was ignited and their burning times were recorded. Then the burn rate was calculated along with the averages, medians, and ranges. The samples sprayed with pesticide had an average burn time of 2.08 seconds and an average burn rate of 2.74 cm per second. The control group had an average burn time of 3.40 seconds and an average burn rate of 1.59 cm per second. It was found that the samples with pesticide applied to them had a faster average burn time and higher average burn rate than the control. Therefore the hypothesis was supported.

The Allelopathic Effects of Walnut and Eucalyptus on Sorrel, Chickweed, and Dandelion Jordan Dillon

Weeds are a common problem among plant growers across the world. One possible solution to the eradication of weeds is the process of allelopathy, which occurs when plants produce allelochemicals that inhibit the growth of other plants. This study investigated the allelopathic effects of walnut and eucalyptus on sorrel, chickweed and dandelion by germinating seeds in extracts derived from the allelopathic plants. Based on the data collected in this experiment, germination in the eucalyptus, walnut, and eucalyptus/walnut extracts resulted in smaller root growth of sorrel, chickweed, and dandelion, and smaller shoot growth in chickweed and dandelion compared to the control group. In addition, no chickweed seeds germinated in the walnut or eucalyptus extracts, and only 16% of the chickweed seeds germinated in the eucalyptus/walnut extract compared to 50% in the control. Furthermore, none of the dandelion seeds germinated in the eucalyptus extract, and none of the dandelion seeds grew roots in the walnut extract. The results of this experiment show that there may indeed be an allelopathic effect of walnut and eucalyptus extracts on the ability of the sorrel, chickweed, and dandelion seeds to germinate, grow shoots, or grow roots.

The Earthworm Effect Josh Coulter

Plants need many things to grow such as, sunlight, carbon dioxide and nutrients. An investigation was performed to find the effect of the number of earthworms in a pot on the growth of a plant. If two plants are grown with three worms or one worm present and compared to a plant with no worms, then the plant with three worms will grow taller because the worms will add nutrients to the soil. Thirty cups were filled with soil. One worm was placed in ten cups, three worms were placed in ten cups and there was a control of no worms. Then there was a bean seed planted in each cup. Each cup was placed in the sunlight and the growth of the bean plant was recorded daily. When comparing the growth of plants (control, one earthworm and three earthworms) the growth of the bean plant with three earthworms had the highest growth of 34.82 centimeters. The reason this occurred may be because the earthworms produced nutrients in the soil. The group of plants with one worm had an average of 30.72 centimeters and the control had an average growth of 32.75 centimeters. The reason that this occurred is because one worm in the pot did not have much more of an effect than no worms did. It is important to note that although there was some difference in growth, the trials have a lot of variation. Because of this it can't be conclusively said that earthworms were the only factor that affected the growth of the plant. Based on the data collected in this experiment, the three earthworm trial had the highest amount of growth while the trial with one worm had the lowest amount of growth. This may have been because the worms gave the soil nutrients. However, because of the inconclusive data, the hypothesis cannot be supported.

Fertilizer Exploration
Matthew Thomas Fought

Plants are Earth's main resource and are used by almost everyone. Plants usually grow in a substance called soil, which carries nutrients and other minerals that help plants grow. If a bean plant is planted in soil with different types of fertilizer (potting mix, potting mix with Earthworm Castings, and potting mix with Osmocate™), then the plants planted in the potting mix with Earthworm Castings will grow better, because it has the most nutrients. To make the soil for the experiment, two different fertilizers (Earthworm Castings and Osmocate™) were mixed separately with the Potting Mix. The mixtures were formed in two different large bowls. The growth of the plants stem and roots were observed. This was done by putting a metric ruler in all 30 cups, each different fertilizer being color coated differently. There were 10 plants that grew for each different fertilizer for seven days. When comparing the growth of a bean plant in different soils (Potting Mix, Potting Mix with Earthworm Castings, Potting Mix with Osmocate™), the average growth of bean plants in Potting Mix was 0.26cm. Bean plants in Potting Mix with Earthworm Casting had an average growth of 6.58cm. While bean plants in Potting Mix with Osmocate™ had an average growth of 5.83cm. The reason these plants grew the way they did was because both fertilizers contained nutrients that boosted plant growth. In Conclusion, the bean plants in Potting Mix with Earthworm Castings had the highest growth results, while bean plants in Potting Mix had the lowest. This was because Earthworm Castings supply food and nutrients needed for plant growth. Therefore, the hypothesis can be supported.

Cell Biology/Microbiology/Bacteriology

The Write Way to Bacteria
Sarah Crosley

Bacteria can be spread many ways, therefore, causing many sicknesses to be spread from one person to the next. This experiment was conducted to find out which of the three types of pencils (wooden, mechanical, and a pencil with a rubber grip) would have less amount of bacterial growth and would slow down the spread of bacteria caused sicknesses. The procedure was carried out by having a control group composed of a wooden pencil and two experimental groups (mechanical and a pencil with a rubber grip). The pencils were then used for a period of one day. They were then swabbed. The Petri plates were kept in a dark area. The numbers of bacteria were recorded every day for one week. The procedure was repeated five times. The average amount of bacteria growth on a wooden pencil was 19.2 bacteria colonies. The pencil with a rubber grip had an average of .6 bacteria colonies. The mechanical pencil had an average of 2 bacterial colonies. The data indicated that the two pencils with a plastic barrel grew the least amount of bacteria colonies then the wooden pencil. However, the pencil with a rubber grip had the east amount of bacterial growth.

Basterial Bowling
Kelsey Hulse

Since many people enjoy bowling as a regular hobby, it came to my attention that many people do not wash their hands quite as frequently as they should, thus leaving unsanitary germs in the finger holes of the bowling balls. This research was conducted to find which size bowling ball collected the most bacteria. The procedure was carried out by having a control group of a ten pound bowling ball, a six pound bowling ball, and a fourteen pound bowling ball. Data was collected by swabbing all finger holes of each size bowling ball, then swabbing inside of Petri dish. Labeled Petri dishes were examined every day for the following three weeks. Then, the space bacteria had grown on was measured using graph paper (.6cm x .6cm). The Petri dish of the six pound bowling ball produced an average of 4.05 graph squares. The ten pound covered only 0.1 average squares, and the fourteen pound covered an average of 0.25 graph squares at the end of three weeks. The hypothesis in this particular case was supported.

Beauty & the Bacteria
Caitlyn Massy

Mascara is considered basic to any cosmetic application. When the mascara is used it is being exposed to bacteria. This experiment was conducted to find out which of the amount of times the mascara tubes were used (1, 5, 10, 15, 30) would have the most bacteria. The procedure was carried out by having a control group comprised of a mascara tube that was never to be used. Five other tubes of mascara were used a different number of times. One was used only once, one was used five times, another was used ten, and another one fifteen times. The last tube was used 30 times. After each had been used the amount of time specified, the tubes were tested five times each. The average amount of bacteria colonies for the mascara tube that was never used was 8.4 colonies. The tube that was used once had an average of 6 colonies. The tube that was used five times had an average of .4 colonies. The tube that was used ten times had an average of .2 colonies. The tube that was used fifteen times had an average of 16.4 colonies. The tube that was used thirty times had an average of 9 colonies. The data indicated that the five tubes that were used had more bacteria growth than tube that wasn't used. However, the tube used fifteen times had the most bacteria colonies.

Paper vs. Metal
Morgan Smith

A typical bank has to carry around 20 to 30 pounds of coins or maybe even more. So coins and dollar bills can easily collect and grow bacteria. This experiment was conducted to see which of four different types of money, (quarters, nickels, pennies, and dollar bills) would have more bacterial growth. The procedure was carried out by having all four different types of money swabbed, and then running the same swab all over half of the Petri plate with agar to see which one would have more bacterial growth occur over a week period. The average amount of bacterial growth for the dollar bill (control) was 9 bacterial colonies. The average amount of bacterial growth for the quarter was 2 bacterial colonies. The average amount of bacterial growth for the nickel was 2 bacterial colonies also, and the average amount of bacterial growth for the penny was 10 bacterial colonies. The data indicated that the penny had had the most amount of bacterial growth than the other three types of money. However, the quarter and the nickel had the least amount of bacterial growth.

Mother Always Said . . .
Hannah Sharpe

When there is a lack of hygiene and people do not wash their hands regularly, it is very easy to spread illness. When germs are spread, they can infect other people. This experiment was conducted to find whether different hand cleaning agents such as distilled water, antibacterial soap, and hand sanitizer have an effect on the amount of bacteria that grow on hands. Which cleanser will prevent the most bacteria from growing? The procedure was very complex, containing many steps. There were three different hand cleansers: distilled water, antibacterial soap, and hand sanitizer. Each cleanser was applied to the hands, as directed, for fifteen seconds. Each time, after being cleaned, the hand was swabbed. Then, the dirty swab was rolled in the petri dish. Then it was covered and left to grow for six days. Then after this time, the squares with growth were counted and recorded. This was repeated 10 times for each cleaning agent. The average amount of growth for each variable was affected by some abnormal data which caused it to be inaccurate. As a result, the highest and lowest recorded data of each variable was not incorporated. The mean bacteria growth for the distilled water was 5.9 percent. The mean for the antibacterial soap was 2.8 percent. For the hand sanitizer, the mean growth was 5.1 percent. The collected data showed that none of the variables were completely effective in preventing bacteria. But, in the end, the antibacterial soap was the most efficient in preventing bacteria.

Counter Madness
Courtney Faber

Kitchen counters are used practically every day for preparing food to eat for a meal or snack. The counter you use probably has bacteria on it, from the different foods that are set on it. To get rid of most of the bacteria, people use cleaners. There are a variety of kinds of cleaners. There are the commercial brands, the natural cleaners, items found in your home that make cleaning easy, and just plain water. The procedure was carried out by placing the following items on a counter: moldy cheese, spoiled milk, and raw meat. Also have an individual cough on the kitchen counter. Then, various household cleaners were used to clean the counter. A cotton swab was used to take samples of the cleaned areas and then rubbed on a Petri dish. The Petri dishes were placed in a type of incubator for seventy-two hours. After that, the growth within each Petri dish was measured to determine how much bacteria formed. The data was recorded. The counter was cleaned using Clorox Disinfecting Kitchen Cleaner had the least amount of bacterial colonies. The anti-bacterial soap came in second and the Lysol Disinfectant Spray was third. The not cleaned area of the counter had an average of 4,934 bacterial colonies. Using tap water would be the worse way of cleaning, because it had the highest amount of bacterial colonies. Vinegar/water and Renu Eye Contact Solution had thousands of bacterial colonies, so they wouldn't be a good choice for a cleaner either. Lemon with Baking soda had 256.8 bacterial colonies and baking soda/water had 115.9 bacterial colonies. You should always clean your counter with an effective cleaner, because thousands of bacteria colonies will grow if you don't. When cleaning a kitchen counter, Clorox Disinfecting Kitchen Cleaner would certainly be one to consider.

Would You Like Salt With That?
Mikala Jaderborg

The newest thing for swimming pools is making them similar to the ocean. Now instead of chlorine swimming pools, there are salt or saline pools. An experiment could be conducted to see which type of pool disinfectant, saline or chlorine, will leave pond water with the least amount of bacteria over one week duration without additional disinfectant. If you use saline and chlorine pool disinfectants to sanitize pond water, then the saline pool disinfectant will leave the pond water with fewer bacteria, because the sunlight will not break down the sodium chloride molecule. Three bowls were filled with one liter of pond water each. Then one gram of sodium chloride was added to one of the bowls (equivalent to the recommended dosage of 3000ppm). Then one drop of chlorine was added to the second bowl (equivalent to the recommended dosage of 3ppm). Nothing was added to the third bowl. Each of the three bowls were separated into ten cups each and were left to sit for five days. Then one drop of water from each of the thirty cups was placed in Petri dishes and allowed to grow. After three days, photographs of each dish were taken and an AutoCAD program was used to determine the area of the bacteria that had grown. When testing the type of pool cleaner (chlorine or saline) on how much bacteria is in pond water after one week, chlorine had the least amount of bacteria with an average area of 0.19mm squared. Saline was next with an average area of 2.55 mm squared and Pond water was last with an average area of 9.72mm squared. Based on the data collected from this experiment, the use of a chlorine pool cleaner will lower the bacteria the most, whereas a saline pool cleaner will lower the bacteria level the least. Therefore, the hypothesis cannot be supported.

Talking Dirty
Sarah Briggs

Because germs and bacteria can grow almost anywhere, they can be found on all different types of phones. Certain environments are better for bacteria growth (moist and humid) while other places are not conducive to bacteria growth. This research was conducted to determine which type of phone (Bar, Cordless, or Flip) has the most bacteria. The procedure was carried out by having a control group (Cordless) of 15 trials, an experimental group with 15 trials of both Flip and Bar phones. The Data in the results were taken after five days of growth. If any part of the bacteria was growing in the square, it was marked so the results could be noted. Each Petri dish grew bacteria. The average growth of bacteria in the control group (cordless) was 22.0% or 61.8 cm². The average growth for the Bar phones was 12.3% or 29.2 cm² and the average growth for the Flip phones was 30.5% or 76.1 cm². Therefore the hypothesis wasn't accepted. Each type of phone didn't have a constant average range. The average range was approximately 24.79. The lowest range was 4.8. The largest range was 53.6. More testing would be needed to truly find out if Flip phones really do have the most bacteria on them.

Bacteria: What's In Your Water?
Emily Chambers

With a rapidly growing population, water purification is becoming a more important issue in our world. Only 3% of Earth's water is fresh. The rest must be filtered and purified so it can be used for human purposes. Ultraviolet light is used in the purification process. This project was conducted to see which source of ultraviolet light (a UV light bulb or the Sun's rays) would have less bacteria growth in the water that was exposed to them. It was hypothesized that the water exposed to the UV light bulb would have less bacteria growth. Twenty-one plastic cups were each filled with 50 ml of regular tap water. Seven were placed in a dark room, seven were placed under an ultraviolet light bulb, and seven were placed near a window where the Sun's rays could get to them. The cups stayed in their assigned areas for one hour. After an hour, a cotton swab was dipped into the cups and spread on a Petri plate. The bacteria were allowed to grow for ten days. The bacteria colonies were counted and recorded. The measurements showed that the water exposed to the UV light bulb had less bacteria growth than both the water exposed to the Sun's rays and the control group. The data supported the hypothesis.

Does Your Butcher Have Gas?
Abby Reynold

Many grocery stores have meat cases where they store their raw meat. Bacteria can be growing on the meat which could result in illness to the consumer. Grocery stores want to keep their meat as bacteria free as possible. Filling the cases with different gases could help eliminate the bacterial growth on the meat. Some common gases that could be used are nitrogen, carbon dioxide, argon, pure oxygen, and oxygen, which is already inside the cases. The procedure required having five trials for each gas. The meat was swabbed and stamped into 5 different Petri dishes for each gas. Then the meat was put into a Ziploc bag filled with the gas. The bags were then refrigerated for five days. After five days, the meat was swabbed again and stamped into 5 new Petri dishes. Bacteria were then counted and a percent change was found from the averages. Nitrogen allowed the least amount of change in bacteria growth on the meat. Carbon dioxide allowed the second least amount of change, and then argon had the third. The control group, which had no extra gas put into the bag, had the fourth least amount of change, and lastly, was oxygen.

Earth Science/ Environmental Science/ Ecology

Limestone Erosion

Eric Zoellner

Erosion affects many cliffs, ledges, and canyons. Erosion can be a problem for landscapers and engineers. An investigation could be to find out how the pH level of a liquid would affect erosion. What effect does the pH level of a solution have on the amount of erosion of limestone rocks? If different pH level solutions have limestone rocks placed in them, then the amount of erosion will be greater in the solutions that are farther away from neutral pH, because more acidic pH level solutions erode objects faster than neutral pH level solutions. Five limestone rocks were weighed and their mass recorded, then they were each put into a labeled cup with 100ml of a solution in the cup. The five solutions were vinegar, tea, bleach, and salt water. The final was pure water as the control. The cups were left to sit for twenty-four hours, and then emptied and left to dry. After they were dry they were weighed a second time. The experiment was then repeated for a total of ten trials. When comparing the mass changes of the five rocks in each of the solutions, the vinegar, with a pH of 3, eroded an average of 21.5% of the limestone rocks, the tea, with a pH of 5.5, eroded an average of 2.7% of the limestone rocks, the pure water, which was control and with a pH of 7, eroded an average of 0.8% of the limestone rocks, the salt water, with a pH of 8, added an average of 2.4%, and the bleach, with a pH of 12.5, added an average of 2.2% of the limestone rocks. Based on the data collected, the vinegar, with a pH of 3, eroded the most limestone rock with an average of 21.5%. Therefore the hypothesis can not be supported.

Global Warming Gasses

Alex Van Pelt

Many gasses contribute to global warming and have devastating effects on the earth. An investigation could be to find out the amount of solar radiation Carbon dioxide, Methane, Nitrogen, and Argon absorb compared to the amount air absorbs. If each gas is tested on the amount of solar radiation absorbed, then Carbon dioxide will absorb the most because it is a common greenhouse gas. Each of the five gasses were put into individual clear plastic bottles along with a thermometer. The bottles were placed in the sun and every five minutes the temperatures were recorded. The temperatures were taken until it stopped rising. The experiment was then repeated nine more times. When comparing the amount of solar radiation absorbed by Argon, Carbon dioxide, Methane, and Nitrogen, to air, Argon absorbed an average of 35.6 °C, Air absorbed an average of 28.1 °C, Methane absorbed an average of 26.9 °C, Carbon dioxide absorbed an average of 26.1 °C, and Nitrogen absorbed an average of 25.6 °C. Based on the data collected from this experiment, Argon absorbed the most solar radiation. Air absorbed the second most, Methane the third most, Carbon dioxide the fourth most, and Nitrogen the fifth most. Argon absorbed the most solar radiation because it is an isolator. Therefore, the hypothesis was rejected.

Run Shrimp Run!
Andy Wickoren

This experiment was conducted to test the effect of acid (formed by carbon dioxide) to organisms on earth. To do this, dry ice was enclosed in a wide mouth jar for twenty four hours giving the water the carbon dioxide content essential for the experiment. Twenty-four hours was enough time for the water to return to room temperature but maintain its carbonated state. The amount of carbon dioxide in the water was measured with PH paper since CO₂ in water will change the acid content. To vary the amount of CO₂ in the water, small portions of it were exposed to the air for different lengths of time. This allowed a small quantity of the carbon dioxide to evaporate. To test the way this constituent impacts organisms, the Carbon Dioxide was added to water which was inhabited by brine shrimp. The Brine shrimp are hardy invertebrates that are often used in experiments because of their resilient structure; therefore making them a good addition to this research. Bodies of water across the world are slowly becoming more acidic as Carbon Dioxide becomes a more abundant element. This experiment will illustrate how the increasing level of this component affects organisms on earth.

The Heat is on!
Katrina Nelson

The world is currently in trouble. Polar ice caps are melting. Summers are getting hotter and winters are getting colder. Properly insulating a house is crucial to saving energy and money. By choosing the right insulation to protect homes, cool air stays outside while warm air is trapped inside. An experiment was conducted to determine which type of insulation would retain the most heat (fiberglass, rigid foam board, and loose fill). Three boxes were each lined with a different type of insulation and one box with no insulation. A light bulb with a stand and a thermometer was placed in each box. With the room temperature at 23 degrees Celsius, the light was turned on in each box. They set for 10 minutes. After ten minutes the temperature of each box was taken and the light in each box was removed. Then the box set for another 10 minutes. The temperature was taken in each box and recorded. The average amount of degrees retained from the fiberglass box was 19 degrees Celsius. The average amount of degrees retained from the rigid foam board was 22.2 degrees. All though during the process, the foam board melted at 58 degrees Celsius. The control box retained 13 degrees. As the loose fill insulation box was tested the hot light bulb burnt the newspaper like insulation. After only one test, the loose fill insulation retained seven degrees. In conclusion, the foam insulation retained the most heat, but melted when direct heat was put on it. Fiberglass seemed to be the most practical because it retained 19 degrees on average and neither melted or burned.

Wastewater Wonders
Lauren Severance

This research was conducted to decide whether an old wastewater treatment plant is less efficient than a new wastewater treatment plant because the old wastewater treatment plant uses a settling tank as part of its treatment process. However, the new treatment plant uses a process called activated sludge instead of a settling tank. It was hypothesized that the old wastewater treatment plant would be less efficient than the new wastewater treatment plant. Five samples were collected upstream and downstream of each treatment plant. They were tested for the following: pH, phosphates, nitrates, turbidity, and fecal coliform to determine the overall quality of the water. The pH results showed no significant change between any of the samples taken. Both treatment plants reduced the level of phosphates by about the same amount. The nitrate levels actually improved more after going through the old treatment plant than the new treatment plant. The turbidity was raised slightly from upstream to downstream at both treatment plants, and the fecal coliform tests showed little difference between the samples taken upstream and the samples taken downstream of both plants. The hypothesis was not supported.

A Bright Idea
Jessica Leichter

This experiment was conducted to see if energy efficient light bulbs would get as hot as standard incandescent light bulbs. The hypothesis was that the energy efficient light bulbs would stay cooler, because they use less energy. A procedure board was built to test the light bulbs on. The procedure included, screwing a bulb of each kind into the fixtures, and using an electronic thermometer to determine the temperature. The results were that the average temperature for the energy efficient light bulbs was 42.2° C. The average for the standard incandescent light bulbs was 75° C. Based on the data, the energy efficient light bulbs stayed cooler than the standard incandescent light bulbs, therefore the hypothesis was supported.

Up In Smoke
Ryan Thomas

Air pollution is a constant problem and threat to both our modern, and ultimately, future societies. Air quality is controlled by a number of forces, both natural and man-made. This experiment was conducted to see what effect different air temperatures have on smoke by simulating a thermal inversion in a controlled environment. I simulated Earth's atmospheric conditions using a graduated glass bottle serving as my controlled environment. Identical lit paper matches were dropped into the bottles simulating smoke in the atmosphere. The trials were carried out using the air temperature at the bottom of the inside of the bottles as the variable. I was able to achieve temperatures of 2°, 21° and 40° C for this experiment. The data, as well as the results, were taken by measuring the height of the smoke in each temperature bottle in centimeters. The findings from each temperature were recorded in five trials, calculating averages for each. The height of the smoke in the 2° C temperature bottle had an average of 11.6 centimeters. The height of the smoke in the 21° C temperature bottle had an average of 19.0 centimeters. The height of the smoke in the 40° C temperature bottle had an average of 19.6 centimeters. The data indicated a noticeably higher average smoke height in the 21° C and 40° C temperatures, while the 2° C temperature had a much lower average smoke height.

Radon . . . Invisible Danger
Kaitlyn Carl

Radon is an air pollutant. It comes up through cracks in basements of houses. Radon is the second leading cause of lung-cancer deaths in the United States, and the number one cause of lung-cancer deaths in non-smokers. Radon is responsible for twenty-thousand deaths per year. Radon is tasteless, scentless, and invisible. This is why it is so dangerous. This research was conducted to test whether or not basements with sump pits have a higher amount of radon than basements without sump pits. The experiment was carried out by using a control group (three radon tests on the middle level of different houses) and experimental groups (three tests that were exposed to sump pit basements and three tests that were exposed to walk-out basements). Data was collected and then analyzed by scientists. The average amount of radon in the sump pit basements was 14.3 pCi/l (picocuries per liter of air), 5.1 pCi/l for the tests in the basements without sump pits, and 2.5 pCi/l for the middle level tests. One trial from the sump pit basements was particularly high. Overall, the sump pit basements did have more radon in them than the walk-out basements. Therefore, the hypothesis was supported.

Catching Some Rays

Becca White

For solar houses there are many different ways to heat the house. One way is to use a material for thermal mass that will absorb heat in the day and release it in the cool evenings. After being in direct sunlight for fifteen minutes, which material (water, sand, and salt) will have the least decrease of heat after being removed from direct sunlight for five minutes? The procedure was carried out by having three 18 oz. cups, one filled with water, one with rock salt, and one with sand. The three cups were placed in direct sunlight for fifteen minutes, and then taken out of direct sunlight for five minutes. The temperatures were taken by the Logger Pro System at thirty second intervals. The sand had the least average increase in temperature after fifteen minutes in direct sunlight and an average increase after being out of direct sunlight. Rock Salt had the highest average increase in temperature after being in direct sunlight and the highest average decrease in temperature after being out of direct sunlight. Water had the median average increase in temperature from direct sunlight and the smallest average decrease after being out of direct sunlight. The data indicated that there was a temperature increase after being in direct sunlight for fifteen minutes and for water and rock salt a decrease in temperature after being out of sunlight for five minutes. For sand there was a temperature increase after being out of sunlight for five minutes.

Engineering/Math/Computer Technology

Camera Color Commotion

Isabel Zacharias

The color of a photograph differs with the type of camera. The 4 cameras I tested were digital, film, Polaroid, and camera cell phones. This experiment was conducted to find out which type of camera produces photographs with the most accurate color. The procedure was carried out by making a color scale out of paint color samples and labeling them with numbers 1 through 9 (5 being the actual color, 6 being one shade lighter, 7 being one shade lighter than 6, and so on; 4 being one shade darker than 5, 3 being one shade lighter than 4, and so on.) The four cameras were then used to photograph an original Rubik's cube puzzle. After all photos were developed, the color scale was used to compare the colors in the photo to the actual colors on the Rubik's cube. This was repeated 5 times for each camera type. The digital camera's pictures had the most accurate color, rated as an average of 5 (perfect) on the color scale for yellow and 4 (a little bit too dark) on the color scale for red. The cellular camera phone was the least accurate with an average of 4.6 on the color scale for yellow and 6 on the color scale for red. The film camera was rated as an average of 5.6 on the yellow color scale and 4 on the red scale, and the Polaroid camera was rated as an average of 5.6 on the yellow color scale and 4.2 on the red scale. In this experiment, the digital camera had the most accurate color. Therefore, the hypothesis is accepted.

The Reflection of Laser Light

Ryan Land

Does laser light lose intensity when it is reflected off of mirrors? A laser makes a narrow beam of very bright light. Mirrors reflect light. When light is reflected off of a smooth surface it is reflected in a straight line. When light is reflected off of a rough surface it is reflected in different angles. This is called diffused. When light is reflected off of a mirror most of the light is reflected in a straight line but some of the light is diffused. This experiment was done to see if laser light would lose its intensity after being reflected off of mirrors. The procedure was to set up a laser for a light source, a light meter that measured light in foot candles, and mirrors to reflect the laser light off of. The result of the experiment was that the mean decrease in intensity of light, measured in foot candles, was 2.2 foot candles as each mirror was added. Laser light that is reflected off of mirrors does lose some of its intensity; therefore, the hypothesis can be accepted.

Puttin' the Wind to Work Jenny Nelson

This experiment was conducted to determine the optimum blade angle for wind turbines to produce the most power. It was hypothesized that the power output would increase when the blade angle was increased from the control setting of zero degrees. This experiment began by setting the blade angle to zero. A fan provided a constant wind speed, and was placed thirty centimeters away from the turbine. In each of the successive trials, the blade angle was increased by ten degrees and the power (voltage and amperage) output of the turbine was recorded. The maximum voltage and amperage were both attained at the twenty degree setting. Therefore, the hypothesis can be accepted.

Signal Strength Connor Mitts

This experiment was performed to determine how strong a Wi-fi signal will be when it attempts to penetrate obstacles. When the experiment was performed, a box was placed over the Wi-fi router and the signal strength was measured using a Nintendo DS from 25 feet away. Then another box was placed over the first box and the results were recorded. A third and final box was placed over the router and the signal was tested. Then the boxes were covered with aluminum foil and the experiment was repeated with the aluminum-coated wood. The three wooden obstacles didn't seem to slow the signal down, allowing it to stay at three out of three bars. The aluminum had the same effect until the end when the third box finally reduced the signal strength to two out of three bars. The conclusion had been reached that there must be many more and thicker obstacles to reduce or stop a Wi-fi signal. The hypothesis for this experiment was rejected because the aluminum didn't stop the signal and the wood didn't weaken it whatsoever.

Leather Or No Leather Is That the Question? Rachel Nyhart

When soccer balls and soccer shoe were made they were made of Leather and Naugahyde. Although the leather shoes may not give a complete control over the leather ball, so what about other materials? This experiment was conducted to find out which material (Cotton, Velcro, Nylon, Microfibers, Berber carpet, Sandpaper, and Leather) would have the best score in three test measuring friction and bounce (incline ramp, spring-scale pull test, and a bounce test) to have more control over the soccer ball, which will improve practice and help create more exciting plays that make soccer fun. The procedure was carried out by using a weighted sled that contained the material being tested (Cotton, Velcro, Nylon, Microfibers, Berber carpet, Sandpaper, or Leather). For the first test (incline ramp) the sled was on top of leather that was clamped onto the wood board, then by tilting the board until the first movement one was able to get the how far the height was. The second test (spring-scale pull) was constructed by attaching the spring scale on the weighted sled and pulling until first movement. Then reading the spring-scale one would be able to tell how much force was needed. In the third test (the bounce) the material being tested was laid out flat on cement, then a 35.584newtons (8lbs) ball was dropped from 157.48 cm (62in) high. The average for the incline ramp test for leather gave an average of 22.44725 cm in the first test (incline ramp test). There were 4.9484 newtons in the second test (pull test), and an 85.9155 cm on the third test (bounce test). Microfibers gave 35.27425 cm on the first test (incline ramp test), and gave 5.8936newtons for the second test (pull test), as well as an 87.503cm in the third test (bounce test). The Berber had an average of 28.3845cm on the first test. Also. Berber gave a 4.17 newtons with the second test, and a 79.4385 cm on the third test. Nylon tool gave a 31.84525cm in the first test, followed by a 6.116 newtons in the second test, and in the third it gave an 85.69325 cm. The Nylon tool was closely followed by Nylon in the first test consisting of 31.1785 cm, 4.6704 newtons in the second, and 84.8995 cm in the third test.

Cool Circuit
Alex Davila

Since the beginning of time, technology has been implemented to help make our lives easier. In this day and age, computers have surpassed many past discoveries and inventions, proving to be very useful. Still, even before the personal computer era, heat has affected the performance of all computers, whether that be the Macintosh from 1984, or a Dell Optiplex from today. This experiment was conducted to test at what temperature a computer operated most efficiently. In this experiment, a large Microsoft® Excel® file ran on an average computer system at the temperatures 12°C, 16°C, 20°C, and 24°C, with 24°C being the average operating temperature. As the file was launched for each temperature, the time it took for it to load was recorded. Between experiments, the computer was cooled for an hour to sustain consistency. The averaged experimental group indicated that the coldest temperature, 12°C, performed most efficiently, thus ruling my data inconclusive. Therefore, my hypothesis, cannot be accepted.

Testing the Effects of Polystyrene and Rubber on Particle Vibrations
Arjun Kumar

There are many places where physical vibrations are interfering with the surrounding environment. For example, when a new building is under construction, many vibrations travel through the ground to nearby structures. Is there a way to reduce these vibrations? This experiment was conducted to determine whether polystyrene or rubber could reduce the amount of vibrations that pass through them. The beginning of this experiment involved building a controlled environment for the testing. A vibration device was used to simulate a constant vibration in the earth's surface. Polystyrene and rubber were each placed at the exact center of the controlled environment. The vibration device was placed at a specific location on one side of the synthetic material while the seismograph's sensor was placed 35cm away, on the other side of the synthetic material being tested. A second set of readings was also taken close to the synthetic material but on the same side as the source of vibrations. The seismograph took both sets of readings and the results were graphed. The results show that polystyrene had the most effect on the vibrations. When it was compared to the Control, it reduced the intensity of the transversal vibrations on average by 0.058 cm/sec. The polystyrene also reduced the vertical vibrations by 0.150 cm/sec. The longitudinal vibrations increased when compared to the Control by 0.051 cm/sec. Rubber increased the transversal vibrations by 0.168 cm/sec. in addition, the longitudinal vibrations by 0.157 cm/sec. when compared to the Control. The rubber did decrease the vertical vibrations by 0.118 cm/sec. when compared to the Control. Based on the information collected, polystyrene had the most desired effect. It reduced the intensity of the transversal and vertical vibrations. The polystyrene also reduced the frequency of the transversal and vertical vibrations. The intensity of vertical vibrations was reduced after passing through rubber, but the transversal and the longitudinal vibrations were amplified. The conclusions of this experiment means the hypothesis can be accepted.

The Generation Gap Hannah Biegel

Efficient energy generation is important to reduce costs. This research was conducted to determine how generator productivity is effected by varying the gap between the rotating magnet and the stationary coil bar, and the number of turns in the coil. The procedure was carried out by making generators with gaps of 1.5mm, 2.5mm, 4mm, and 8mm, and with 100, 150, 200, 250, and 300 turns in the coil. The control group was the generator with a gap of 4mm and 200 turns in the coil. Data was taken by measuring the voltage with and without a load, the current, and the coil and load resistance. The output power was also calculated. Data was taken twice for each sample and the average of the two was used. The generator with the smallest gap, 1.5mm, and the second largest number of turns in the coil, 250, had the greatest output power. The generator with the largest gap, 8mm, and the fewest number of turns in the coil, 100, had the lowest output power. Unexpectedly, the data indicated that the most productive generator did not have the greatest number of coil turns, but it did have the smallest gap as hypothesized.

Shake and Sink Siobhan Barret

The term liquefaction is used by geologists and earthquake engineers when referring to the sudden loss of strength in water-saturated sand or silty soil during an earthquake or other vibrations. As a result buildings and other structures are damaged. This research was conducted to find out if liquefaction could be reduced by compacting sand. A shake table was used to produce the effect of an earthquake. One control group and four experimental groups of commercially available pave stone sand were tested. Loose sand was used for the control group. The compaction consisted of dropped a 4.5 kg weight 1170 mm onto the sand. The first through fourth experimental groups were compacted five, ten, fifteen and twenty times respectively. Then the experimenter saturated the sand. When saturated, a wooden dowel was pushed 85 mm into the sand. A 2.2 kg weight was placed on top of the dowel to model the weight of a building on a foundation. The sand was shaken on a shake table for two intervals of five seconds. After each interval data was collected by measuring the distance the dowel sank into the sand. The average total distance the dowel dropped for the control group was 28.45mm. For the experimental groups, these distances were 23.71, 19.71 mm, 19.57, 18.57mm respectfully. This data shows that liquefaction decreases as the effort of compaction increases.

London Bridge is Falling Down Ryan Koster

Different types of bridges are used all over the United States. There are certain situations when a certain type of bridge might be needed. What is the effect of the type of bridge made out of toothpicks on the amount of weight it will hold? If each type of bridge (Arch, Beam, and Truss) is tested to find out how much weight it can hold, then the Truss bridge would support the most weight, because it has metal bars that help hold up the weight. Three different types of bridges (Truss bridge, Arch bridge, and Beam bridge) were built. Five gram weights were added on until each collapsed. Each bridge was built of 300 toothpicks. There were 10 bridges built for each type of bridge. For the Beam bridge, all ten trials averaged out at 49.5 grams. For the Arch bridge, all ten trials averaged out at 159 grams. For the Truss bridge, all ten trials averaged out at 220grams. The reason this occurred may be because the uses of these bridges are different, and therefore they are built and designed for different things and different weights. Based on the data collected from this experiment, the Truss bridge will support the most mass before collapsing. Beam bridge supported the least amount of mass before it collapsed, with the Arch bridge in the middle. The Truss bridge supported the most weight because it has metal bars that help hold up the weight. Therefore, the hypothesis can be supported.

Physical Science

Pump It Up, Or Should You Mason Oberheu

Soccer is a popular sport all around the world and requires many skills. There are also the variable factors, one being the pressure in the ball. What effect does air pressure, or psi, have on the distance a soccer ball travels? If the amount of pressure in a soccer ball is increased, then the distance which the ball travels will be greater, because there will be less displacement, or indentation, in the ball. A simulator was developed to ensure a consistent kick; one ball was used. The ball was kicked ten times at each of five different pressures. The distance was measured from the kicking simulator to the point it stopped moving. For each kick the lever was lifted to the same height. Generally the ball traveled the furthest when at the lower pressures, especially four psi. The variation in the distances between the longest and the shortest kicks was slight. The ball that had the farthest average distance was the ball with 4psi. Based on the data collected in this experiment, the lowest psi tested (4 psi) traveled the farthest. Therefore, the hypothesis cannot be supported.

Propeller Design Jack Roeder

What effect does the material of a propeller have on the thrust of a radio control boat. Nylon and Beryllium propellers to see which one produced more thrust. If the propellers of a radio control boat are made of beryllium, then the thrust produced will increase because the material the propeller is made out of is harder and has less resistance. First attach the boat to a fishing scale and then full throttle it till it reaches its peak thrust. Repeat that procedure ten times. Attach a different type of propeller. Record the data on a spread sheet. The average thrust for the Nylon propellers were .3147 Newton's, the average thrust for the Beryllium propellers were .3878 Newton's. The highest thrust recorded for Nylon propellers was .3372 Newton's for Beryllium it was .4496 Newton's. The data from this experiment showed that the most thrust was produced by the beryllium propellers the force exceeded the nylon propellers greatly. Therefore the hypothesis was supported.

Crazy Cool Calorimeters! Paige E. Stevens

The cost of buying a calorimeter can be up to or over seven-hundred and fifty thousand dollars. This is a very high price to pay to find the energy content in food; so many different kinds of homemade calorimeters are constructed and used instead. An investigation could be done to find out how accurate the different homemade calorimeters are compared to a peanut nutrition label. If each type of homemade calorimeter (Thermos, Styrofoam cup, and Can) is tested to find its accuracy compared to the nutrition label, then the thermos calorimeter will measure the calorie content most accurately, because it insulates better. Three different homemade calorimeters were constructed out of materials that could be found at home. Each calorimeter was then tested to find its accuracy by burning a peanut inside of it under 30 mL of water. Then the results were calculated into Calories with the formula $q=m*c*T$. The formula being the mass of the substance times the specific heat of the substance times the temperature change of the substance equals the amount of Calories. The experiment was repeated for a total of ten trials. When comparing the accuracy of the three homemade calorimeters to a peanut nutrition label, the Thermos calorimeter was most accurate with an average of 4.4 Calories. The other two calorimeters were less accurate. The Styrofoam cup calorimeter had an average of 6.4 Calories and the Aluminum can calorimeter had an average of 1.7 Calories. The peanut nutrition label was about 4 Calories per peanut. Based on the data collected from this experiment, the use of a Thermos calorimeter will calculate the most accurate results. The Styrofoam cup calorimeter will be the second most accurate, with the Aluminum can calorimeter being the least accurate. The Thermos calculated most accurately because it insulated the best and the heat produced by the burning peanut mostly went towards heating the water. Therefore, the hypothesis was supported.

Attraction Action Amy Miller

Electromagnets are essential for many uses of technology that people rely on today. They are used in motors, generators, and electric doorbells. What is the relationship (linear or nonlinear) between the number of coils and the strength of an electromagnet? If different numbers of wire coils (20, 40, 60, and 80) are used on an electromagnet, then the relationship between the number of coils and magnet's strength will be linear, because magnetic flux density is increased with each coil of wire. First, a wooden base was constructed. Then, different numbers of coils were wrapped around the iron core. The electromagnet was placed on the board, and the wire was attached to the battery. Finally, the compass was moved along the wooden base toward the electromagnet, and when the compass needle reached a certain point, the data was recorded. The experiment was repeated ten times for each number of coils. When comparing the number of coils (20, 40, 60, and 80), and the point at which the needle of the compass reached the northeast mark, the 20 coils had an average of 18.7cm. When the electromagnet had 40 coils, it had an average of 24.8cm. At 60 coils, there was an average of 28.9cm from the compass. Finally, with 80 coils, the average measurement was farther, at 33.0cm. Based on the data collected in this experiment, the 20 coils had the shortest distance, while the 80 coils had the longest distance, with 40 and 60 coils proportionately in between. This was because the greater number of coils produced a stronger electromagnet. The graph of average distances shows that "Distance from Magnet" verses "Number of Coils" is linear. Therefore, the hypothesis can be supported.

Force of Follow Through Michael Relic

Force and gravity affects the game of baseball in many ways. What is the effect of the amount of follow through a bat has on the distance the ball moves? If you compare the distance a ball goes with different amounts of follow through, then the ball will go further when there is more follow through because there is more stored energy from backswing to use. Styrofoam balls were being tested if follow through had an effect the distance a ball goes. The bat was pulled back fully, then let go and then was stopped at its correct distance. The distance was measured once the ball came to a complete stop with a tape measure. Each different distance was trialed 10 times. All ten trials of the no follow through averaged out at 3.61 meters. All ten trials of the half follow through averaged out at 3.79 meters. All ten trials of the full follow through averaged out at 3.7 meters. When comparing the follow through of three different distances, no follow through, half follow through, and full follow through, the half follow through was the one with the highest average distance of 3.79 meters. All of the averages and distances that were measured were close to each other. Based on the data collected in this experiment, the half follow through had the longest average, the full follow through had the middle average, and the no follow through had the shortest average. This was because the half follow through had more time to use up all of its energy. The full follow through may not have performed as it was supposed to because of the inconsistency of the carpet. Therefore, the hypothesis can not be supported.

Flammable Fabrics Katie Mulich

Many people use Febreze each day. This experiment was undertaken to determine the safety of this treatment specifically as it relates to flammability. I tested to determine if the burn rate would be higher if fabric was Febreze treated or if the fabric was not treated. The tests were carried out by using nine 72cm. x 72cm. pieces of Febreze treated fabric and nine pieces of untreated fabric of the same size. Results were taken by measuring the length of time it took each piece of fabric to burn. Data was recorded after each piece of fabric was burnt. On average the non treated fabrics burnt faster than the fabric with Febreze treated to it which lead us to believe that Febreze is a safe fabric treatment.

The Rusty Nail Austin Schubert

Every day, people all over the world use machines that are made of metal. For example: cars, airplanes, or your household stove. These machines need to be protected from rust. If the machines rust, they can malfunction and cause accidents. Also, preventing rust would keep the machines looking better. This experiment was conducted to research the effect bacteria has on the growth of rust on iron nails. If bacteria are introduced on an iron nail, then the iron nail will produce more rust. I believe this is because the bacteria will weaken the defenses of an iron nail. The procedure was carried out by having a control group of six (6) iron nails in sterilized jars filled with distilled water, and six (6) iron nails in sterilized jars filled with a tablespoon of soil. The results were recorded by measuring the weight of the nails before they were put into the jars and after. Data was recorded at the start and finish of a two month period. The experimental group had an average weight change of 0.05 g. The control group had an average weight change of 0.09 g. The experimental group showed the smaller amount of weight change. Therefore, the hypothesis cannot be accepted.

Burn, Baby, Burn!

Kaiemi Teel

Wood is one of the oldest building materials used by man. One of the major drawbacks of wood is that it burns easily. An experiment can be conducted to find the effect of sodium chloride, boric acid, magnesium hydroxide, and magnesium sulfate on the burn time of wood. If each type of solution (sodium chloride, boric acid, magnesium hydroxide, and magnesium sulfate) is tested to find the burn time of wood, then boric acid will have the slowest burn time on wood, because it will raise the ignition temperature of the wood. Each material was mixed with water to form a thoroughly dissolved solution. Ten wood splints were then soaked overnight in each chemical. The wood splints were dried for two days and then ignited over an alcohol lamp. The time required for each splint to ignite was measured. This experiment was repeated ten times for each solution. When comparing the ignition times of the wood treated with the four chemicals (Sodium chloride, Magnesium sulfate, Magnesium hydroxide and Boric acid) to plain wood, the ignition time of the wood treated with Boric acid was longest with a median time of 6.17 seconds. The other three treated woods had ignition times longer than plain wood, but not as long as Boric acid. The mean time of Magnesium hydroxide treated wood was only .21 seconds (4.3%) longer than plain wood. Magnesium Sulfate treated wood performed a little better with a difference of .3 seconds or 6.2%. Sodium Chloride treated wood had an ignition time .49 seconds longer than plain wood, which was 10.1%. Based on the data collected in this experiment, plain wood had the fastest ignition time, while Boric acid had the longest ignition time. This is because the wood absorbed the boric acid, which has a high ignition point. This made it take longer for the wood to catch fire. Therefore, the hypothesis can be supported.

Popping Problems

Beth Koehn

Approximately seventy percent of popcorn is eaten by people at their homes, and thirty percent of it is eaten when people go out to the movie theater. Popcorn is eaten a lot and is a popular snack to eat. An investigation could be to find out which method of popping popcorn would leave the fewest amount of unpopped kernels, hot oil, hot air, or microwave. If each different method (microwave, hot air, and hot oil) is tested then hot oil will leave the fewest percent of unpopped kernels, because it will give more even heat and reach a greater amount of kernels making a greater amount pop. Thirty bags were each filled with 50 kernels and put into groups of three with ten bags in each group. Each group was tested for each cooking method hot oil, hot air, and microwave. Each bag was cooked until popping was heard and continued to heat up until no more popcorn kernels were heard popping for 15 seconds and then wrote down the percent. The experiment was then repeated for every bag, which was thirty trials in all. When comparing the percent of unpopped kernels for each method (hot oil, hot air, and microwave) the average percent of unpopped kernels for hot oil was 3%. Hot air had an average of 26%, which made it have the greatest percent of unpopped kernels. Then microwave had the average of 16.1% of unpopped kernels. Based on the data collected in this experiment, the method of hot oil will leave the fewest percent of unpopped kernels. Hot air will leave the greatest percent of unpopped kernels with microwave in the middle. Hot oil left the smallest percent of unpopped kernels because of its ability to transfer heat more effectively into the popcorn kernels. Therefore, the hypothesis was supported.

Conducting Chemicals
Christopher D'Silva

Electricity is everywhere; it is conducted every day. An analysis could be conducted to see how the conductivity of water compares to the conductivity of salt, sugar, and water. If the conductivity was tested and compared to distilled water and each type of solution (Salt, Sugar, and Baking soda), then salt would be the most conductive because it breaks into it two ions when it dissolves. A beaker was filled with 500 mL of water and then 2.5 mL of different household elements (salt, sugar, and baking soda) were added. The content of the beaker was then poured into the DC-10 voltmeter. The readings were measured. Then, the beaker was cleaned with distilled water and re-used for the other solutes. The experiment was repeated for a total of ten trials. When comparing the conductivity of the household elements (salt, sugar, and baking soda) to distilled water, the conductivity of salt was the highest with an average of 9750 microsiemens. Baking soda had an average 4400 microsiemens. Sugar had an average conductivity of 26.4 microsiemens, and the distilled water had an average of 22.7 microsiemens. Based on the information gathered from this experiment, the use of salt will raise the conductivity of water the most, sugar the least, and baking soda in the middle. The salt raised the conductivity of water the most because it breaks into its two ions when it dissolves. Therefore, the hypothesis can be supported.