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Animal Physiology/Pharmacology

Can You Stand It?

Amy L. Hein

Vision Impairments directly affect the ability to balance. Visual signals are sent to the brain about the body's position in space. This helps to maintain balance. This experiment was conducted to see what effect covering the different eyes would have on a person's ability to balance. The procedure was carried out by having a control group composed of having five test subjects stand on their right leg with both eyes open. Test subjects also stood on their right leg with their right eye covered, left eye covered, and both eyes covered. They were timed to see how long they could stand on their right leg with the different eyes covered without falling over. Then these steps were repeated using the subject's left leg. Then the average was found for each balancing task. The average time for both eyes covered on the right leg was 57.880 seconds. Its average time for the left leg was 134.66 seconds. The right eye covered group's average on the right leg was 197.7296 seconds. Its average time for the left leg was 458.838 seconds. The left eye covered group had an average of 509.738 seconds on the right leg. It had an average time on the left leg of 255.834 seconds. The average time for both eyes open was 2750.384 seconds on the right leg. On the left leg the average time was 650.75 seconds. The data indicated that the three groups with at least one eye open could maintain balance longer than with both eyes covered. The group with the eye on the dominant side open (left eye covered) had a longer average time than the group with the eye on the dominant side covered (right eye covered). They were pretty close; however, the hypothesis was supported.

Carbonation Invasion

Connor Kelley

The calcium intake in children, teens, and adults in the United States has been decreasing in the past few years. The reason for insufficient calcium intake in children and teens is they have been drinking more soft drinks than milk. Calcium plays a major role in bone growth and health. Without sufficient calcium your bones will not grow properly or they may become diseased. Many of the people who have trouble getting enough calcium will take calcium supplements in the form of tablets. The three most commonly used calcium tablets are calcium carbonate, calcium citrate, and calcium hydrogen phosphate. What effect do Pepsi and calcium citrate have on bone density? It was hypothesized that if a bone is placed in Pepsi, water, and water with calcium over six days, and if the change in bone density of the water group becomes a baseline zero, then the bone density of the bones placed in Pepsi will decrease, because the phosphoric acid will corrode the bone. The bones in water with calcium will increase in bone density, because calcium will deposit itself onto the bones. The procedure was done with a control group of 5 bones submerged in water for 6 days, 5 bones submerged in calcium, and 5 bones submerged in Pepsi. Data was collected every 24 hours for six days. Mass and volume of each of the 15 bones was recorded. The bone density of the calcium group declined by $.026 \text{ g/cm}^3$ but after you add $.041 \text{ g/cm}^3$ for the baseline, it rose by $.015 \text{ g/cm}^3$, therefore this part of the hypothesis was accepted. The Pepsi group declined by $.050 \text{ g/cm}^3$ but after you add $.041 \text{ g/cm}^3$ for the baseline, it declined by $.009 \text{ g/cm}^3$, therefore this part of the hypothesis was accepted.

Do You Remember . . . ?

Anna King

To find if girls in the 7th grade have a more accurate emotional memory than boys in the 7th grade, this experiment was conducted. Three pictures were chosen to be shown to the subjects, a pleasant one, a neutral one, and a violent one. It was hypothesized that girls would remember more in the pleasant picture, the boys more in the violent picture, and in the neutral picture both groups would remember an equal amount of details/objects. 12 subjects were gathered, 6 girls and 6 boys. Each was shown a picture for 15 seconds, then wrote down what they remembered from the picture for the duration of 15 seconds. This was repeated for every picture, and every subject. The results showed that the hypothesis was not supported. The girls remembered more accurately, than the boys, for every picture.

Can You Smell It?

Lyndsey Harrold

Since basil is used all the time by experienced chefs and home cooks alike and is one of the most common herbs used in cooking today, this experiment was conducted to see whether different types of soil (loam, sandy, and chalky) had an effect on the how strong the basil smelled. The procedure was carried out by having basil grow for three weeks in different types of soil (loam, sandy, and chalky). After the basil was grown the leaves and stems were cut out of the dirt and smashed into plastic containers. Each plastic container had one trial inside of it. Each type of soil had three trials. Familiarize the human subjects to the "Strength of Smell Scale". The human subjects smelled each trial three times and wrote down how strong it smelled using the "Strength of Smell Chart" (one being very little or no smell and five being very strong smell). The basil grown in loam soil had the strongest smell. Most of the human subjects rated it with a four or a five. The average of the smell was 3.50. The basil grown in sandy soil smelled the second strongest. The average of the smell was 2.29. The basil grown in chalky soil smelled the least. Most human subjects rated it with a one or a two. The average smell was 1.64. The data indicated that the basil had significant differences in smell according to the different types of soil. The basil grown in loam soil smelled the strongest and also the best according to the human subjects. The basil grown in sandy soil and the basil grown in chalky soil did not smell very strong, although the basil grown in sandy soil smelled stronger than the basil grown in chalky soil.

Which Color Would You Choose II

Sean Amos

There are billions of different products in the world. Among those products there are millions of different colors. If a majority of people like a certain color on a certain product then they will be more tempted to buy that product than others. There was a flier produced with 42 colors on it and subjects marked the color preference they had that day. If multiple colors are placed in the form of a flier, then the color that is a shade of purple will be chosen the most by both genders, while a shade of red will be chosen the most by boys, and girls will choose a shade of blue the most. This is because red and blue were chosen the most by their respective genders in previous studies with a small amount of people, and purple would be chosen since it is a mixture of red and blue. The procedure was carried out by placing a color sheet and an answer sheet (table 1) on a table by the separate gym entrances, one for males, and one for females. Subjects then marked what their color preference was that day. Measurements were taken with how many people chose that color that day. The experiment was tested over a period of 10 school days. All of the following colors that correspond to the number on the color sheet with an average of 1 or more for females are as follows: 13(2.5) 14(1.7) 15(1.6) 16(1.2) 27(1) 33(1.7). All of the following colors that correspond to the number on the color sheet having an average of 1 or more for the males are as follows: 1(3.9) 2(1.3) 4(1.3) 5(1.4) 6(1.3) 7(1.2) 12(1.1) 13(1) 15(1.1) 18(2.6) 24(1.2) 33(1.1) 34(6.1) 42(5.5). All of the following colors that correspond to the number on the color sheet with an average of 1.5 or higher when both genders were combined: 1(4.3) 4(1.7) 5(1.8) 7(1.6) 13(3.5) 14(2.4) 15(2.7) 16(1.7) 17(1.7) 18(3.4) 24(1.7) 33(2.8) 34(7) 42(6.2). Based on the data collected in this experiment, the choice of color will change day by day. Color 13, a blue, did the best for females, being chosen an average of 2.5, color 34, a brown, did the best for males being chosen an average of 6.1, and color 34 did the best for both genders with an average of 7. The colors 2(red), 9(blue), 28(turquoise), 29(turquoise), 32(dark pink), 37(white), 38(grey), 39(grey), 40(grey), and 41(black) picked by females did the worst, averaging 0 each. For males, colors 39(grey) and 40(grey) did the worst with an average of .2 each; for both genders, colors 39(grey) and 40(grey) did the worst with each averaging .2. Therefore the hypothesis can be rejected for the males and both genders but can be accepted for the females.

Botany/Plant Physiology

Seed Germination

Chase Kennedy Richards

Most plants go through the process of photosynthesis, which is when plants absorb and mix together water, carbon dioxide, and light to create a sugar, which is used as food for the plant. This is what allows a plant to create oxygen, live, and grow. The natural the light source is the sun, but other light sources can be used, some might be better than others. Plants need light for photosynthesis. Varieties of light sources are used by humans to see colors and navigate. What effect does the type of light have on the rate at which been seeds germinate? If a variety of light sources are used (Sun, plant light, incandescent light bulb) the seed with sunlight will germinate faster, because, seeds naturally germinate using light from the Sun. For the experiment all of the light sources were gathered and set up. The bean seeds were then planted in the same type and size of plastic cups. The bean seeds were then placed in groups under the designated light sources and given the same amount of water, as to begin the germination process. The bean seeds all got the same amount of time exposed to their light sources a day. When they germinated the time taken for germination was recorded. When comparing the data of the time needed for seed germination by three different light sources, the Sun light source had the most seeds that didn't germinate. The reason this occurred may be because of the indirect angle of light hitting Earth do to its current angle in the season of winter. The Sun light source had the lowest germination average of 4.7 days, due to the fact that most of the seeds didn't germinate. The plant light source had the highest average of 8.9 days. This may have occurred because of the changes in temperature between night and day. Based on the data collected in this experiment, the incandescent light bulb light source had the quickest results, while the Sun light source had the fewest and slowest results. This might be because of the indirect angle of Sun light hitting the Earth, due to Earth's current angle during the winter, so the plants would be getting insufficient amounts of sunlight. Therefore, the hypothesis can not be supported.

Effect of Incense Smoke on Plant Growth

Ereka Hunt

This purpose of this experiment is to test if air pollutions are having effects on plants' ability to grow. The air pollutant used in this experiment was incense smoke. Incense is like an air freshener that produces a fragrance from the smoke when burned. Incense has been shown to produce toxic chemicals from the smoke it gives off. What effect does incense smoke have on plant growth? If incense is burned around growing plants, then the plants will not grow as tall, because the smoke from the incense is like an air pollutant. Lettuce seeds were used in this experiment. There were two trays, one for the plants that were exposed to the incense and one for the plants that weren't. Each tray had a lid to cover up to plants when the incense cones were burning. Each tray was given 50 mL of water everyday, and given 8 hours of light. After the end of 10 days, each plant was measured in centimeters. When comparing the final data of the experiment, the plants that were exposed to the incense smoke grew the shortest at an average of 2 ½ cm. This may have occurred because air pollutants stopped or cut short their growth soon after they sprouted. Therefore, the plants that weren't exposed to the incense smoke grew the tallest at an average of 4 cm. This may have occurred because the air was clean and allowed the plants to continue to grow. Based of the data collected in the experiment, the plants exposed to incense smoke had the shortest average growth, while the plants not exposed had the tallest. This was because the plants that were exposed to incense smoke were exposed to toxins and pollutants that harmed the plants and stopped the growth. Therefore, the hypothesis can be supported.

Soil, Seeds, and Hydroponics
Brett Cooper

During the course of this experiment, the question asked was, "What effect does germinating a seed have on how long the germination period will be when being compared to germination in soil?" Based on facts found in the sources used, seeds that are planted using hydroponics have more freedom to spread than seeds that are planted in soil. Because of this, the hypothesis of this experiment was that if the amount of time it takes for a seed to germinate depends on the environment that the seed is placed in, then the seeds planted using hydroponics will have a shorter germination period than the seeds planted in soil because they will be in a freer environment. This experiment was spread out over a period of about seventeen days. Every day, the seeds grown using hydroponics had to be watered. All of the nutrients that seeds get from soil had to be added to the water. The seeds grown in soil were watered whenever the soil turned dry. When a seed germinated, its time was recorded. The seeds that were grown using hydroponics produced an average of 10.47 days and the seeds that were grown in soil produced an average of 14.68 days. This may have occurred due to the fact that roots have more room to spread when grown using hydroponics than they do when grown in soil. An explanation for the eight seeds that did not germinate may be that the seeds were planted in mid autumn instead of spring time when seed germination occurs more. If the seeds have been planted then instead, the results may have been more reliable. Based on the results of this experiment, the average germination period for the seeds grown using hydroponics was smaller than the average germination period for the seeds grown in soil. Therefore, the hypothesis can be supported.

Growing Gas: An Investigation Testing Growth Rates of
Zea Mays var. Golden Bantam for Ethanol
Colby Everett

Americans spend over \$800 million in gas imports daily, and now the nation is looking for alternative fuels to reduce dependence and global warming. This experiment was conducted in two phases. The second phase was reconstructed with slight variation for improved accuracy. The procedures and results of the first phase will be displayed first then; the procedures and results of the second phase will be displayed: this is for comparing purposes. What effect does the type of light (halogen, fluorescent, and incandescent) have on the growth rate of sweet corn (Zea Mays var. Golden Bantam)? So, if the type of light (halogen, incandescent and fluorescent) is tested to see which best promotes the growth rate of sweet corn, then fluorescent light should have the highest effect on the growth rate of sweet corn (Zea Mays var. Golden Bantam), because fluorescent light has the closest spectrum to the sun. Golden Bantam corn was grown under three different types of light (halogen, incandescent and fluorescent). Fifty seeds were planted and placed under each light in a temperature controlled environment. Each plant was given sixty cc's of water after thirty days thirty more cc's were added. Each plant was measured in centimeters then averaged. Then, the second time, thirty seeds were planted and water was not increased after thirty days. The experiment lasted thirty days and at the end each plant in each pot were measured. The halogen plant averaged 20.82 cm, the incandescent averaged 28.61 cm and, the fluorescent averaged 27.84 cm. The second time this experiment was conducted the halogen averaged 28.88 cm, the incandescent averaged 13.19 cm, and the fluorescent averaged 4.33 cm. Based on the data collected in this experiment the first time, the incandescent light had the highest growth rate results, while the halogen light had the lowest growth rate. This could have been because the incandescent light maintained a better balance of water and light taking heat from the light into consideration. Whereas, the second time this experiment was conducted the halogen had the highest growth rate while the fluorescent had the lowest growth rate. This could have been because of the low temperature in the basement. Therefore, in both experiments, the hypothesis could not be supported.

The Effect of Microorganisms on Bean Plants

Jack Rogers

Microorganisms are a very important part of a plant's life. They help fertilize the soil and contribute to the overall health of the soil. What is the effect of the presences of microbes on the growth of a plant? If plants with microbes in their soil and plants without microbes in their soil are tested, then the plants with microbes will grow faster than plants without microbes in its soil because the microbes help break down organic material in the soil and give the plant more energy. The experiment was conducted by growing ten bean plants in soil with microbes and by planting ten bean plants in soil that was cooked in a microwave, because cooking microbes kills them. The plants were watered daily and the heights were recorded. When comparing the amount of growth between plants with microbes in their soil with plants without microbes in their soil, the plants with microbes in their soil had the highest growth with an average of 7 cm in three weeks. The reason this occurred may be because the microbes in the soil break down organic material in the soil and turn it into nutrients that the plants can use to grow. The plants without microbes in their soil grew less when compared to the other plants. They grew an average of 6 cm in three weeks. The reason this occurred may be because without microorganisms in the soil to break down material, the soil contains less of the nutrients that the plants need to grow. Based on the data collected in this experiment, the plants with microbes had the most overall growth, and the plants without microbes had the least overall growth. This may be because the plants with microbes in their soil had more nutrients in their soil that were necessary for growth. However, there were not enough trials to say that microbes caused more growth, so the hypothesis cannot be supported.

The Effect of Microwave Radiation on the Germination of Seeds

Abby Gomer

What is the effect of microwave radiation on the germination of seeds? Well, the thought was that if seeds are exposed to microwave radiation and compared to seeds that were, then the seeds that were not exposed to microwave radiation would grow more, because the heat from the microwave radiation would fry the beans and kill them. There were 40 Bush Bean seeds that were microwaved for specific amounts of time (0 seconds, 10 seconds, 20 seconds, and 40 seconds), and then planted separately in their individual cups (10 seeds in each group of cups microwaved their specific amount of time). For 12 days they were watered and the germination of the seeds was recorded once the seed sprouted above the soil. Since the effect of microwave radiation on the germination of seeds was being tested, the seeds were microwaved and then put in soil to germinate for 12 days. The measuring of the plants was quite simple because the only thing that was measured was the day the plant germinated, or sported, out of the soil. For each variable, there were 10 trials to be tested. In the end the 10 second and the 0 second microwave radiation seeds grew the fastest, while the 40 second seeds didn't even grow at all, and the 20 second microwave radiation seeds came right behind the 10 and 0 second seeds by an average of .5 days. Therefore, the hypothesis can be supported.

Cell Biology/Microbiology/Bacteriology

"The Cutting Edge"

Paige Waltman

This experiment was conducted to find out which types of cutting boards (acrylic, wood, plastic, and plastic with Microban), have the least bacteria and are the safest to cut food. The procedure was carried out by having 4 different types of cutting boards, acrylic, wood, plastic, and plastic with Microban. Each were tested for bacteria before raw chicken was swiped on the boards and after raw chicken was swiped on the boards. This was done a total of five times. The average number of bacterial colonies for the acrylic board before the chicken was swiped on it was 5.8, and after the chicken was swiped the average number of bacterial colonies was 80.2. The average number of bacterial colonies for the wood cutting board before the chicken was swiped on it was 26, and after the chicken was swiped the average number of bacterial colonies was 39.4. The average number of bacterial colonies for the plastic cutting board before the chicken was swiped on it was 12.2, and after the chicken was swiped the average number of bacterial colonies was 26.4. The average number of bacterial colonies for the plastic with Microban cutting board before the chicken was swiped on it was 12.2, and after the chicken was swiped the average number of bacterial colonies was 54.4.

Wipe On, Wipe Off

Lindsay Nelson

How do people know whether or not Clorox wipes really are the best thing to clean your counters with? If a rag or sponge with water cleans the counter just as effectively as the Clorox wipes then why should people be using them if you can only use them once? The bad thing about only being able to use a Clorox wipe once is once they have to be thrown away which clog up our landfills when sponges and rags are both reusable. Which cleaning method will work the best to remove the most bacteria? This project was done using Clorox wipes, a wet sponge, and a wet rag. The experiment was performed by wiping down a counter every two days with each cleaning tool. Then swabbing the counter before and after it was cleaned. This procedure was used five times. In this experiment the Clorox wipes had an average bacterial count of 7. The wet sponge had an average bacterial count of 8. The wet rag had an average bacterial count of 5. The data indicated that the wet rag had the least bacterial growth. Therefore, it cleaned the counter better than the Clorox wipes or sponge, and my hypothesis was rejected.

Eye Spy Bacteria

Cecilia Smith

Mascara grows bacteria even after only the first use! It is supposed to be replaced every three-six months. The mascara can cause conjunctivitis, and other eye infections if misused or used for too long. This experiment was conducted to find out which of the number of uses of bacteria would grow the most bacteria. The procedure consisted of a control group of a tube of unused mascara. Mascara was also used for one, five, 10, 15, 20, 25, and 30 times. Six girls 13 years old and one adult used the mascara the set number of times. After they were done using the mascara it was swabbed on a petri plate with agar. A line was drawn down the middle so two trials were on one petri plate. The petri plates were put on a counter in sunlight. They were left on the counter for fourteen days. The number of bacterial colonies was counted each day consecutively. After fourteen days the bacteria was identified. The average amount of bacterial colonies for no uses was zero. The average number of bacterial colonies for one use was zero. The average number of bacterial colonies for five uses was 0.6. The average number of bacterial colonies for 10 uses was 0.6. The average number of bacterial colonies for 15 uses was 0.2. The average number of bacterial colonies for 20 uses was zero. The average number of bacterial colonies for 25 uses was 0.2. The average number of bacterial colonies for 30 uses was one. The data indicated that the greater number of times you use mascara the greater number of bacteria colonies there was. The mascara tube that was used 30 times had the greatest number of bacterial colonies.

Germs at the Doctor's: A Study of the Number of Microorganisms
That Grow from Various Locations at a Doctor's Office
Megan Smith

Most people who go to a doctor's office are unaware of the microorganisms they are exposed to. This experiment's results will teach patients which activity they participate in at the waiting room will expose them to the least amount of microorganisms. If swabs are grown from a chair, a toy, and a magazine from a waiting room, then the most microbial colonies will grow from the chair. In order to do this, swabs were taken from a toy, a magazine, and a chair and grown. The number of microbial colonies visible to the naked eye at 48, 72, and 96 hours were counted. This process was repeated three times. After 96 hours, the average number of colonies present in the toy was 64 colonies. After the same time, there were 99 colonies on the magazine and 115 colonies on the chair. The results showed that the most colonies grew on the chair, followed by the magazine, and lastly, the toy. These results did not support my hypothesis.

The Effect of Preparation Technique Used to Slice Apples
on the Amount of Bacteria on the Apple Slices
Courtney Stirk

The purpose of this project was to determine if commercially prepared apple slices have more bacteria than freshly sliced apples. The problem was to find out what effect the preparation technique for slicing apples has on the amount of bacteria transmitted to those slices. The idea being that if sliced apples are more susceptible to bacteria once they have lost the protective barrier provided by the skin, then more bacteria will be found on the pre-packed apple slices than on those freshly sliced. In order to test the hypothesis, two brands of pre-packed apple slices along with freshly cut slices from washed and unwashed whole apples were selected. Samples of the skin and fruit of each group were taken using sterile transfer swabs and then streaked across nutrient agar plates. These were incubated at 37° C for 24 hours and then observed for bacteria growth. It was found that no bacteria colonies developed on 5 of the 6 samples taken from the inside fruit of the fresh apples, and little was found on the skin of the washed apples. The outer skins of the unwashed apples and those of the pre-packed slices showed very similar bacteria growth; their averages ranging from 19.67 to 26.33 colonies. The fruit of the pre-packed slices had the highest amount of bacteria with Brand A averaging 40 colonies and Brand B averaging 98.33 colonies. These results supported the hypothesis, and so it was concluded that freshly sliced apples are less likely to be contaminated and are, therefore, safer to eat.

Bacteria Battles
Mac Cook

People cut all types of food on cutting boards. Different cutting boards accumulate different amounts of bacteria. What effect does the material of a cutting board have on the amount of bacteria collected after use? If each type of cutting board, (wood, plastic, and glass), is tested to find the amount of bacteria that remains after use, then the plastic cutting board will accumulate the most bacteria, because biofilms are more likely to form on plastic. Make the incubators. Cut the chicken on one type of board, the wash the board and swab it to get bacteria for the agar plate. Place the plate in the incubator for 24 hours and count the bacteria. Repeat for all board types. When comparing the data of the number of bacteria colonies that grew on different surfaces, plastic produced the least colonies of bacteria at an average of 0.4. This may have occurred because there are less pores or groves for bacteria to avoid being killed by washing on the plastic surface. Cutting chicken on the wooden cutting board produced the most colonies of bacteria at an average of 3.8. This may have occurred because of wood's many pores, allowing the bacteria to survive after being washed. Based on the data collected in this experiment, the wood cutting board grew the highest amount of bacteria, with an average of 3.8 colonies, while the plastic grew the least. Therefore, the hypothesis cannot be supported.

In the Shadows
Caitlyn Massy

Many women and some men wear makeup. Besides mascara, eye shadow is basic to any cosmetic application. The eye is the most vulnerable part of your body. Getting bacteria in your eye can cause conjunctivitis. The differences in bacteria count between eye shadow cream, powder eye shadow, and the shadow stick will be shown in this project. If eye shadow cream, powder eye shadow, and the shadowstick are each worn once and used by the same person, then the eye shadow cream will have the most bacteria because of the material used to make the cream eye shadow. Having a control group that was powder eyeshadow carried out the procedure. Two other types of eyeshadow were used: cream eyeshadow and the shadowstick, these were the experimental group. To test the eyeshadow, the hands and face had to be cleaned thoroughly. After this was done, one of the eyeshadows was applied with an eyeshadow brush. Immediately after applying the eyeshadow, the brush was swabbed. The swab was then swiped on the Petri dish. The dish was then taped shut, labeled, turned upside down, and never opened again. This was repeated nine more times with the same eyeshadow, making a total of ten trials. The whole process was repeated two more times with the other eyeshadows. Bacteria was given a week to grow, then the colonies were counted and the data was recorded and compared. When comparing three different types of eyeshadow to each other, the shadowstick had the most bacteria. The shadowstick had an average of 11.2 bacteria colonies. The experimental group had a higher bacteria count than the control. The powder eyeshadow, the control group, had an average of 5.8 bacteria colonies. The cream eyeshadow had an average of eight bacteria colonies. The shadowstick had an average of 11.2 bacteria colonies. Based on the data collected from this experiment, the type of eyeshadow has little to do with the growth of bacteria. The casing plays a much bigger role. The cream shadow and powder shadow are packed in the same type of case. The shadowstick is in a case that looks like a lipstick tube. It twists up and therefore, gets more exposure to bacteria being out in the air. The shadow stick had the most bacteria colonies. The shadowstick had an average of 11.2 bacteria colonies. The powder eyeshadow had the least amount of bacteria, 5.8 bacteria colonies. Therefore, the hypothesis is accepted, as the experimenter believes that the shadowstick would have the most bacteria.

Pondering Peppers, Part 2
Connor Kelley

Chile peppers are high in capsaicin, which has been proven to have antimicrobial properties. This experiment was carried out to see if dried peppers could inhibit mold growth. The peppers used were Ancho, De Arbol, Puya, and Habanero for the experiment. In order of least to greatest in capsaicin levels first was the Ancho, then the Puya, De Arbol, and Habanero. The experiment was done using by blending the peppers then applying bread mold to a nutrient agar plate with one control side and one side with the pepper on it. The plates left for 3 days to grow then the mold was measured by counting the mold colonies using graph paper. The Ancho pepper was the most antibacterial with an average of 18 mold colonies per plate followed by the Puya, De Arbol and lastly the Habanero. The Habanero which contained the most capsaicin was expected to do the best but inhibited the least amount of mold of the peppers used. The data showed that all the peppers significantly inhibited mold growth. While all the peppers inhibited mold growth the one with the most capsaicin inhibited the least.

Dirty Dishes
Tessa Parker

Energy conservation has become an important issue related to global warming. Many people use dishwashers to simplify their lives. Today, dishwashers have many features to improve the cleaning process. This project was conducted to determine if the extra features on dishwashers, which come with increased energy usage, have an effect on bacterial growth. This experiment tested normal, heated dry, sanitize and high temperature dishwasher cycles to find out which cycle had the least amount of bacteria growth. The hypothesis predicted that the sanitize cycle would have the least amount of bacteria growth. Two kinds of bacteria were used for the project: bacteria from spoiled milk and bacteria from saliva from a person. The procedure was conducted by running one plate covered with spoiled milk or saliva in a dishwasher cycle. At the end of the cycle, a sterile swab was rubbed across the plate. Then, the same swab was rubbed onto a Petri plate with agar. Five trials were conducted for each cycle for both bacteria from spoiled milk and bacteria from saliva. After seven days, the Petri plates were placed on graph paper squares to determine how many graph paper squares were covered by the bacteria and fungi. The average amount of bacteria on plates with bacteria from spoiled milk were: 7.20 graph paper squares from the normal cycle, 2.18 graph squares from the heated dry cycle, 2.70 graph squares from the sanitize cycle, and 3.00 graph squares from the high temperature cycle. The average amount of bacteria on plates with bacteria from saliva from a person were: 2.70 graph paper squares from the normal cycle, 5.44 graph squares from the heated dry cycle, 3.64 graph squares from the sanitize cycle, and 5.46 graph squares from the high temperature cycle. Therefore, the hypothesis was not accepted.

Does Surgical Face Masks Prevent Spread of Droplet/Airborne Infections:
A Microbiological Correlation Study
Shilpi Ganguly

Many health care workers and patients wear face masks everyday in medical environments hoping it will help prevent transmission of any infections. However, there is a controversy as to whether the common surgical face mask is able to fully protect the wearer and those around from transmission of infections. In this project I tested to see whether a common surgical face mask and an N95 respirator mask are able to efficiently prevent spread of droplet infections to and from wearers. I conducted this experiment in three phases. Phase one was to test to see what normal pathogens are in the environments around us. Phase two was to see whether the common surgical face mask and N95 Respirator are able to prevent the spread of infections to and from wearers. Finally, in Phase 3 I tested to see whether or not both the N95 Respirator and Common Surgical face mask are able to prevent transmission of droplet infections. My results indicated that the common surgical face mask is able to prevent the spread of airborne/droplet infections in only 70% of cases, whereas the N95 Respirator was able to prevent the spread of airborne/droplet infections 100% of cases. Concluding, if one needs to use a mask to keep thyself or individuals around from contracting an infection, the best option is to wear an N95 Respirator. My hypothesis was supported with the data that was presented.

Earth Science/Environmental Science/Ecology

What Provides the Best Sun Protection; Sunscreens or Fabrics?

Megan Anderson

Does the level and SPF of sunscreen of a UV bead protect the bead better than 100% black or white fabric on a UV bead? In this experiment different levels of sunscreen were tested, along with 100% black and white Cotton Fabrics were tested to see which material would protect the UV beads the best. If, SPF 15 sunscreen is put on UV beads, SPF 30 sunscreen is put on UV beads, SPF 45 sunscreen is put on UV beads, SPF 50 sunscreen is put on UV beads, black fabric is placed over UV beads, and white fabric is placed over UV beads, then, the beads with the SPF 45 sunscreen will produce the least color change in the UV beads. SPF 15 sunscreen had an average of two, SPF 30 sunscreen had an average of 1.6, SPF 45 sunscreen had an average of 1.6, SPF 50 sunscreen had an average of 1.6, 100% white fabric had an average of 1.2, and 100% black fabric had an average of 0. Therefore, the hypothesis was rejected and 100% black fabric protected the UV beads the best.

CO₂: Friend or Foe?

Andrew Herrmann

Both carbon dioxide and water lettuce have bad reputations, but some people think that something good can come from the two combined. People believe that the rising CO₂ levels in our atmosphere are bad for everything on Earth. Other people believe that the rising CO₂ levels are better for plant growth. What effect does added CO₂ in the water have on the growth of water lettuce? If carbon dioxide is added to water, (20g, 40g, and 60g), then the water lettuce in the water with 60g of added CO₂ will show the most increase in size, because CO₂ is needed for plants to complete their photosynthesis process. Fill all the tubs 2-3 litres full of water, and label. Then, measure ten water lettuce where it is widest, and put into each tub. Place the right amount of dry ice into each tub. Measure plants and add dry ice once every day, for two weeks. In the control group, the tub without dry ice added, the average amount of growth of water lettuce was .23 cm. In the first experimental group, the tub with 20g dry ice added, the average amount of growth of water lettuce was .22 cm. In the second experimental group, the tub with 40g dry ice added, the average amount of growth of water lettuce was .26 cm. In the third experimental group, the tub with 60g dry ice added, the average amount of growth of water lettuce was .39 cm. The more CO₂ added to the water, the more the water lettuce grew. Based on the data collected from this experiment, the group with 20g of added CO₂ showed the least growth, while the group with 60g of CO₂ showed the most growth. This might be because carbon dioxide is needed by plants to complete their photosynthesis process, which makes food for plants. The more carbon dioxide a plant has, the more food it has, and, furthermore, the more it grows. Therefore, the hypothesis can be supported.

Octane Breakdown

Kylie Lambeth

Global warming is becoming a big factor in the world today. People are trying to figure out ways to reduce carbon dioxide. Hybrid cars are a way to do that, but people may not want to buy them. Also, they may not want to trade in their perfectly fine cars for an energy saving car that is quite expensive. So getting people to buy hybrids as a way to lower carbon dioxide emission levels may take awhile. A quicker way perhaps would be to eliminate higher octane gas if the higher octane contains more carbon dioxide. This experiment was conducted to see if a higher octane of gas contains more carbon dioxide than a lower octane of gas. If the gas octanes of 87, 89, and 91's carbon dioxide levels are compared then the octane 87 will have the lowest amount because octane 87 has only 87% hydrocarbons which are the lowest out of the three octanes, and hydrocarbons contribute to carbon dioxide. This experiment tested 3 different gas octanes, 87, 89, and 91, to see if the higher octanes of gas contained more carbon dioxide than the lower octanes of gas. The experiment was conducted by capturing the emissions from a lawn mower engine in a balloon, bubbling the emission through BTB solution, neutralizing the mixture with ammonia and recording the amount of ammonia required to neutralize. The amount of ammonia required to neutralize the mixtures was compared to the amount of ammonia required to neutralize a mixture of BTB and 100% carbon dioxide mixture required 50 ML of ammonia to neutralize. On average, each of the octanes tested, 87, 89, and 91, required 0.24 ML of ammonia to neutralize. Each of the octanes tested were determined to contain, or average, 0.48 percent carbon dioxide. Based on the data collected in this experiment all three octanes (87, 89, and 91) had the same average of carbon dioxide within them, 0.48 percent. Therefore, the hypothesis is not accepted as the experimenter believed that octane 91 would have the highest carbon dioxide amount within the exhaust.

Oceans Away

Song Loftus

Oil is something that we all use in our everyday life. Unfortunately it isn't the easiest thing to obtain. People have to ship it all over the world. Because of that we have had some problems with oil spills. Because oil is hard to separate or clean from water, the longer it stays, the more damage it causes the environment. The materials that will be tested are baking soda, dishwashing liquid, cat litter, talcum powder, straw, and sponges. Which one of these materials removed the most oil from water? If baking soda, liquid detergent, cat litter, straw, talcum powder, and sponges are used to clean up oil spills then the baking soda should clean up the most oil because it is so good at breaking down substances. In the comparison of six methods of removing oil from water, talcum powder, sponge, dishwashing liquid, cat litter, straw and baking soda, (the experimental group), to the control group (adding nothing), adding nothing didn't change the amount of oil in the water all. The average of adding nothing was 0.00% of removing the oil. The other six methods of removing oil (talcum powder, sponge, dishwashing liquid, cat litter, straw and baking soda) all removed a higher percentage of oil from the water than the control. I filled all the cups with 125 ml cup of water, then added 25 ml cup of motor oil. In the first 10 cups I added two teaspoons each of baking soda; the next 10 cups two teaspoons each of some cat litter; the next 10 cups two teaspoons each of talcum powder; 2 teaspoons of liquid detergent into each of the next 10 cups; the next 10 cups twenty-five pieces of three inch straw; and ½ of a sponge placed into each of 10 cups. The last 10 cups had nothing added to them. The 70 cups then sat for an hour. I then removed as many of the variables as possible from the cups, and measured the amount of oil that remained in the cup. The average amount of oil removed by the dishwashing liquid and the baking soda was 7.228%. The sponge and the straw removed the most amount of oil from the cups. The average of the two is 60.004%. The talcum powder and the cat litter averages were in between the dishwashing liquid and baking soda and the sponge and the straw. The averages of these two are 24.452%. Based on the data collected in this experiment, the sponge removed the greatest amount of oil from the cup of water. On average the sponge removed 64.448% of the oil. Adding nothing had the least amount of oil that was removed from the water. The average of adding nothing is 0.00%. The baking soda performed worse than some of the other variables. Therefore, the hypothesis can be rejected.

Up In Smoke?

Katrina Nelson

Scientists have proven that smoking cigarettes is harmful to our bodies and can cause disease, but does anyone think about how cigarette smoke affects the world's plants? More and more people become addicted to cigarettes every day but don't think about the consequences. Does cigarette smoke affect the growth of a sugar snap pea plant? Four trays with twelve individual pots were each filled with dirt and given a sugar snap pea seed and watered. The trays were labeled accordingly as control, 1 hour, 3 hours, and 5 hours. This would determine how long that tray would be exposed to smoke each day. The trays labeled 1 hour, 3 hours, and 5 hours were placed under upside-down fish tanks with a lit cigarette. They were measured and watered each day and smoked (except for the control which was exposed to no smoke). The control and 1 hour plants were the first to sprout. The control group grew steadily, while the five hour didn't grow nearly as much as the control. The control looked healthy, while the 3 hour and five hour were somewhat bent over. The soil in the 5 hour group seemed constantly wet while the others were dry. The control group grew much taller than those exposed to cigarette smoke and grew at a steady rate, while the others grew fast at first, then slowed down.

Ocean Potion

Sarah Bowman

The ocean currents blend different salt concentrations together to form an overall balance. Water that evaporates from the ocean will usually fall in the same region that it evaporated in, thus keeping the ocean salinity balanced. What is the effect of the salinity on coral reefs? If the salinity of the oceans gets too high, then the corals will become stressed, because the salinity would be too powerful and overcome them, they could die. The amount of salinity that surrounds coral reefs was being tested in this project. It was tested by taking the same salt concentration and adding it by one cup increments into the tank that was being tested. This experiment was measured by using a hydrometer to measure the salinity of the water, and by counting the number of coral that shut after each cup of salt solution was added until the coral totally closed. There was one variable so this experiment had ten trials. The average for the salinity in the experiment was 42.00 ppt. The average for the amount of coral that closed was 39%. The coral as a living animal seemed to have an overall response to salinity change. The control tank was kept at the ideal salinity range of 34-36 ppt. In trial one (tank one) the coral showed distress only after it endured high salt concentration for 75 min. This could have been because this was the first time the coral experienced an extreme saline environment. The different parts of the corals didn't shut down at the same time. This shows that each piece of coral can respond differently in the same environment. Stress as measured by individual closing of arms on the *Zenia* coral occurred in all of the trials at a salinity range of 39-51ppt. This could be caused by reaction to stress and shock. Thus the coral reefs will die at different rates. The experiment shows that if salinity becomes too high the coral will show distress. If the salinity is not lowered fast enough the coral could die. Higher temperatures will increase evaporation in our oceans, raising salinity. In nature rebalancing is achieved through rainfall, ice melt, and ocean currents. If global warming affects these things then our coral reefs could die. Therefore, the hypothesis is supported.

Crying Over Spilt Gas

Ty Thompson

Gasoline has the ability to pollute environments in many ways everyday. The effects of cars polluting the air with their fossil fuel combustion to the effects of gasoline spills spilling into the fresh water environments causing fresh water to become toxic. Can gasoline have an effect on planaria when added to fresh water environments? If planaria are living in a fresh water environment and are introduced to increasing ratios of gasoline (0.1mL, 0.2mL, 0.3mL, 0.4mL) , then planaria survival should decrease as the gasoline ratio increases because of hydrocarbon contamination. What was being tested in this experiment was the survival rate of planaria, flatworm, in freshwater with different amounts of added gasoline (0.1mL, 0.2mL, 0.3mL, and 0.4mL) and would record the data of each of the five trials for 14 days. This experiment was measured by the survival rate of the planaria. The control group was planaria in fresh water with no gasoline added. The experimental groups were planaria in fresh water with added gasoline (0.1mL, 0.2mL, 0.3mL, 0.4mL). When comparing the control group (water only) to the experimental groups (0.1mL, 0.2mL, 0.3mL, and 0.4mL) of gasoline added to the fresh water, the control group had the best survival rate average, which was 14 out of 14 days. The 0.1mL of gasoline added to the fresh water, had an averaged of 6.2 out of the 14 days. This came out this way because the planaria in two of the trials crawled up the side of the container to escape the hydrocarbon contamination. The 0.2mL of gasoline added to the fresh water, had an averaged of 0 out of 14 days. This came out this way because the hydrocarbon contamination was too high for the planaria to live in. The 0.3mL of gasoline added to the fresh water, had an averaged of 0 out of 14 days. This came out this way because the hydrocarbon contamination was too high for the planaria to live in. The 0.4mL of gasoline added to the fresh water, had an averaged of 0 out of 14 days. This came out this way because the hydrocarbon contamination was too high for the planaria to live in. Based on the data collected from this experiment, the less gasoline added to the 50mL of fresh water, the slower planaria died. The planaria in the control group lived an average of 14 out of 14 days. The planaria in the 0.1mL of gasoline lived an average of 6.2 days out of 14 days. The planaria in 0.2mL, 0.3mL, and 0.4mL lived an averaged of 0 days out of 14 days. Therefore, the hypothesis can be accepted.

Passive Solar Power

Jonathan Volker

In the last few years the price of gasoline and other fossil fuels have jumped significantly. One very simple option to save money is the use of passive solar energy. Passive solar is using only the Sun's heat, not a solar panel. The reason for this experiment was to see if on a cold day would a passive solar water heater collect less heat then on a warm day, all days have clear skies. The control group, one liter of water at a known temperature, 17 degrees, was compared to one liter of water run through a passive solar water collector for ten minutes. Four different air temperatures were used in the test: 15.5, 11, 2.2, and -11.1 degrees Celsius. All of the tested air temperatures showed constant patterns. The first test was always much hotter than the original 17 degree water. The following tests showed a slight decline in temperature gain. The warmest air temperature tested was slightly warmer than the other days, but the coldest air tested was warmer than two of the others. Not a single test showed a sign of cooling; water was heated in every test. After the experiment was conducted it would be concluded that air temperature does not have a considerable effect on the heating of the water. On a clear day water can be heated by the use of a solar collector left in the sun for three and a half hours. It is likely that at some point the collector would stop heating, but that air temperature would be much colder than -11.1 degrees Celsius, making the outdoor temperature unsafe to be outside for ten minutes.

Bubble Trouble
Andy Wickoren

Because the process of sequestering CO₂ under rock beneath the ocean is becoming more accepted as a method of controlling carbon in the atmosphere, this experiment was conducted to test the effect of the type of rock on the amount of CO₂ that can be permanently trapped. The research was carried out by designing a pressure vessel that was developed to measure the amount of air flowing through three different rocks. The rocks consisted of granite, slate, and marble- a representative of the sedimentary, igneous, and metamorphic classification of rocks. The apparatus was created so it exposed the rocks to high air pressure. It was made using impervious materials and therefore the only path of which the air could escape was directly through the rock itself. A pressure gauge measured the air pressure within the vessel (psi). If any air escaped through the rock, the gauge would indicate a lower psi. It was found that the most air escaped through the granite as it dropped from 80 psi to 60 through the course of three hours. The marble and slate however showed virtually no signs of air-leaks.

How Green are the Greenhouse Gases
Patrick Nachtsheim

Carbon dioxide, nitrous oxide, and methane are some of the most prominent greenhouse gases, on this research these gases are added to the environment of dragon trees, what effects these gases have on the plants. The procedure was carried out by having a control group of three dragon trees in normal environments and three groups that were exposed to methane, nitrous oxide, and carbon dioxide in their living environments. After two weeks more gas was added to make up for the gas that was lost. The plants lived in air-tight terrariums made of two liter bottles filled with the gases. The data was collected by measuring the height, and weight before and after the testing. The control group grew average growth was 6.07 cm and gained, on average, 6.3 grams. The methane group had similar results growing on average 5.23 cm and gained, on average, 5.6 grams. The nitrous oxide group grew very large, on average, 8.7 cm, but didn't gain much weight, on average, 4 grams. Even though the group grew very tall, it didn't gain any weight which is unhealthy for plants. Last, the carbon dioxide group wasn't very healthy to start, so the group didn't grow much, on average, only .97 cm, and gained only, on average, 2.7 grams. Even though the group didn't grow much it grew much healthier. The data showed that methane didn't affect the plant, and nitrous oxide promoted growth, but no gaining weight. Which is very unhealthy for plants, and the carbon dioxide group, didn't start healthy, but started to get healthier.

Engineering/Physical Science

Effects of Copper Wire on Magnetic Force
Elissa Ojeda

My Science Fair Project is about copper wire and how much magnetism and/or magnetic force is in the copper wire. This Project shows how copper wire can effect the pull on a magnet. It also shows how good of a pull the magnet has on the copper wire wrapped battery.

Robo Rampage
Christopher Wartko

Since the invention of the first automobile, the controversy over front-wheel drive versus rear-wheel drive has yet to be resolved. There are definite advantages to both drive systems, but how will this conventional wisdom apply in a robotics environment? What effect will different drives and terrains (front wheel drive, rear wheel drive, wood, carpet, and concrete) have on the speed of a robot while completing a preprogrammed course of movement? Tests done in the automobile industry have shown that front-wheel drive is more stable while rear-wheel drive tends to have higher performance levels. Though there are many driving-course configurations, a simple loop is usually all that's required to focus on the drive trains' performance. Can the results of similar robotics testing help to shape the future of robotics design? This experiment was conducted to test the effects of rear-wheel drive and front-wheel drive robots. Two Mindstorms NXT robots were built, one with rear-wheel drive and one with front-wheel drive. Each robot was tested on three different terrains, concrete, wood and carpet. Each ran a pre-programmed course to find the fastest overall time. Each test was done five times. The front-wheel drive tests averaged 12.237333 seconds while the rear-wheel drive tests averaged 11.882666 seconds. Based on the data collected in this experiment the rear-wheel drive robot was the fastest at completing the course because the powered wheels were pushing the non-powered wheels. The front-wheel drive robot was the slowest. The front-wheel drive robot was the slowest because the powered wheels pulled the non-powered wheels.

The Study of Nose Cose Drag Characteristics Using a Simple Wind Tunne
Connor A. Henley

Since nose cones are used in many vehicles to make them more aerodynamic, thereby improving a vehicle's efficiency and performance, this experiment was done to examine how different types of rocket nose cones resist drag from air flow. The procedure first involves preparing model rocket nose cones to be mounted in a simple wind tunnel. The simple wind tunnel uses a leaf blower as an air source and balsa wood nose cones which can be bought at any local rocket store. Within the wind tunnel, air is blown around the nose cone and the drag force is measured using a kitchen scale. This was done three times for each nose cone, with the leaf blower positioned differently to create different air velocities within the wind tunnel. The drag force data measured during the testing did not prove conclusive results. However, when the coefficient of drag for each nose cone was calculated, a pattern in the results was formed. In general, the results show that the longer nose cones had the lowest coefficient of drag, and as the nose cones got shorter the coefficient of drag increased. It was concluded that the type and shape of the nose cone directly relates to the drag force.

Package Protection Against Shock Damage

Kailee Evatt

Proper packaging is very important to prevent shock damage during shipments. What effect do different types of packaging materials have on the protection against shock damage? If different types of inner packaging (bubble wrap, packing paper, and foam peanuts) are tested to see what type has the least shock damage, then the items wrapped in bubble wrap will have the least shock damage because people usually use bubble wrap for packaging fragile products for shipment. Ten corrugated boxes were packed with bubble wrap, another ten boxes were packed with foam peanuts, another ten boxes were packed with packaging paper, and a final ten boxes contained no inner packaging. There was an egg inside each box that was being protected by each one of these materials. The boxes packed with bubble wrap were dropped at one meter, two meters, then three meters. Then the boxes packed with foam peanuts and packing paper were dropped at the same heights. The control boxes, with no protection were dropped last. When comparing the data from using the various inner packaging of boxes being dropped using various inner packaging and from three different heights, the boxes using foam peanuts had the least amount of breakage providing 100% protection against shock damage. Bubble wrap performed at 93% effectiveness. Packaging paper performed at 83% effectiveness, and boxes with no inner packaging performed the worst at 53% effectiveness. Choosing the appropriate inner packaging for boxes to protect fragile items during shipment is critical. Based on the data from this experiment, the foam peanuts allowed the least amount of breakage. Therefore, the hypothesis cannot be supported.

The Shape of Your Car Affects the Size of Your Wallet

Andrew Marshall

This project measured the difference in aerodynamic drag of several vehicle shapes by rolling them down a ramp. Speed was measured by a photo-electric time trap. Oval, wedge, and conventional sedan shapes were tested. The hypothesis stated the wedge would have the least drag but this was proven false. The oval shape had the least drag. Future experiments should try different shapes attached to the rear of a conventional vehicle shape.

Concrete – A Fuzzy Scienc

Katie Miller

The purpose of this investigation was to determine if fiber reinforcement would improve the tensile strength of concrete and to determine the effects of different types of fiber reinforcement on concrete. The premise was that if different types of fiber are added to concrete, then the concrete with steel fibers added will have the strongest tensile strength. The procedure was as follows: concrete was made using six different fibers, cured for twenty-eight days, and then tested to see how many pounds per square inch each could hold (tensile strength test).

Heat Convection: Too Hot To Handle

Jayden Robert

Homes are heated in many different ways by a variety of heaters. Many of these ways are inefficient and waste natural resources. What effect does a heat source alone, a heat source with a fan, and a heat source with a fan and a baffle, have on the temperature throughout a given space? If a thermometer is closest to a heat source with no other objects affecting it, it would have the highest temperature recorded, because there would not be any force that might move the heat away from the thermometer. A heat source with a fan behind it was placed at one end of a space. Three thermometers were placed an equal distance of 5 feet away from the heat source and from each other place thermometers. Place one thermometer four inches from the heat source out of the way of the air currents. Turn on the heat source and start timing. Every three minutes, for nine minutes, record the temperatures from all four thermometers. Repeat using the fan and the fan and baffle with the heat source. The results showed that the highest average after three, six and nine minutes from thermometer one (the closet) belongs to the experimental group with the heat source only. The highest average for the thermometer two after three, six, and nine minutes belonged to the group with the fan and baffle to direct the air. The highest average for thermometer three after three and six minutes belonged to the heat source with the fan. After nine minutes the highest average was for the heat source only. Thermometer four's highest average belonged to the control group with the fan and baffle after three, six, and nine minutes. Thermometer one had the highest degree change after nine minutes. It was a 46 degree difference. Therefore, the hypothesis can be supported.

Focus

Rachel Nyhart

Robots are being used more often with the help of modern technology. Vision is one of the most necessary senses and an exceptionally practical tool for robots (Krasnoff, 1982). If a robot has vision then they only require to be told roughly around where to go and then they can determine where that is (Krasnoff, 1982). For this reason accurate distance is important, as well. If one was to make an industrial robot, the ability to see will give a higher chance of it correcting errors (Krasnoff, 1982). If one were to make a robot that uses stereoscopic vision, three-dimensional vision produced by the fusion of two slightly different views of a scene on each retina (Stereoscopic vision) then could that robot determine actual distance to a given object using the pixel offset? The procedure was carried out by having two cameras placed parallel on a platform. Next the two cameras were used to take a picture of a set object (one foot away, three feet away, and five feet away). Using a photo editing tool the two photos were merged together and the pixels were calculated between a set point on the objects. On the test where the cameras were one foot away from the object the pixel offset was 530.5. In the test where the object was three feet away the average was 175.4. Lastly when the object was five feet away the pixel offset average was 94.6. The data indicated that there was an inverse relationship between the distance and the pixel offset.

Shake 'n' Break
Sam McManness

This research was conducted to see which design of bridge could last the longest against a shaker table earthquake simulation. The designs of bridges consisted of suspension, arch, and truss. The procedure was carried out by first building three of each kind of bridge made out of popsicles and balsa wood. Once the total of nine bridges were constructed, one was placed on a shaker table and held down by bungee cords. Then, a brick that weighed 5 lbs 3 oz was placed on top of the bridge, the shaker table turned on, and a stopwatch started counting how long the bridge lasted before it collapsed or was damaged in any way. Once the bridge was broken, the amount of time it lasted was recorded. Finally, it was repeated with the eight remaining bridges. The results indicated that out of the three types of bridges (suspension, arch, and truss) the truss bridge lasted the longest. In fact, the truss bridge's average was 114.798 seconds longer than the shortest lasting bridge's average, the suspension. The truss's average was 141.496 seconds, the arch's average was 58.648 seconds, and the suspension's average was 26.698 seconds. In conclusion, the truss bridge lasted the longest, and this was probably because all members of the bridge were in tension, tightly held together, while the arch and suspension were somewhat loose and a lot less in tension.

The Elasticity Of Rubber Bands
Craig Vandervelden

Polymers are links of chains bonded together and have been around for many centuries. They are used in numerous situations. What effect does the temperature of a rubber band have to do with its elasticity? If, rubber bands are at 100°, 21°, and 0° C and put weights on them, then the one heated will stretch the farthest because the polymers in the rubber band will become more malleable due to the heat and can therefore stretch farther distances. The rubber bands were tested at 100°, 21.1°, and 0° C. The rubber bands at 100° C were heated by being boiled. The rubber band at 0° C were chilled by a freezer. They were on a board with metal poles with hooks on them and drilled down so all results were constant. The rubber bands were tested by nuts and bolts in a bag with an S-hook and then put on. The rubber bands at 100° C averaged highest at 4.325 centimeters. The rubber bands at 21.1° C averaged next highest at 2.925. The rubber bands at 0° C averaged the lowest at 2.5 centimeters. When comparing how far the rubber band dropped (rubber bands at 0°, 100°, and 21.1°C), the rubber band heated at 100° C had dropped the most with an average at 4.325 centimeters. The reason this occurred may have occurred is that the polymer links in the heated rubber band were more malleable so the polymers stretched farther. Based on the data collected from this experiment, the rubber bands at 100° C had the highest results, while the rubber bands at 0° C had the lowest results. This could have happened because the polymers were in the rubber bands at 100° C were more malleable so they could stretch farther. Therefore, the hypothesis can be supported.

Those Lost . . . Now Found?
The Effect of Water on Global Positioning System
Lauren Komer

GPS is a system of satellites that transmits radio signals that GPS receivers can pick up and use to find their position, altitude, and velocity. GPS units are used to guide road vehicles, ships, and boats, or are used for recreational purposes. If GPS receiver was able to be used underwater, it could help scuba divers, rescue workers, and marine biologists. It could also be used as another way for submarines to find their position underwater. Underwater GPS systems could save significant amounts of money and lives. The procedure was originally going to be carried out by having a GPS antenna submerged in water at varying levels of 10 centimeters over a two minute time period, but had to be changed when results weren't possible. The revised procedure had the GPS antenna submerged halfway, three-fourths, and completely in water, as well as have the antenna above the surface of the water for the control group. The data was recorded over a two minute period using the GPS Gate PC Program in NMEA-0183 format. Data and results were taken by measuring the SNR in decibels. When GPS antenna was completely submerged in water, it had a total SNR average of 18 dB and was unable to acquire a position. When the GPS antenna was three-fourths underwater it had a total SNR average of 19 dB but was still able to acquire a position. When the GPS antenna was half-way underwater and above the surface of the water it had a total SNR average of 47 dB. The data indicated a significant drop between the SNR of the GPS antenna submerged underwater compared to the SNR of the antenna being above the surface of the water, with a difference of 29 dB.

Raising The Roof
Cameron Bock

Because high wind speeds produced by tornadoes and hurricanes often damage roofs or even lift them off houses, this experiment was conducted to determine what pitch of roof would experience the most lift, measured in apparent mass change. The actual mass of the model houses remained the same, therefore the best way to measure the differences with and without wind was by the apparent change in the houses' mass as recorded by the scale. Force equals mass times acceleration. Because the acceleration due to gravity of the models remained constant, the changes in the apparent mass of the models was directly proportional to the vertical forces acting on the model. Measuring apparent mass change produced the most meaningful data in relation to the masses of the houses and their roofs. The hypothesis predicted that the model with the 45 degree roof would experience the greatest apparent change in mass. House models, with the scale of one to ten, were built with the same size bases (6x6x1.5 cm). They had roof pitches of 0 degrees (the control), 9 degrees, 18 degrees, 27 degrees, 36 degrees, and 45 degrees. They were placed on a scale and subjected to winds in a wind tunnel. The wind was moving at 3.2 kilometers an hour, 320 scale kilometers an hour. Each model was tested 7 times and the apparent mass change was recorded. The model with a 9 degree roof pitch experienced an apparent decrease in mass of 0.28 grams, enough to lift 20% of its roof's mass. The model with the 45 degree roof had an apparent mass loss of 0.01 grams. The control model had an apparent decrease of 0.17 grams. The results indicated that the model with a 9 degree roof pitch experienced the greatest change in apparent mass and that the model with the 45 degree roof experienced the smallest apparent change in mass. Therefore the hypothesis was not supported.

Where in the World?

Lauren Severance

This research was conducted to determine whether two-dimensional (2-D) triangulation or Google Earth gives a more accurate reading of location identification when compared to a global positioning system (GPS) that uses three-dimensional (3-D) triangulation. Ten points were chosen on a map. The investigator traveled to these points and using a GPS, their latitude and longitude was found. A cell phone was used to find the latitude and longitude according to 2-D triangulation. The points were also found on Google Earth, and the latitude and longitude according to Google Earth was recorded. The distance between the GPS location and the cell phone reading was calculated to find the variance of the cell phone reading. The distance between the GPS location and the Google Earth reading was also calculated to find the variance of the Google Earth readings. The average variance of the cell phone readings was .328 km. The average variance of Google Earth readings was .065 km. The difference of the averages was .163 km. The median of the variance of the cell phone readings was .177 km. The median of the variance of the Google Earth readings was .031 km. The data indicated that the Google Earth readings were more accurate than the cell phone readings.

Ride like The Wind

Grant Pittrich

The sailboat used to be the main way of transportation on the ocean or on lakes. When the steam boat came it turned the sailboat into just another way to have fun and spend leisurely hours in the sun and on the water. What is the effect of sail angle on the speed of the sailboat when in a constant wind? If each angle of the sailboat is tested to see which travels a certain distance the fastest, then the greatest angle will have the most velocity, because the sail catches the greatest amount of wind to propel it faster. The sail vehicle was created then 200 centimeters were set out on a hardwood floor. Then we set the fan six inches away from the starting position. We timed how long it took the vehicle, in seconds, to travel the distance at the different angles. We tested the vehicle's angles ten times each to get good results. The average for the control group (90°) took an average time of 2.676 seconds to complete the distance. The second group (60°) took an average time of 3.156 seconds to complete the distance. The third group (40°) took an average time of 4.671 seconds to complete the distance. Though the average's had distance, the results were to inconclusive trial by trial to have significant statistics. Based on the data collected in this experiment, the control (90°) had the fastest results, while the 40° angle had the slowest results. This could have been because the sail had more area at 90° to thrust the sail vehicle forward, but the results are very inconclusive due to the variability from trial to trial. Therefore, the hypothesis cannot be supported.

Concrete Cumbrance Capacity: A Study on the Effect of
Polypropylene Fibers on the Load Capacity of Concrete
Alex Van Pelt

Concrete is an important building material that is used in almost every construction site around the world. When concrete is used in situations where extra strength is needed, polypropylene fibers can be added. An investigation could be to test the load capacity of concrete bricks infused with different lengths of polypropylene fibers (2.5cm, 5cm, and 7.5cm). If each length of polypropylene fibers is added to concrete and tested for strength, then the 7.5cm fiber will make the concrete more resistant to cracking because the more area on the fiber means that more adhesion can occur between the fibers and the concrete. Molds were created to make a brick 28 cm long by 9 cm wide. Concrete was mixed with the different lengths of polypropylene fibers and put into the molds. It was then allowed to set for 12 days and the molds removed. The bricks were then positioned above the ground and weights were added to the middle of the brick until it broke. The experiment was then repeated nine more times with all three lengths of fibers. When comparing the load capacity of different lengths of polypropylene fiber reinforced concrete bricks, the 7.5 cm fiber bricks held an average of 175.2 kilograms, the 5cm fiber bricks held an average of 148.4 kilograms, the 2.25 cm fiber bricks held an average of 117.9 kilograms, and the bricks without fiber reinforcement held an average of 111.5 kilograms. Based on the data collected in this experiment, the 7.5 cm polypropylene fiber reinforced concrete bricks had the highest load capacity, while the concrete bricks without polypropylene fibers had the lowest load capacity. This could have been because the fibers spread out the load that was being exerted onto the brick, distributing the weight evenly throughout the brick. Therefore, the hypothesis can be supported.

Moving Music
Scott Hirsch

I wanted to learn if I could shoot sound over a laser, use mirrors to reflect it around corners and over a distance and still understand the sound that comes out. In part one of my experiment I played a sound on my MP3 player that went over a laser. I used a 300Hz 15dB sine wave. I shot the laser 10-14 board spaces with no mirrors, then recorded and saved each of the sounds on my computer. I repeated this process using 2, 4, 6, and 8 mirrors. I found out the following three things: 1. The more mirrors I used, the more altered the sound was. 2. Even though I put extra distance between the laser and the receiver, the sound did not change. 3. The trial with the most mirrors and the greatest distance did not produce the most altered sound. Since the distance did not affect the sound I decided to take the project farther and use more distance. So in part two of my experiment I shot the sound over the laser 3ft-30ft skipping three feet every time. I did three trials for each distance. I again found out that the distance did not affect the sound even though I added more distance.

Cooling Cloths; A Study of the Wicking and Cooling
Ability of Cotton, Spandex, and Coolmax
Brianna Leyden

Exercise and other increases in activity cause the human body to heat up and sweat a lot more. What is the effect of different wicking fabrics (Spandex and Coolmax, compared to cotton) on the amount of evaporation of water? If each different wicking fabric is tested to find how much cooler the fabric becomes when water is evaporated from it, then the Coolmax will have the largest decrease in temperature because the cross sections of fiber allow the water to go through the cloth easier, thus allowing the water to get to the surface and evaporate. To run the experiment, there were 30 fabric samples of cotton, spandex, and Coolmax (10 each), and a heater. One sample of each fabric was laid out, and ten mL of water were released onto each sample from a syringe, and then the temperature of each fabric was taken every three minutes for 30 minutes. This procedure was repeated nine more times for the other nine samples of each fabric. The cotton samples lowered in temperature approximately 2.94 degrees Celsius each trial. The spandex samples decreased about 3.25 degrees Celsius, and the Coolmax samples decreased about 2.81 degrees Celsius. This is most likely because the spandex is a thinner fabric with a more loosely woven pattern, allowing water to get through easier, while the cotton and Coolmax are more tightly woven, making it harder for water to get to the surface and evaporate. Based on the data collected in this experiment, spandex fabric has the best wicking capability with the biggest average decrease in temperature, while Coolmax had the smallest average decrease in temperature. Therefore, the hypothesis cannot be supported.

Magnets Tested in Temperature Trial
Luke Schnefke

Recent discussions on magnets have shown that magnets can be a very effective and new way to use many different materials. Magnets are used everyday with most people but with future knowledge and different strengths that can be expanded further. What is the effect of a magnet's temperature on its strength? If magnets are put into different temperatures to test which temperature has the greatest effect on the magnet's strength, then the magnets that are put in the coldest temperature will be the strongest, because the magnetic domains will be lined up so that it will have a magnetic attraction. Magnets were tested in different temperatures to see if the magnets are affected their strength. It was tested by putting magnets into a freezer, oven, and kept one at room temperature. The way the magnets were measured was that paper clips were used and times the weight of the paper clips times how many paper clips there were. The average of the mass that magnets at the room temperature magnets picked up was 41.28 grams, the freezer magnets picked up an average of 46.88 grams, and the oven magnets picked up an average of 60.48 grams. When comparing the strength of magnets at different temperatures the results found were that the hot magnets picked up the most mass and the weakest was the magnets at room temperature. Most of the trials were consistent. The biggest inconsistency might be that the coldest and the warmest temperatures were both higher than the room temperatures, which means the results may be inconclusive. Looking at the data collected in the experiment, the oven temperature had the most strength, while the weakest was the room temperature magnets. This might of happened because of the type of magnets used. Therefore, the hypothesis cannot be supported.

As the Oil Flows Holly Ratliff

Viscosity is the material property that measures a fluid's resistance to flowing. Motor oil is measured into different grades by the oil's viscosity. What is the effect of temperature on the viscosity of different types of motor oil? If each grade of oil (5W-30, 20W-50, and 85W-140) were tested at 104°C, 21°C, and -16°C to find the viscosity, then the 85W-140 would have the highest viscosity in the colder climate, because it is a thicker liquid with a greater density. In the procedure, the viscosity of three different oils (5W-30, 20W-50, and 85W-140) was tested at three different temperatures (104°C, 21°C, and -16°C). The experiment was measured in seconds for the timing of the oils and the temperatures were measured in degrees Celsius. The viscosity of the oils was tested by timing the flow of each of the oils on a slanted surface (plexi glass). There were ten trials for each of the oils in the three different temperatures. This totaled 30 trials for each of the oils in all three temperatures. The averages of each group of results was 34.88 seconds for the 5W-30 oil at 21°C, 23.77 seconds for the 5W-30 oil at 104°C, and 55.38 seconds for the 5W-30 oil at -16°C. The averages for the oil 20W-50 were 51.54 seconds at 21°C, 21.31 seconds at 104°C, and 98.94 seconds at -16°C. The averages for the 85W-140 were 87.51 seconds at 21°C, 25.73 seconds at 104°C, and 310.57 seconds at -16°C. The oil that flowed the quickest at -16°C and at 21°C was the oil 5W-30. The oil that flowed the quickest at 104°C was the 20W-50. The 85W-140 flowed the slowest at all three temperatures. In this experiment to test how well oil will flow in different climates, was at times inconsistent with high ranges. The hypothesis was supported in stating that the 85W-140 would flow slowest at -16°C.

Can Oranges Produce More Than Just Orange Juice Makenzie Hawkins

Electricity is the flow of electrons through conductors, usually a wire. Fruit is considered an electrolyte because it produces electricity. What is the effect of the temperatures of a fruit on the amount of voltages produced? If the temperatures of the fruit are tested to see which produces the most voltages, then the fruits at warmer temperatures will produce the most voltages, because the atoms are moving at a faster speed throughout the orange. Five sheets of copper, five sheets of zinc, fifteen oranges, a voltmeter, and two alligator clips. The experiment resulted with the oranges at the warmest temperature producing the most volts. The coldest oranges resulted as the oranges with the least amount of volts produced. The experiment was all measured in volts. For each of the variables, there were ten trials during the experiment. Throughout the experiment, the oranges at 47°C produced the most volts with an average of .0159 volts and the oranges at room temperature (20°C) had an average of .0038 volts. The oranges at 10°C had an average of .0083 volts throughout the experiment. When testing the amount of volts produced by oranges with three different temperatures (20°C, 10°C, and 47°C) the oranges at 47°C produced the highest amount of volts with an average of .065 volts. The reason this occurred may be because the oranges with the highest temperature have more molecules that move faster because the molecules are more spread out. Also this may have occurred because the oranges with higher temperatures have more acidic juice, causing the juices to produce more volts. Based on the data collected in this experiment, the 10 orange halves measured at 47°C had the highest results, while the ten orange halves measured at 10°C had the lowest results. This could have been because the oranges with a higher temperature have more citrus acid, which produce more volts. This experiment had many different readings telling which temperature produced the most volts. Therefore the hypothesis can not be supported.

Now that's hot!
Jenny Nelson

The world is gradually depleting its natural resources and global warming is greatly affecting the environment. We need to have a cheap or free energy resource that is environmentally friendly. Solar energy fits into both of these categories. The Curnutt Solar Furnace and the Parabolic Trough system are the two types of solar collectors that were tested for energy collection. It would not be possible, in the given amount of time, to produce very much energy; therefore, the temperature of the water will be measured. When testing two types of solar collectors, the Parabolic Trough will be more efficient. If two types of solar collectors have the same reflective material and the same surface area, then the Parabolic Trough system will produce more potential energy than the Curnutt Solar Furnace because it has a curved shape. To make this project, each of the solar collectors needed to be made. Each collector was aimed at the Sun, with bricks. The 2-liter bottle was filled with water and then set out for it to find a steady temperature. The temperature was recorded and the pipes were connected to the bottles and the collector. Water was pumped through the collector and back to the bottle and after five minutes, using a stopwatch, the water in the bottle was again set out to find a steady temperature. When it had settled, the water's temperature was taken and the water was dumped out onto the grass. The hose was let to run for a while so it could be at air temperature. The collectors, as well as the bottle, were set out to come to room temperature also. This process was completed ten times for the Parabolic Trough and ten times for the Curnutt Solar Furnace. This experiment shows that the parabolically curved shape of the Parabolic Trough collects more of the Sun's rays of energy than the square-shaped blocks of the Curnutt Solar Furnace. The squares of the Curnutt Solar Furnace did not reflect completely on the black pipe through which the water ran. The average change in temperature for the Parabolic Trough was 2.46 degrees Celsius and the average temperature change in the Curnutt Solar Furnace was 1.79 degrees Celsius. With these results, it can be concluded that the hypothesis was supported.

Temperature vs. Viscosity
Isaac Van Hoecke

Motor oil is used everyday to help run cars. Some cars work better with oils that have different viscosities. What is the effect of temperature on the viscosity of motor oil? Since regions and countries have different temperatures, different temperatures on the oil might affect the efficiency of a car. If the viscosity of three samples of oil are measured, each sample with a different temperature, then the oil with the lowest temperature will have the highest viscosity because the molecules will be moving slowly, which would cause an object passing through to go more slowly than an object passing through a sample with a higher temperature. In order to test the hypothesis, ten trials were executed to measure viscosity more accurately. Motor oil was poured into three different jars. One jar was placed in a jar of boiling water for 20 minutes. One jar was placed in ice water for 20 minutes. The other was left at room temperature. For each jar, the procedure was the same. A stopwatch was used in order to measure the time it took a paperclip dropped into the oil to reach the bottom of the jar. Each time, it was a different paperclip dropped. The time was measured and recorded. The longer it took to reach the bottom, the higher the viscosity was because there was less "flow" to the oil, and vice versa. According to the results, the average time it took for the paper clip to reach the bottom of the jar in the room temperature oil was 2.752 seconds. The average time it took in the hot oil was .392 seconds. The average time it took in the cold oil was 6.816 seconds. According to the data, the oil with the highest temperature had the lowest viscosity. This is an inverse relationship.

Zoology

Does Added Protein In a Hen's Diet Affect the Number of Eggs Laid?

Kayla Dowell

The purpose of this experiment was to determine if added protein in my hens' diets would make them lay more eggs. This experiment involved keeping track of how many eggs were laid each day when the hens were fed corn or layer crumbles. The experiments indicated that added protein in a hen's diet does increase the number of eggs laid, but the differences were not significant ($P \leq 0.05$). The first experiment showed that it was not worth feeding my hens layer crumbles to make them lay more eggs, because the cost per egg when the hens were fed corn was lower than the cost per egg when the hens were fed crumbles. However, the second experiment showed that the cost per egg was the same whether I was feeding the hens corn or layer crumbles. In both experiments, my hypothesis was proven correct, although the results between layer crumbles and corn were not significantly different.