

the NEW
JOURNAL of
STUDENT
RESEARCH 2013
ABSTRACTS

vol 18

California State University
Northridge

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RESEARCH 2013
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Editor
Steven B. Oppenheimer
California State University, Northridge

Sponsor
California State University, Northridge

California State University
Northridge

The New Journal of Student Research Abstracts

2013

Volume XVIII

An Annual Journal for Young Investigators and Their Teachers

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California State University
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March 2013

Dianne F. Harrison, Ph.D.
President
California State University, Northridge

We are pleased to welcome you to the 2013 edition of the *Journal of Student Research Abstracts*. The innovative brainchild of Dr. Steven Oppenheimer, Professor of Biology at California State University, Northridge, for nearly 20 years the *Journal* has showcased the work of young scientists at the pre-collegiate K-12 level, who have conducted their research under the tutelage of their teachers trained in CSUN's research labs.

The excitement of conducting true, hands-on research and seeing the results of their work published in the *Journal* provides students with the kinds of experience, confidence, and pride that are essential to encouraging youngsters to pursue a career in science and research. The continued strong preparation of future scientists will be essential to the nation's place as a leader in innovation, as well as to its continued security, health, and welfare. Indeed, the priority placed by the Federal government on putting more youth on a science and research track has made this program a nationwide model and was a key reason Dr. Oppenheimer was honored by President Barack Obama with a U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring in 2009.

Beginning with this edition, the university is pleased to make the journal now available online free of charge to students and teachers who wish to be inspired and see the innovative research conducted by their peers.

CSUN is proud to support the work of Dr. Oppenheimer and the teachers and students whose outstanding work is included in the journal. They truly help make CSUN shine!

A handwritten signature of Dianne F. Harrison, Ph.D.

Dianne F. Harrison, Ph.D.
President

A handwritten signature of Harry Hellenbrand, Ph.D.

Harry Hellenbrand, Ph.D.
Provost and Vice President
for Academic Affairs

A handwritten signature of Jerry Stinner, Ph.D.

Jerry Stinner, Ph.D.
Dean, College of Science
and Mathematics

About the Editor: Dr. Steven B. Oppenheimer

Steven B. Oppenheimer received the Ph.D. degree from Johns Hopkins University and is currently Professor of Biology and Director of the Center for Cancer and Developmental Biology at California State University, Northridge. He is author or co-author, mostly with his Cal State students, of about 200 publications, including 14 books and book editions; was awarded over \$7 million in research and science education grants serving as Principal Investigator; and served on National Institutes of Health and National Science Foundation grant review panels. He serves on the editorial board and is editor for the United States, Canada and South America of the international journal *ACTA Histochemica*, published by Elsevier. He is recipient of 26 distinguished teaching awards, distinguished research awards, outstanding professor awards and other honors from local, statewide and national organizations. In 1984, he was named statewide Trustees Outstanding Professor of the California State University system (the system's highest honor), and in 1992 he was elected Fellow of the American Association for the Advancement of Science (AAAS). The AAAS defines a Fellow as "a member whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." He is a recipient of a U.S. Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.

Dr. Oppenheimer thanks the following organizations for funding his student-involved research programs: National Institutes of Health, National Institute of General Medical Sciences SCORE, RISE and MARC programs, the Joseph Drown Foundation, the Sidney Stern Memorial Trust, the National Science Foundation and California Science Project.

The editor also wishes to thank Van Nuys Airport for all of its past support of the journal, helping give wings to students' educational dreams!

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www.csun.edu/biology/faculty/oppenheimer.htm

www.youtube.com/watch?v=JQCd5NIFVoQ

www.youtube.com/watch?v=KmlN6DHW3nQ

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About the Associate Editor: Dr. Helen H. Chun

Helen H. Chun received her Ph.D. and was a postdoctoral researcher at the University of California, Los Angeles. She currently is an Associate Professor in the Biology Department at California State University, Dominguez Hills. She researches the cellular response to radiation exposure, particularly in the stimulation of DNA repair and cell death.

About the Sponsor

California State University, Northridge, has been ranked by the National Science Foundation in the Top 12 (sometimes No. 1) of over 500 similar universities in numbers of its science and social science graduates who go on to achieve doctoral degrees.

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Dr. Steven Oppenheimer (seated front row, second from left) visits the Blue Room in the White House, where he received a 2009 U.S. Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. Arden Bement, Director of the National Science Foundation, is standing at the far left.

From the Editor:**Golden Opportunity for Underrepresented Science Students Interested in Careers in Biomedical Research**

To those underrepresented science students who select California State University, Northridge, for your college experience: We have a golden opportunity for you. If you are a U.S. citizen or permanent resident and if you are possibly interested in a Ph.D. degree in biomedical science, you can apply for distinguished programs funded by the National Institutes of Health (Maria Elena Zavala, Director). These programs will open many doors and will pay you thousands of dollars to do research while a student at California State University, Northridge. We thank the National Institutes of Health, National Institute of General Medical Sciences MORE program for distinguished support for these student opportunities.

For more information, contact Steven Oppenheimer at steven oppenheimer@csun.edu.

**About the Journal and Abstracts**

The New Journal of Student Research Abstracts is published yearly in the fall. Continued publication is always dependent on funding.

The journal is intended to serve as

- (1) A vehicle to honor young investigators and their teachers by showcasing their work, motivating them to continue their involvement in research science;
- (2) A sourcebook for both students and teachers who are looking for ideas for research projects; and
- (3) A volume to disseminate student research discoveries.

Many abstracts included in the journal demonstrate good science, i.e., clear introductions describing a hypothesis to be tested, appropriate methods and data analysis, results and conclusion statements, and – most important – sufficient numbers of appropriate control and experimental samples and repetitions of experiments. Some are idea abstracts, and some are abstracts of library or Internet research projects.

Abstracts are reviewed by the teachers and the journal editors. Although the journal editors delete very poor abstracts from the publication, some abstracts herein are quite flawed, and some lack at least one component of a good science experiment. Including some of these abstracts helps make this journal very useful for classes to learn what makes for a good experiment and a good abstract vs. a not-so-good experiment and a not-so-good abstract.

Some of the abstracts are experimental plans instead of completed projects. This is especially true in the case of long-term, sophisticated research programs that require extensive setup and planning. The journal encourages abstracts on the planning and progress of such projects.

The journal editor continues to reserve the right not to publish those abstracts that are seriously flawed. The journal does not notify authors if their abstracts have been deleted. *Please note that any abstract that involves harming vertebrate animals (including humans) will not be published in this journal.*

Any opinions, findings and conclusions or recommendations are those of the individual authors of the abstracts presented in the journal, and do not necessarily reflect the views of California State University, Northridge, other contributing organizations and individuals, or the journal staff.

Submission of Abstracts

Any science teacher may submit student abstracts following the format used with the abstracts in this volume. After the title, followed by student author name(s) and teacher name (teacher), school and school street address, city, state and ZIP Code, abstracts should begin with the purpose of the study, followed by how it was done, and then the results and conclusions.

All abstracts should be typed in **11-point Arial font**, error-free. Messy abstracts and those not following proper format may be discarded. The journal is not responsible for any abstracts received or for publication errors. The journal does not acknowledge receipt of abstracts and there is no guarantee that they will be published or that the journal will be published in any given year.

Only teachers may submit their students' abstracts to the journal. Teachers must submit each abstract as an **electronic Word document** to steven oppenheimer@csun.edu. Abstracts not submitted electronically or not following the other guidelines provided herein may be discarded without notice.

The deadline for receipt of abstracts for each annual volume is June 1, but an issue may be closed at an earlier date. Publication is scheduled for each fall. Submitted abstracts are not returned to authors, so students and teachers are advised to keep a copy of all submitted materials. The only confirmation that abstracts will be published is if they appear in print.

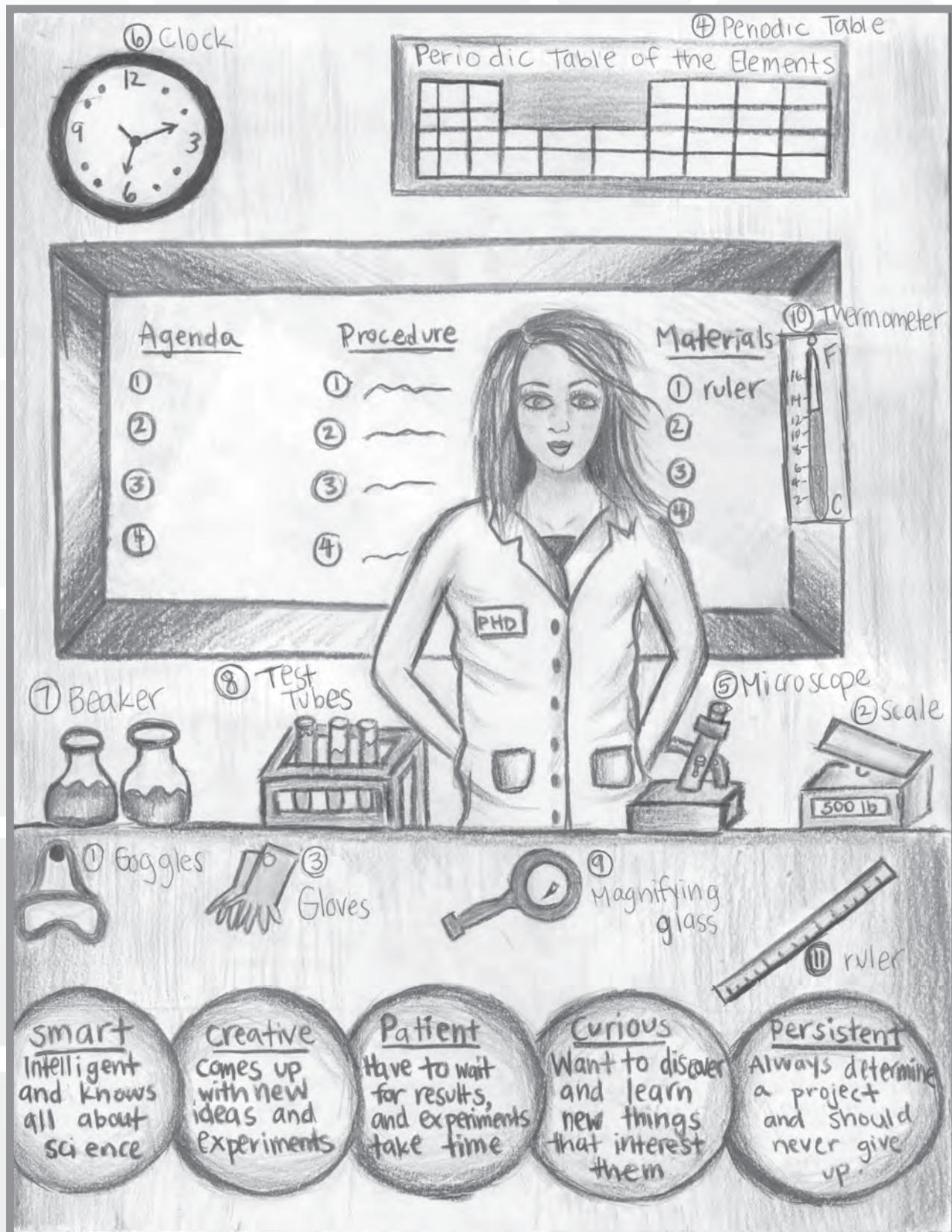


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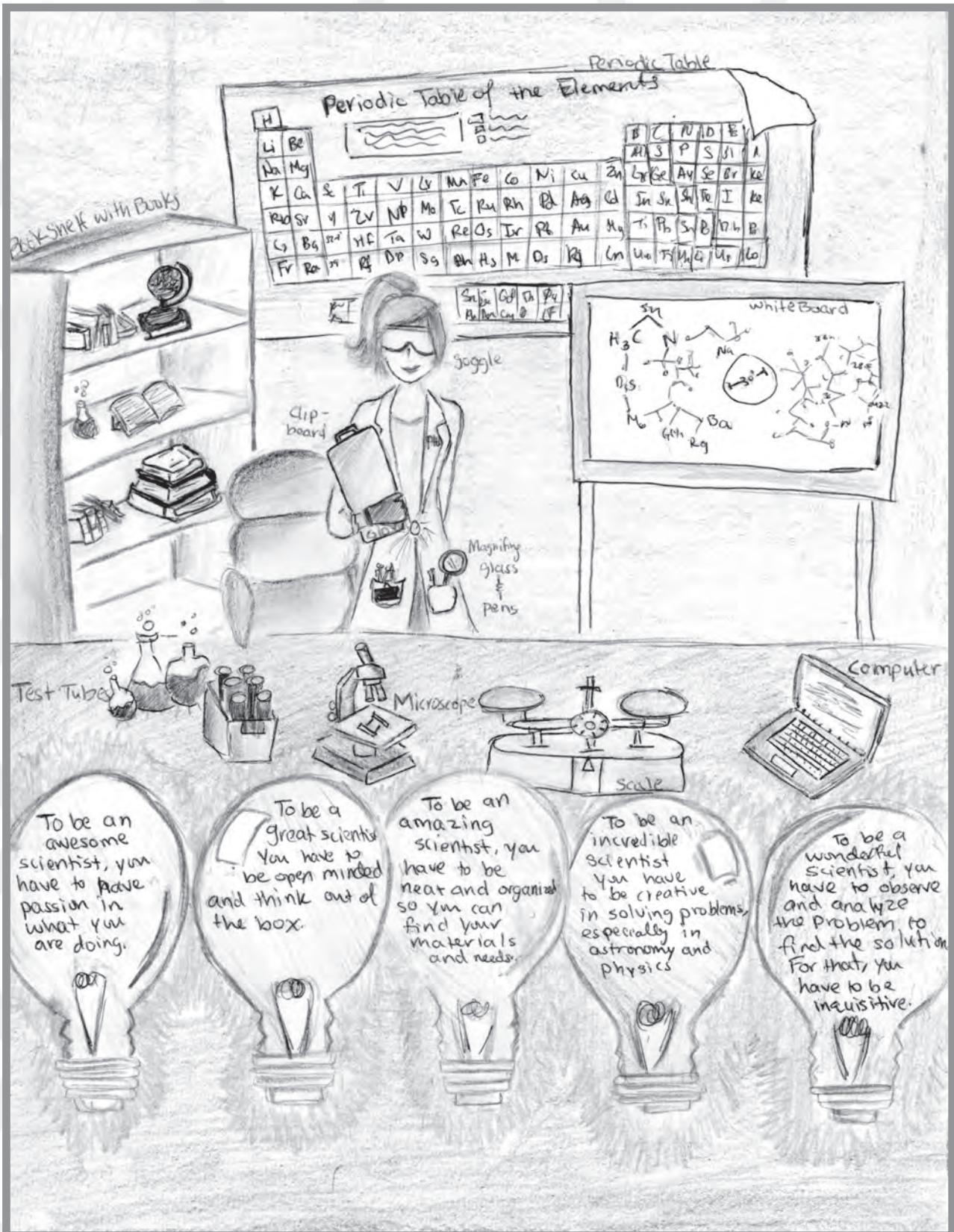
STUDENT ARTWORK

*What is a
Scientist?*



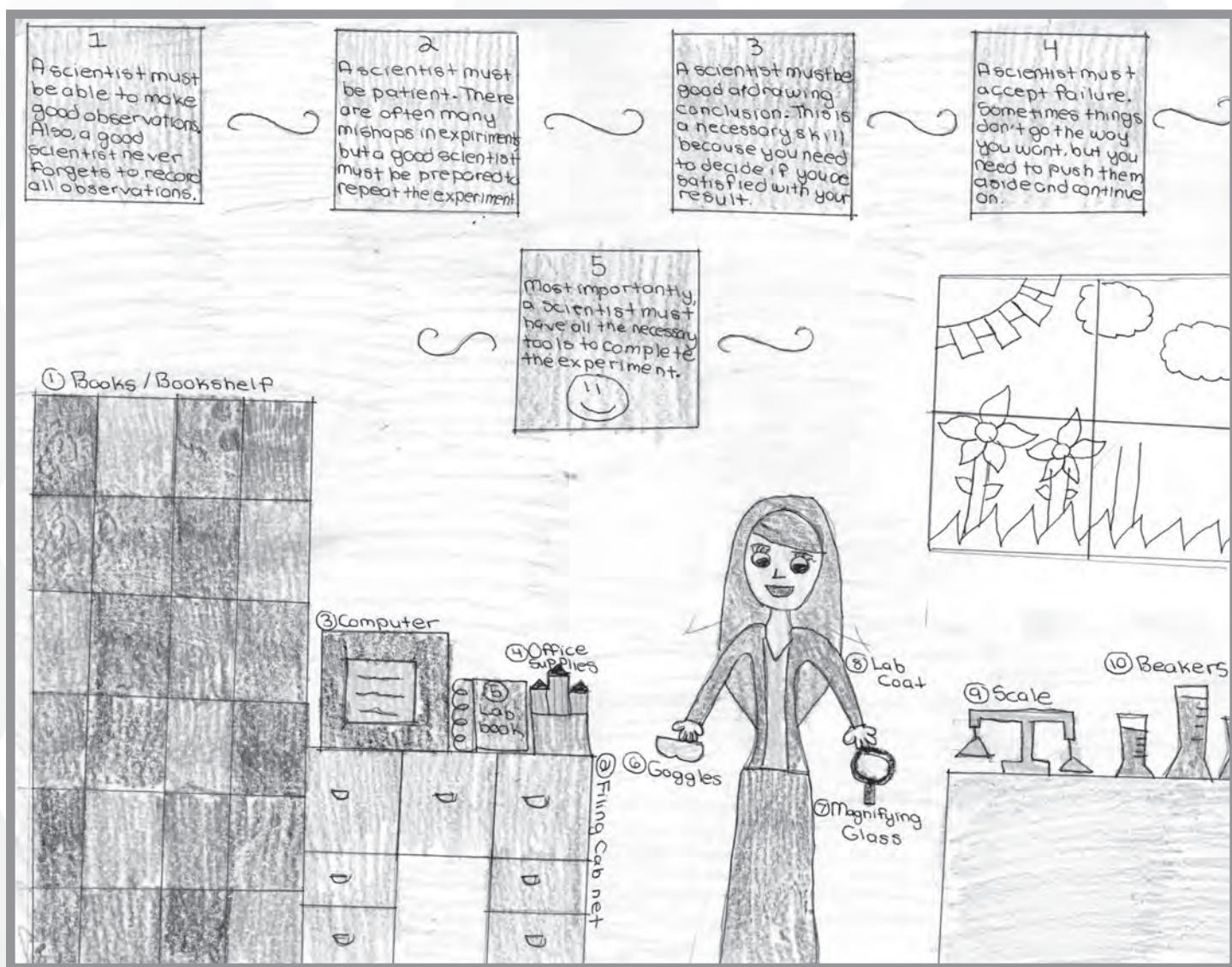
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STUDENT ABSTRACTS

5271

How Pure Is Purified Water?

Amari Turner, Elsa Primiano and S. Graeber (teacher)
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We have often wondered about different types of purified and mountain spring waters that we find in supermarkets and wished we had a way of comparing these waters so we could find out their comparative levels of purity. We gathered eight different types of waters and tested their total dissolved solids (TDS), hardness (measure for Ca++ and Mg++ content), pH (a test for acidity) and salt content.

We used eight different types of water: distilled water, Aquafina, Albertson's, Niagara, Dasani, Arrowhead, Crystal Geyser and tap water. We measured TDS in parts per million (ppm) using HANNA Watercheck instrument. We measured hardness in ppm using Hach water quality test strips for total hardness. We measured pH using Hach water quality test strips for PH. We measured salt content (NaCl) using 0.1 molar solution of silver nitrate. Silver nitrate, after being added to water, combines with salt in the water and creates a white precipitate (silver chloride: AgCl) that makes the water milky white. This test is qualitative and a stronger milky color indicates a higher level of salt concentration. We added five drops of 0.1 molar silver nitrate solution to 30 milliliters of each of the water samples.

We were amazed by our results. We are reporting results for TDS, hardness, pH and salt content for all of the water samples individually. Our numbers are an average of two numbers that we received after running two similar tests for the same four parameters on all water samples. For distilled water we obtained TDS = 0 ppm, hardness = 25 ppm, pH = 5 (acidic) and no salt content. For Aquafina water we obtained TDS = 0 ppm, hardness = 0 ppm, pH = 5 (slightly acidic) and no salt content. For Albertson's water we obtained TDS = 0 ppm, hardness = 25 ppm, pH = 6 (slightly acidic) and no salt content. For Niagara water we obtained TDS = 10 ppm, hardness = 0 ppm, pH = 6 (slightly acidic) and no salt content. For Dasani water we obtained TDS = 35 ppm, hardness = 25 ppm, pH = 6 (slightly acidic) and slight salt content. For Arrowhead water we obtained TDS = 60 ppm, hardness = 50 ppm, pH = 6 (slightly acidic) and no salt content. For Crystal Geyser water we obtained TDS = 140 ppm, hardness = 120 ppm, pH = 7 (neutral) and slight salt content. For tap water we obtained TDS = 335 ppm, hardness = 180 ppm, pH = 7.5 (slightly basic) and very salty.

In conclusion we found out that tap water had the worst quality compared to the other seven purified water types. It is interesting that as bad as tap water tested compared to other waters, tap water is still considered potable water since the United States Environmental Protection Agency (EPA) has set our National Secondary Water Quality Standard for TDS at 500 ppm, which is much higher than what we found for our tap water samples, which was 335 ppm on average.

Out of the seven purified water samples, the Mountain Spring water (Arrowhead) and Alpine Spring water (Crystal Geyser) had the highest TDS and hardness. We need to continue our research and find out what distinguishes purified water from Mountain Spring, Alpine Spring or other spring waters. The EPA's National Secondary Standard for pH is 6.5 to 8.5. Our experimental pH values are mostly within the EPA established range and seem to imply compliance as well.

5272

Will a Population of *Onychiuridae encarpatus* Increase If They Are Kept Under 60-LED Green Lights?

Brandon Arcineiga, Rafael Babayova, Jasmine Campos, Samantha Choy, Ricky Covarrubias, Daisy Cruz, Allen Cuellar, Ivana De Jesus, Arshiya Dhiman, Cipriano Ferido, Katherine Guzman, William Loera, Katherine Mena, Rigoberto Mendoza, Samuel Munoz, Carlos Palacios, Vanessa Rodriguez, Stephanie Ruelas, Maaz Umer, Ivan Valladarez, and T. Miller (teacher)
 Oliver Wendell Holmes Middle School
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The purpose of this experiment is to determine if a population of collembola (*Onychiuridae encarpatus*) will increase if they are kept under 60-LED green lights. *Onychiuridae encarpatus* are blind tiny hexapods, with a springtail (furcula), and eat mold. As a hypothesis, the class decided the population of collembola would increase if kept under the green lights. One part powdered charcoal was added to nine parts plaster of Paris, to which was added water. It was stirred, poured into 10 petri dishes and allowed to dry for a couple of days. The petri dishes were moistened with water, and yeast was added for the collembola to eat. Equal numbers of collembola were placed into the petri dishes in the control and the petri dishes in the experiment. The experiment was placed under 60-LED green lights during the day for five weeks. At the end of the five weeks, 59% of the collembola and 47% of the collembola eggs were in the experiment. Forty-one percent of the collembola and 53% of the collembola eggs were counted in the control. The data suggests the hypothesis was correct. There was a slight increase in collembola kept under the 60-LED green lights.

5273

Will a Population of *Lepidocyrtus northridge* Increase If They Are Kept Under 60-LED Green Lights?

Elizabeth Adwani, Aaron Ambrosio, Alexis Clare, Chiara Dominguez, Cathrina Figueiroa, Isabella Gamboa, Adam Hernandez, Timothy Meyer, Melissa Padilla, Lauren Perez, Shaila Perry, Salma Ramirez, Cynthia Rodas, Liani Ruiz, Shane Schomer, Suzy Silva, Juan Velasco and T. Miller (teacher)
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The purpose of this experiment is to determine if a population of collembola (*Lepidocyrtus northridge*) will increase if they are kept under 60-LED green lights. Collembola are tiny hexapods commonly called springtails. As a hypothesis the class determined the population of collembola would increase if kept under the green lights. One part powdered charcoal was added to nine parts plaster of Paris, to which was added water. It was stirred, poured into 10 petri dishes and allowed to dry for a couple of days. The petri dishes were moistened with water, and yeast was added for the collembola to eat. Equal numbers of collembola were added to the petri dishes in the control and the petri dishes in the experiment. The experiment was placed under 60-LED green lights during the day. For five weeks data was collected by counting the live collembola and collembola eggs using stereomicroscopes and magnifying glasses. Fifty-five percent of the collembola and 47% of the collembola eggs were counted in the experiment. Fifty-four percent of the collembola and 53% of the collembola eggs were

counted in the control. These results showed a small increase under the 60-LED green lights. This suggests the hypothesis is correct.

5274

Will Collembola Survive If They Are Watered With Tea Instead of Water?

Breanna Ascencio, Gabrielle Bodden, Rachel Bresciani, Dimitri Camberos, Sebastian Correa, Andrea Cortez, Richard Diaz, Joshua Escobar, Adrian Fontanills, Jasmine Garcia, Nika Garcia, Tristan Kendall, Wahaj Khan, Jocelyn Lares, Spencer Lee, Kimberly Lopez, Carina Lusk, Crystal Martinez, Oscar Mora, Anthony Morales, Liliana Nurinda, Adam Omary, Donara Pogosian, Aurora Rivas, Ishiban Rodriguez, Leonardo Rodriguez, Taylor Russo, Blanca Sanchez, Genesis Sandoval, Kyle Vicente, Andre Yacapin, Estuardo Zecena and T. Miller (teacher)
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The purpose of this experiment was to determine if collembola (*Onychiuridae encarpatus*) would survive if they were given tea rather than water. As a hypothesis we believed the collembola would survive being watered with tea. Collembola are tiny arthropods that have a special jumping organ called a springtail. They live in leaf litter and dirt. Nine parts plaster of Paris were mixed with one part powdered charcoal. Water was added and it was stirred to about the consistency of yogurt. The thick liquid was placed in the petri dishes and tapped on the table to spread it through the entire petri dishes. It was allowed to dry for a few days. The petri dishes were labeled control and experiment and equal numbers of collembola were placed in the petri dishes. The control was moistened with water and the experiment was moistened with tea. Yeast was added for the collembola to eat. The number of collembola and collembola eggs was counted for five weeks. Fifty-seven percent of the collembola and 58% of the collembola eggs were counted in the experiment. Forty-three percent of the collembola and 42% of the collembola eggs were counted in the control. Based on the data the hypothesis was correct; the collembola thrived being watered with tea.

5275

Will a Population of Collembola Increase If Vitamins Are Added to Their Food Source?

Kenneth Adkins, Shaina Alvarado, Dion Atkins, Alexis Cain, Bianca Casillas-Martin, Nataley Casillas, Emily Cervantes, Oliver Domingo, Ryan Downs, Valeria Gabrielli, Lissette Galdamez, Brandon Garcia de Alba, Jesse Gonzales, Justin Hogarth, Ruby Ivey, Darius Johnson, Daisy Juarez, Arvin Libao, Isaiah Martinez, Khanh-Vy Nguyen, Tatiana Orellana, Isabella Padilla, Sammantha Pitpit, Jaime Ramirez, Adrian Ramirez, Denise Rios, Leonardo Rodriguez, Torshawn Roland, Diana Sanchez, Nicholas Sharifie, Bryan Solano, Therese Torres, Elle Tortorici, Nathalie Tuazon, Gerianne Viray, Meghan Williams and T. Miller (teacher)
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The purpose of this experiment is to determine if a population of collembola (*Onychiuridae encarpatus*) will increase if vitamins are added to their diet of yeast. Collembola can be defined as tiny, wingless hexapods that have a springtail to help them escape from danger. As a hypothesis, it was decided that the population would increase if vitamins were added to their diet. One part powdered

charcoal, nine parts plaster of Paris, and water were stirred in a small container. The thick liquid was then poured into 18 petri dishes and allowed to dry for a few days. Half of the petri dishes were labeled experiment and half of the petri dishes were labeled control. Water and yeast were added to all of the petri dishes.

Crushed Centrum vitamins were also added to the nine petri dishes labeled experiment. Equal numbers of collembola were placed in the control and in the experiment. Stereomicroscopes and hand lenses were used to count the number of collembola and collembola eggs in each petri dish. At the end of five weeks 45% of the collembola were counted in the control and 55% of the collembola were counted in the experiment. Forty-five percent of the collembola eggs were counted in the control and 55% of the collembola eggs were counted in the experiment. The population rate of the collembola did increase slightly when vitamins were added to their diet. The hypothesis was correct.

5276

Will a Population of Collembola Decrease If They Are Fed Avocado For Food?

Mabel Aceves, Evan Ancheta, Danielle Arevalo, Brendan Ascorra, Tatanka Baskerville, Jared Bejerano, Caitlin Buckband, Ashley Campbell, Albert Campos, Marisol Castaneda, David Castellanos, Melody Castillo, Sebastian Felix, Paulynn Gallardo, Briana Garnica, Donaldo Gonzalez, Destiny Gonzalez, Christian Gutierrez, Eduardo Guzman, Dionte Lovelace, Adeleine Mariano, Kyle Martinez, Keyan Moiny, Kathleen Molina, Hannah Morris, Ashley Murphy, Katherine Ornelas, Sebastian Pena, Alicia Ramos, Vanesa Samano, Miraf Shehata, Jan Suero, Juan Verduzco, Jovaun Williams and T. Miller (teacher)
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The purpose of doing this experiment was to determine if a population of collembola (*Onychiuridae encarpatus*) will decrease if fed avocado for food. Collembola, commonly known as springtails, are tiny hexapods that eat mold. As a hypothesis, it was determined the population would increase if avocado was used as food. To begin the procedure, nine parts plaster of Paris, powdered charcoal, and water were stirred in a container. It was then dropped into 18 petri dishes and allowed to dry for a few days. Half of the petri dishes were labeled control and half of the petri dishes were labeled experiment. Yeast and water were added to the petri dishes labeled control, and avocado and water were added to the petri dishes labeled experiment. An equal number of collembola was added to the control and experiment. At the end of five weeks, the number of live collembola and the number of collembola eggs were counted. Forty-seven percent of the collembola were counted in the control and 53% were counted in the experiment. Forty-six percent of the collembola eggs were counted in the experiment and 54% were counted in the control. The data suggests that collembola can survive and numbers increase in population when eating avocado or the mold growing near the pieces of avocado. The collembola survived as well eating yeast or avocado.

**5277
Production of Electricity By Various Foods and Liquids**

Aaron Opell and D. Shah (teacher)
Portola Highly Gifted Magnet Center
18720 Linnet St.
Tarzana, CA 91356

My experiment was to see which common household foods and liquids produced electricity, and how much electricity each produced. The experiment was also done to see if pH values had any relation to how much electricity was produced. Copper and zinc plates were attached to the test item and attached by a wire to an electric multimeter, which displayed the energy produced. Each item was tested three times, but with three different fruits. For example, three different apples that were of the same type were tested, not the same apple three times. All test items did produce electricity, but all produced less than 1 volt. The items that produced the most electricity were the apple and the orange juice.

**5278
Effects of Salinity on Brine Shrimp Hatching**

Adam Syed and D. Shah (teacher)
Portola Highly Gifted Magnet Center
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Tarzana, CA 91356

This science project measured the effects of salt on brine shrimp hatching. Four test tubes, with 0 percent salinity, 5 percent salinity, 10 percent salinity and 15 percent salinity, each had 50 brine shrimp cysts placed into them. The test tubes were kept at 80 degrees, and were fed 1/10 of a teaspoon of brine shrimp food after 48 hours. After three trials the rounded results were the 0 percent salinity hatching 0 brine shrimp, the 5 percent salinity hatching 39 brine shrimp, the 10 percent salinity hatching 34 brine shrimp, and the 15 percent salinity hatching 23 brine shrimp. Five percent will most likely be the best salinity for brine shrimp to live in.

**5279
The Different Soundproofing Qualities of Different Materials**

Affan Rahman and D. Shah (teacher)
Portola Highly Gifted Magnet Center
18720 Linnet St.
Tarzana, CA 91356

This experiment tested the soundproofing qualities of different materials. A box was created with one side left open where the materials to be tested were placed. The other sides were made as soundproofed as possible. Each material was placed over the open side and was tested three times. The average of the testing with the box open resulted in 86.8 dB (decibels). The results of testing cardboard averaged to 62.5 dB, foam core board averaged to 59.3 dB, porous foam averaged to 81.9 dB, wood averaged to 51.8 dB, plywood averaged to 51.3 dB, carpet tile averaged to 62.5 dB, and ceramic tile averaged to 57.5 dB. It was found that plywood has the best soundproofing quality.

**5280
Hydroponics and Soil Experiments**

Alexander Ke and D. Shah (teacher)
Portola Highly Gifted Magnet Center
18720 Linnet St.
Tarzana, CA 91356

This study researched the growth rate differences between hydroponics and traditional farming in the lentil plant (*Lens culinaris*). Lentils were grown in a perlite substrate and potting mix. Four out of nine lentils sprouted in perlite substrate and nine out of nine sprouted in the potting mix. The hydroponics plants were leading in growth rate until all of the hydroponics plants died of water loss. Water flow is a key factor in the growth and development of hydroponics plants. The results show that soil plants outlive plants in hydroponics, although soil plants have a slightly lower growth rate.

**5281
Effects of Different Amounts of Aspirin on Different Colored Daisy Poms**

Amanda Lee and D. Shah (teacher)
Portola Highly Gifted Magnet Center
18720 Linnet St.
Tarzana, CA 91356

This study examines the positive or negative effects on Daisy Poms if different amounts of aspirin are added to plain tap water. Magenta and white Daisy Poms were placed in plain tap water, each with no aspirin, one, three or four aspirin tablets. The Poms were monitored for seven days. The results show that the life of a Daisy Pom is longest when only one aspirin tablet is added. The Daisy Pom with with aspirin tablets had the shortest life. Color didn't affect the results.

**5282
The Correlation of Video Game Scores and Reflexes**

Ben Schall and D. Shah (teacher)
Portola Highly Gifted Magnet Center
18720 Linnet St.
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This study questioned if people with higher video game scores have higher reflexes. It was tested by recording the video game scores of a human subject and comparing this to the subject's reflex score. To test the video game score the subject played three video games – "Call of Duty: Black Ops," "Portal 2" and "Super Smash Bros. Brawl" – and the score was recorded on a scale of 1 to 10. The reflexes were tested by having the subject move body parts as instructed by a slide show, while these actions were timed and put on a scale of 1 to 10. The experiment was repeated on five different test subjects. The average video game score and reflex score of each participant were as follows: Test subject 1 (gamer) had a video game score of 7 and a reflex score of 7; test subject 2 (gamer) had a video game score of 5 and a reflex score of 5; test subject 3 (non-gamer) had a video game score of 2 and a reflex score of 2; test subject 4 (non-gamer) had a video game score of 2 and a reflex score of 4; and test subject 5 (gamer) had a video game score of 4 and a reflex score of 5. The results, with scores being identical or having minor differences with the video game as the lower score, indicate that people with higher video game scores do have higher reflexes.

5283**Effects of Different Liquids on a Green Bean Plant***Bryan Deng and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the question of the effects of using different liquids on a green bean plant. Twelve cups, each with a cotton pad and a green bean seed, were placed right next to a window and left there 24/7. Each cup was first watered with 20 mL of the assigned liquid, and then on a daily basis each cup was watered with 5 mL of the assigned liquid. After watering the plants, the height was recorded in the notebook. This study lasted for two weeks. Results showed that water was the only liquid that was able to make the seed grow, and the other liquids failed to take the seed past germination.

5284**Investigation of Electromotive Force Variations By Photovoltaic Generation With Distance Light Sources***Bryce Fang and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study of solar power generation analyzed the effects of various light sources on the electric potential a photovoltaic cell produced. The volt (V) is the common unit of electric potential used. Four unique light sources were chosen for this study: light-emitting diode (LED), incandescent light, fluorescent light and sunlight. Each light source was tested at three different angles. Sunlight was tested over different times of day. The results indicate that sunlight is a superior power source for a photovoltaic cell.

5285**Effect of Music on Blood Pressure***Charles Salmans and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the question of music affecting stress in the measure of blood pressure. A person was tested with a blood pressure monitor before and after listening to music chosen from a specific genre, and the results were recorded. Each experiment was repeated seven times, with four different participants, eight genres and 16 songs. The songs with lower beats per minute reduced the blood pressure. The songs with higher beats per minute raised the blood pressure. However, uplifting or "catchy" songs that the subjects recognized brought blood pressure closer to the average level. The results suggest that the songs with a lower beat per minute would reduce blood pressure, and uplifting or "catchy" songs would produce closer to the average blood pressure.

5286**Effects of Vitamins C and B on Strawberry Plant Growth***Christopher Koh and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the question of possible Vitamin C and B12 involvement in the growth of the strawberry plants *Fragaria × ananassa*. The strawberry plants were divided into two separate groups: One group was given water enriched with Vitamins C and B12, while another group was given regular water. The growth rates were recorded for five weeks. At the end, the plants given Vitamins C and B12 had straightened up and had grown at a faster/more accelerated rate than the control group. The results suggest that Vitamins C and B12 increase the rate of plant growth in strawberry plants.

5287**Effects of Temperature on Magnetic Strength***Cole Horvitz and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This experiment tested temperature's possible connection with the magnetic strength of permanent magnets. Four permanent magnets were tested under four different temperatures: -75°C, 0°C, 20°C and 100°C. Magnets were placed on solid CO₂ (dry ice) for -75°C, placed at room temperature for 20°C, placed in ice water bath for 0°C, and placed in boiling water for 100°C. The magnets were inserted into a container of BBs after being exposed to the temperatures for five minutes. The BBs were each counted and the total number was logged. The end results suggested that the magnets that were exposed to colder temperatures were able to attract more BBs than the ones that were exposed to warmer temperatures.

5288**Effect of Temperature of Water on Kidney Beans***David Cho and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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Does the temperature of the water affect the growth of kidney beans? This experiment will answer that question. The objective of the experiment was to see which temperature of water was more efficient in growing plants. The three temperatures of water that were used to water the kidney beans in the experiment were hot water (67 degrees Celsius), cold water (3 degrees Celsius) and regular tap water (23 degrees Celsius). In this experiment, the method that was used was to water the kidney beans and record the results in the afternoon. During the recording, pictures were taken to show the growth of the plants. If the weather was bad and could affect the experiment, the plants were taken indoors. When the experiment was over a conclusion, graphs, abstract, relevance and application were made to show the results. The results showed that the plants that were watered with regular tap water grew the most, the plants with cold water grew second, and the plants with hot water grew the least. The conclusion is that the temperature of the water does affect the growth of kidney beans.

5289**Effect of Soils on Growth of Succulent Cacti**

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This study examined the effects of different soils on the growth of succulent cacti. Several succulent cacti were planted in three different soils – topsoil, gravel and sand – and observed every two days for about three weeks. Each experiment was repeated three times. The cacti grew better in topsoil every time, whereas the cacti in the gravel and sand grew, but not as well. The results suggested that the cacti grew best in the topsoil.

5290**How Do Music and Emotion Affect Heart Rate?**

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This experiment questioned whether or not music tempo affects heart rate, and whether or not there is any correlation between that heart rate and the subject's emotions. Subjects listened to a fast song (*Gangnam Style* by Psy: 132 beats per minute) and a slow song (*Heavens and the Earth* by The Lonely Hearts: 70 bpm) and had their heart rates recorded before and after the songs, and at one-minute intervals during the songs. After each song, they were given a questionnaire asking about their emotions. This test was repeated on 10 individuals. The fast song caused the heart rate to rise by up to 14 bpm, and the slow song caused it to decrease by up to 6 bpm. The results of the emotion questionnaire showed that 40% of the subjects who listened to the fast song experienced strong emotions (excited and happy/annoyed), while those who listened to the slow song only experienced subtle emotions (calm and content/neutral). The results suggest that fast tempos raise heart rates, slow tempos lower heart rates, and that there is a correlation between heart rate and emotion in this test.

5291**Effects of Colored Light on Bean Plant Growth**

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This study examined the question of whether colored light makes bean plants grow taller. Two germinated seeds were planted in a pot of soil under each colored light filter (red and green), as well as the control (clear), for two weeks and watered. The height was recorded every other day. The experiment with both variables and control was repeated, but in colder weather. At the end the average of the first two red light plants was 18.5 cm and the second two was 2 cm. The first two green light plants were 8 cm and the second two were 14.5 cm. The first two control plants were 13.5 cm and the second two were 0.5 cm. The results suggest that red light causes bean plants to grow tallest; however, in colder weather, green light causes bean plants to grow tallest.

5292**Studying Condensates From Water Desalinator**

Eugene Woo and D. Shah (teacher)
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We are comparing results from various condensate results from the desalinator. A single variable, sunlight, is to be tested on the surface of the machine. From condensate results, we will be able to compare the amount (in millimeters) of difference that sunlight creates. Out of seven tests, we will be letting each machine to get a different amount of sunlight than others and start collecting condensates with 30 minutes of each machine. Each machine will be given five trials and the average will be calculated also.

5293**Effects of Temperature and Salinity on Water Density**

Felix Bulwa and D. Shah (teacher)
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This experiment tested how the percentage of salt and temperature of water create a variation of the water's specific gravity. A bottle filled with a specific temperature of water was placed on top of a bottle filled with a contrasting temperature of water. A different color food coloring was added to each bottle. The denser water (in this case the color) would naturally flow to the bottom. If the coloring from the top bottle seeped to the bottom one, the top bottle proved to be denser; however, if no color change occurred, the bottom bottle contained the denser water. The same procedure was performed with different percent salinities (note the same events in the previous statement apply to salinity for concluding the results). Results were recorded with the exact temperature and salinity each bottle had. The conclusions showed that the colder and/or saltier a sample of water is, the denser it is, so the warmer and/or less salty substances are less dense.

5294**The Different Freezing Points of Solutions**

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This project was designed to test the different freezing points of solutions, allowing chefs or others to know what temperatures to use to freeze different substances. Eight solutions were gathered and their freezing points were tested three times each. Results were then compared to see how the freezing points of the solutions differed from the freezing point of the water only. All of the freezing points were different and below 0 degrees Celsius.

5295

Do Age and Gender Affect How We Perceive Optical Illusions?

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This study examined whether or not age and gender affect how our brains perceive optical illusions. Twenty human subjects – five males under 18, five females under 18, five males over 18 and five females over 18 – were presented with three separate optical illusions, printed on 5-inch by 5-inch squares of paper. The subjects were asked what they saw in each illusion, and the results were recorded. Since there were three optical illusions, these were the three different tests. Each test subject also was shown under the same light, in the same area. The results suggest that age and gender do factor into seeing illusions, but not as much as the person's individual mindset, and what illusion he/she is being shown.

5296

Stronger Bridge Out of Warren Truss, Arch, Cable-Stayed and a New Creation

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This experiment was done to find which bridge of a certain selection could hold the most weight. Each bridge was tested by suspending weights from the bridge and continually adding more weights until the bridge snapped. After each bridge snapped the weight carried by the bridge was recorded. Each type of bridge was tested three times. The warren truss held an average of 1,767 g (grams), or 1.8 kg (kilograms). The cable-stayed bridge averaged 1,333 g, or 1 1/3 kg. The arch bridge averaged 1,800 g, or 1.8 kg. The newly created bridge averaged 3,883 g, or 3.8 kg. The outcome suggests that the new bridge design was the strongest, while the cable-stayed bridge was the weakest bridge.

5297

Effects of Chewing Gum on the Human Memory

Ivan Bermudez and D. Shah (teacher)
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This study examined the question of whether or not chewing gum will help with memorization. Five volunteers were tested with or without chewing gum to see how many items they could correctly memorize off a list in 15 seconds while in a distraction-free environment, and correctly write down in 60 seconds, also in a distraction-free environment. Each experiment was repeated five times, once for each volunteer, for a total of 10 complete tests. The data showed that children not chewing gum memorized four items, and while chewing gum, their memory increased 25% to five items. Adults 40-59 showed no results. Seniors, however, memorized four items which, while chewing gum, increased 43.335%. The results suggest that chewing gum does help a person with memorization.

5298

Effects of Caffeine on Typing Speed

Kelia Lomeli and D. Shah (teacher)
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This study examined the question of how caffeine (a 12-ounce can of Coca-Cola) affected typing speed. Subjects tested ranged from ages 9 through 13. Subjects were given a three-paragraph excerpt and asked to type as many words as possible (in consecutive order) within a 3-minute time limit. The number of words typed was recorded, representing the subjects' "normal"/precaffeine typing speed. Following completion of this test, participants were required to consume a 12-ounce can of Coca-Cola. The time at which the Coca-Cola was finished was noted on the log. Participants were retested (utilizing the same three-paragraph excerpt for all tests) 15 and 30 minutes after the Coca-Cola had been consumed, and the results of each test were recorded on the log. Analysis of the participants' performance results showed that in most cases caffeine caused an increase in typing speed, with peak performance occurring between 15 and 30 minutes after consumption.

5299

Butter vs. Shortening: Baking Royale

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First, the ingredients for the two batters were mixed and each cookie weighed 25 grams. Then, each cookie was measured and put on a tray of either butter or shortening cookies and placed in the oven until they were done. Upon completion of baking, every cookie's diameter was measured once again and the data plotted on a graph. This graph showed that, all together, the butter spread 61% more in the total count than the shortening, which turned out to be 2.9% of the total count. The hypothesis was correct.

5300

Effects of Spin on Ball Speed

Jack Standish and D. Shah (teacher)
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This experiment questioned whether spin affects a moving ball's speed. A baseball was attached to a hanging string and lifted to the side. The ball was then dropped and the time the ball took to drop was recorded multiple times with different amounts of spin on the ball each time. There were several trials: no spin, a little spin, some spin and a lot of spin, each in a clockwise and counter-clockwise direction. Each trial was repeated four times. The average results were graphed on a line graph, and it was found that there were no useful patterns and that the results were inconclusive. However, the results of the experiment could be used to plan future experiments on a similar topic.

5301**Effects of Temperature on Magnets***Jacob Jimenez and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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The study I performed examined magnet strength under extreme temperatures. Magnets were put under extreme cold and extreme heat, and then were tested in the metric unit of centimeters. Magnets first were tested at normal room temperature, and then were placed in hot water until the water was boiling, and then were tested by seeing how far the magnets' radius of strength extended or weakened. I also placed the magnets for cooled testing on top of dry ice until it was cold enough. The results of both the higher and lower tests were then compared to the regular strength. The results suggested that at higher temperatures the magnets' strength decreased. After the experiment, the magnets were permanently affected. At a colder temperature, the magnets' strength had grown.

5302**Baking With the Sun***Jake Hogan and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study determined how a solar (sun-powered) oven made out of cardboard, aluminum foil, string, beads, glass and duct tape would be useful as a cooking appliance. On a cloudy day, in the winter, with an ambient temperature of 5.5 degrees Celsius, the solar oven was ineffective, only achieving a temperature of 32 degrees Celsius. The experiment was retried on a clear day with a temperature of 10 degrees Celsius, once with a reflective baking pan and once with a black one. The reflective pan reached 65 degrees Celsius, while the black pan reached 93 degrees Celsius, meaning that the oven would be useful for baking on most days.

5303**Effects of Preservatives on Bacteria***Jay Ryu and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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The purpose of the experiment was to figure out the difference in time in between the formation of bacteria in preservative-added bread and organic bread. The weather's impact on the experiment was huge, and the method needed to be changed. The bread needed to be warm, enclosed and watered. As a result, the growth of bacteria increased and did affect the outcome. However, that indicates that if the experiment done this way did not have any bacteria formed at one week, then the normal conditions would take much longer.

5304**The Effect of Smell on the Sense of Taste***Jennifer Choi-Nakama and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the possible effects the sense of smell has on taste. Volunteers were asked to taste different foods while blindfolded. (The blindfold made sure that the volunteers didn't recognize the food before they tasted it.) At first, they were to taste the foods without the sense of smell. After each sample, they described what it tasted like from a variety of flavor choices. They did the same thing again, but with the sense of smell. The results were recorded. The outcomes suggest that smell (or the lack of smell) does affect the sense of taste because the descriptions were different when the same person tasted the same food. For example: Person 1 said that the mozzarella cheese tasted bland without smell, but sour with smell.

5305**Effects of Various Activities on Memorization of Numerical Data***Jessica Mindel and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the effect of different activities on memorization of numerical data. A computer program was created that exposed subjects to seven different activities/situations in a random order. The activities included reading to oneself, listening to four different types of music, playing with clay and marching in place for 30 seconds. Subjects were given 5 seconds to memorize 10 randomly chosen numbers, 1 second of waiting time and 7 seconds to recall the data. The experiment was repeated 20 times, with five male adults, five female adults, five male children and five female children. Overall results indicated that playing with clay was most helpful to memorization of numerical data, whereas listening to modern-day hit music (with lyrics) was least beneficial to the subjects. Although modern-day hit music was least helpful to the subjects, music without lyrics was found to be just as helpful as activities without music in them. In conclusion, playing with clay and listening to music without lyrics may be most helpful to individuals trying to memorize numerical data.

5306**Effects of Liquids on Bottle Rocket Heights***Joel Kim and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study asked which liquid (orange juice, water or soda) could raise a bottle rocket to the highest point. Bottle rockets were launched with orange juice, water and soda. The heights were then recorded and averaged out. The rocket powered by soda flew an average of 22.5 meters high. The rocket powered by orange juice flew an average of 17 meters high. The rocket powered by water flew an average of 21.6 meters high. These results conclude that a bottle rocket powered by soda will fly the highest.



5307

Effects of Over- and Under-Watering Tomato Plants

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This study examined the question of whether or not slightly under-watering tomato plants had an effect on tomato size and growth. Tomato plants were given either 2 or 3 ½ liters of water per week for 60 days and kept at 25°C next to an indoor window sill. They received proper pruning and were left to grow. Each experiment was repeated at the same time three times during the harsh times of winter, when tomatoes really shouldn't be grown. The tomato plant's tomatoes that were given 3½ liters of water produced tomatoes first. However, the tomato plant whose tomatoes were given 2 liters of water lived longer than the other tomatoes. All plants died before making full adult tomatoes. Thus, the information shows that the tomatoes that were given more water made larger tomatoes faster than the tomatoes that were given less water.

5308

Effects of Temperature on Magnetic Strength

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This study was conducted to answer if temperature affects magnetic strength. Three magnets were placed in each of the following: a bag of dry ice, a freezer, a pot of boiling water, and a room at room temperature for a day. A test was then conducted. The experiment was to see how many paper clips could be attached to the end of different-temperature magnets. The end result showed that the colder magnets were more powerful than magnets at higher temperatures.

5309

The Best Brand of Tennis Balls for Rebound and Lifeline

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This experiment studied the brands of tennis balls and their life-line, rebound and quality. The four brand tennis balls – Babolat, Penn, Dunlop and Wilson – were tested for their rebound by measuring the bounce in meters before, in between and after five tennis games. Each game lasted for 10 minutes and had very similar movements. The whole experiment was tested two times and the results were very similar. After the tests the brands were ranked according to their rebound after the games. The order went like this: Wilson, 1st, with a final overall rebound of 1.194 meters; Dunlop, 2nd, with a final overall rebound of 1.143 meters; Babolat, 3rd, with a final overall rebound of 1.118 meters; and Penn, 4th, with a final overall rebound of 1.067 meters.

5310

The Effect of Color on Candle Burning Speed

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This study tested if dark colored or white candles burned faster. The candles were lit and timed for five hours, and their height was recorded every 10 minutes. This experiment was performed three times for confirmation. The results suggest that the dark colored candles burn faster, since they absorb heat better than the white ones.

5311

Cryopreservation on Lima Beans

Karina Guo and D. Shah (teacher)
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This study examined the question of how cryopreservation affects lima beans. Lima beans were suspended in liquid nitrogen for different durations of one to four days. After the desired duration, the lima beans were removed from the liquid nitrogen and put in petri dishes at room temperature. The specimens were then observed and changes were recorded. On average, the growth rate of the sprout on length of the frozen lima beans was 3.93 millimeters per day for five days in three trials. That was faster compared to the growth rate of the sprout in the control group, which was 2.13 millimeters per day for five days in three trials. The experiment proves that the hypothesis is correct. Therefore, freezing does not change the quality of the beans. The lima beans still germinated; in fact they germinated faster than the control group.

5312

The Effect of Different Conditions on Radish Seed Growth

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This study tested the growth of three different sets of radish seeds grown under different conditions. The first condition was to leave the seeds alone in an upright CD case, the second set was blocked on the bottom and laid flat, and the third set was flipped sideways 90 degrees daily while standing upright. The experiments each lasted one week, with three sets of experiments conducted. After all three experiments were completed, the radish seeds left alone in an upright CD case grew the fastest over the period of a week, averaging 92.1 millimeters at the end of seven days. The second fastest were the seeds blocked on the bottom, which grew 72.7 millimeters, and the slowest were the seeds flipped daily, which only grew 59.3 millimeters at the end of a week. This experiment showed the fastest way of the three ways to grow radish seeds, which was letting the seeds grow vertically while left alone.

5313**Effects of Classical, Pop and Rap Music on Growth of Squash Plants**

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This experiment tests whether music has an effect on the plant Straightneck Squash. Pop, classical and rap music were played next to three groups of plants. It's optional to have another group as a control variable. The squash plants were exposed to music and no music for two hours every day for two weeks. The results were that the squash plants that were exposed to no music grew the best. The music that made the squash plants grow the best was pop music. The conclusion was that the squash plants will grow better without any music.

5314**Effect of Colors on Memory of Words**

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This study examined the effect of different colors of fonts on the memory of words. The colors were red, orange, green, blue and black. There were two trials, short-term memory and long-term memory. For short term, subjects were shown six words and 15 minutes later recorded the words they remembered. For long term, 12 words were shown and an hour later the subjects recorded the words they remembered. Overall, there were 15 7th-grade test subjects, seven boys and eight girls. According to the results, it appears that the hypothesis that the color red would be most effective in having people remember words is incorrect for this group of people. The color blue was most effective, with four words remembered for short-term memory and five for long-term memory. In fact, the color red got the lowest average results of two and three.

5315**The Effects of Packaging on Food Preservation**

Kino Martinez Farr and D. Shah (teacher)
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This study examined the question of which type of packaging affects the preservation of Granny Smith apples the most significantly. The apples were all cut in half, packaged and left in the refrigerator, except for occasionally being taken out every three days for pictures. The experiment was repeated twice and both lasted for 12 days. The control was merely placed in a small bowl and also placed under the same refrigeration of 40 degrees Fahrenheit. In a scale that was created by the scientist that went up to 6 (with a lower number equating to a higher preservation rate), the control apple had a preservation average of 4.5. The FoodSaver apple had an average preservation rate of 1.125. The Saran Wrap apple had an average preservation rate of 3. The Ziploc Box Container had an average preservation rate of 4.25. The Ziploc Bag had a preservation rate of 4.25. Overall, the largest rate of preservation was that of the FoodSaver apple.

5316**Does the Design of a Bottle Rocket Change Its Performance?**

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This study tested what number of fins and what shape of those fins on a bottle rocket would have the best performance. First, the bottle was launched using three, four and five fins with a traditional-shaped fin. Each experiment was repeated three times and was launched at 30 PSI (the amount of air pressure applied per square inch). The results showed that the bottle rocket with four fins flew best. Next, the bottle was launched using traditional, curved and triangular fins. After three repeated launches with each shape, the results showed that the bottle rocket with curved fins flew best. Finally, the rocket was launched using four curved fins and with a head weight. The results showed that with four curved fins and a head weight, the bottle rocket performed at its best.

5317**Which Brand of Glue Can Support the Greatest Weight?**

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During this experiment, four different brands of glue were tested to see which one could support the greatest weight. They were tested by gluing a wooden ball and a wooden cube together. Hooks were then attached to both the wooden ball and wooden cube. They were then hooked onto a luggage scale and pulled on in increments of 2 kilograms until they reached 23 kilograms. After three rounds of testing, Titebond III came out as the strongest glue out of the four tested, supporting 22 kilograms.

5318**Effects the iPhone Sound Has on the Ear With or Without Headphones**

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My experiment is about the effects that the iPhone has on the ear and whether wearing headphones or not wearing headphones can impair your hearing. I chose this experiment to see what volume levels on the iPhone were appropriate for teenagers to be listening to so they don't cause permanent damage to their ears. Those who are hearing impaired will have different development in speech because their ears will not have learned the sounds that the brain needs to be able to recognize and translate into words. I believe my results will tell teenagers which volume levels are appropriate to listen at. After conducting this experiment, I believe the results will show that hearing above volume level 11 will cause damage to one's ability to hear.

The materials I used for this experiment were the iPhone by Apple, headphones by Apple, lined paper and pencil from Office Depot, iPad by Apple, Decibel Counter iPad app by Patrick Schaefer and the song *Tokyo Drift* by Teriyaki Boyz. The variables that needed to change were the volume level and whether I used headphones

or the iPhone speakers. The testing environment needed complete silence from surrounding people, while external room noise was acceptable. The first step to creating this experiment was to gather all of the materials. Then I needed to set up my testing area and prepare the materials. Next, I needed to draw a data table with my pencil and paper so I could record the data. After I completed this step, I began testing. I selected the song and started playing it to a marked time of 18 seconds. I kept changing the volume level with headphones and used the iPhone speakers without headphones (I skipped the first volume level due to lack of sufficient sound).

I made sure that I had the iPad decibel counter close to the iPhone so accurate data recordings were achieved. Once I finished writing down the entire results, I utilized research from my visit to the House Research Institute regarding the decibel level that impairs one's hearing.

I performed 16 trials to reach the maximum volume level on the iPhone. The data showed that the number of decibels emanating from the device, with headphones and with the iPhone speakers, did not exceed the level of 72 decibels. This proved my hypothesis was wrong since none of these volume levels caused serious damage to the ear. Although none of the volume levels exceeded 85 decibels, damage to the ear is still plausible. My recent visit to the House Research Institute informed me that 85 decibels at excessive exposure can cause permanent damage to the ear.

I conducted this experiment to find a safe volume level for teenagers to listen to music at. Although the data does not show that any volume level exceeded 85 decibels, it was within 15% of causing permanent ear damage. Being within 15% may cause degradation to the ear's ability to hear. I have given scientists a starting point to conduct further experimentation on higher volume levels. This data should not be misinterpreted by the world, since high decibel levels at excessive exposure can still cause ear damage.

5319

The Benefits of Switching to Alkaline Water

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Many people have started switching to alkaline water from regular faucet or bottled water since it is apparently healthier and can have lots of benefits for an individual. Most doctors agree that the human body needs to consume foods and drinks at a pH level of at least 7.35 because a lower pH level is considered acidic, which is not good for your body. The more acidic your body is, the less healthy you are. Many diseases thrive in an acidic environment, especially cancer. A higher pH level, such as 8-10, would indicate alkalinity and many agree that consuming alkaline foods is best for your health. This is why many people are switching to alkaline water, although some debate if there really are any benefits. This is why I will be answering the following question with a scientific experiment: Is switching to alkaline water really healthier, and if so what are the benefits? My hypothesis is that it is healthier, and that the benefits are feeling more active and healthy, having an alkalinized body (good for fighting diseases), and weight loss.

To perform my experiment, I will use some simple supplies. First, a one-week supply of alkaline water, coming from the Kangen Water Filter. Second, a subject to test on, a 42-year-old male with high blood pressure, and 6 lbs. overweight (stated by doctor). Third, a weight scale from IKEA, and a portable wrist blood pres-

sure monitor. Lastly, I will need a camera. My procedure is to first weigh the subject, take his blood pressure, record how he is feeling (sluggish, tired, active, etc.) and take a picture of his weight and blood pressure. Second, I will have the subject continue with his regular daily life routine and activities, but switch to alkaline water for seven days. Lastly, I will then record his weight, blood pressure and how he is feeling on the seventh day.

The data I collected was very helpful in my experiment. On the day before the week trial of drinking alkaline water, the subject's weight was 211 lbs., his blood pressure was 160/88 with 69 beats per minute, and he stated feeling "out of energy," even though he had done very little physical activity that day. After the seven days, the subject was 207 lbs., with a blood pressure of 155/88. He said he felt energetic and slightly happier.

As a result, this data helps validate my hypothesis because it proves that alkaline water does in fact benefit an individual and can change factors such as weight, blood pressure and the feeling or mood of someone. The data shows that the subject's weight went down and his blood pressure went down as well, and he felt more energetic. Further investigation showed that the alkaline water is a hunger suppressant and is packed with important vitamins and minerals. That probably contributed to the weight loss and change in blood pressure since eating less results in weight loss, and eating less salty foods helped too because they are unhealthy for someone who needs to maintain a healthy blood pressure.

In conclusion, the results show that there are benefits in switching to alkaline water. I guessed this would be the result because anything alkaline is good for you. This is important in today's society because everyone seems to want/need to get healthier. Switching to alkaline water is very healthy, but maintaining a good alkaline diet is too. It takes 20 parts of alkalinity to neutralize 1 part of acidity. This is an important fact in the well-being of an individual because of diseases like cancer that thrive in acidic environments, and that can be avoided with the help of alkaline food and water.

5320

Will Salt Change the Melting Point of an Ice Cube?

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The melting point of ice is 0 degrees Celsius, or 32 degrees Fahrenheit. However, if a physical change occurs involving the ice, its melting point can be altered. With my current knowledge, I decided to see whether salt would alter the melting point of ice. I think the results will have an effect for the public for numerous reasons. Ice on driveways and roads is a constant threat to our society because it is the leading cause as to why many accidents occur. If salt is the solution to the situation, we can save lives and prevent injuries. I think salt will provide the necessary heat to separate the densely packed water molecules in the ice cube. From what I already know, I think salt will decrease the ice's melting point so that it melts more quickly than a regular ice cube.

The materials I used to conduct my experiment included measuring spoons, table salt, three bowls, six equally sized ice cubes (size is your decision) and a wristwatch. First, place each ice cube in a separate bowl. Measure a teaspoon of table salt using the measuring spoons. Add it to an ice cube of your choice. Have your lab partner time four minutes for the first trial. After the assigned

time has passed, you and your lab partner must calculate how many teaspoons of water each ice cube melted, using the measuring spoons. You can pour the remaining water that was measured from the ice cubes in the third bowl. Then, you should repeat the procedure for the second trial, this time adding another four minutes to make eight, before you check how much water was melted off. Repeat the procedure a third time for the final trial, this time calculating the water from the ice cubes after 12 minutes. With each trial (three in total), you must use two new ice cubes. Record the calculations of the water from the ice cubes in your data table, measuring in teaspoons. You should then compare your results and refer back to your hypothesis. Reflect your thoughts with your newly acquired knowledge.

The first trial, with four minutes timed, had evidence of my hypothesis. The first ice cube that salt was added to melted one teaspoon of water. The ice cube's appearance to the effect of the salt was cracked. The regular ice cube melted only one half of a teaspoon. The second trial, with eight minutes, had similar results. The salted ice cube melted one and a half teaspoons of water, while the regular one only melted one teaspoon. Finally, the third trial had 12 minutes. In the time frame, the salted ice cube melted two teaspoons of water. On the other hand, the regular ice cube melted only one and one fourth teaspoons of water. The results proved that my hypothesis was correct! The salted ice cube melted off about a half teaspoon more water than the other. In all three trials with the increasing time, the salted ice cube melted off more water than the other. I learned that salt decreased the ice's melting point, making it melt faster than a regular ice cube.

To reiterate, the larger implications of the experiment were how the salt decreased the melting point of the ice cube using heat energy. A huge amount of heat energy was required to break the compacted bonds between the water molecules in the solid. One teaspoon of salt melted off a lot of water in comparison to the other ice cube. When the salt was added, it was able to dissolve on it and break the closely packed molecules in the solid. It cracked much of the ice in the given times. The effect of the salt on the ice resulted in a physical change that melted the ice cube with heat energy. This caused the ice's melting point (0 degrees Celsius) to decrease, allowing the ice cube to melt faster. The next time your driveway is coated in ice, just remember to apply salt, and watch the ice melt. It will ensure your safety.

5321

How the Acids and Sugars in Sodas Affect Bones in the Body

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In this 48-hour experiment, I put two chicken leg bones in cups, one filled halfway with Sprite, and the other filled halfway with Ginger Ale. I am performing this experiment to demonstrate the effect that the acids and sugars in soda have on calcium in the body, such as in the teeth and bones. This is an important experiment because it will help figure out if soda is bad for bones in the body or not. My hypothesis is that in this experiment, after a day or two, the chicken leg bone will become softer and will partly dissolve.

For the experiment, the materials I used were two clear glass cups, half a cup of Sprite, half a cup of Ginger Ale, two chicken leg bones (one of them was 10 cm and the other was 7 cm), one ruler for measurements, two pieces of plastic wrap to cover the cups during the experiment, a camera, an alarm clock set to go off every eight hours to check the progress of the bones, several plastic gloves to feel the bones, a few napkins to set the chicken bones on, and, finally, a data table, a pencil and an eraser to record my observations. The variable that changed in this experiment was the sodas, since there were two different types. The variables that stayed the same were the chicken bones (since they came from the same chicken), and the times I made observations because I observed the progress every eight hours. To perform the experiment, I first gathered all of the necessary materials and set them up on a table. Then I created my data table, which included the time and a description of what I saw when I observed the bones every eight hours for 48 hours. Next, I put the chicken bones in the cups and filled one of them halfway with Sprite and the other halfway with Ginger Ale. Then I ripped two pieces of clear plastic wrap and used them to cover the tops of the cups so the liquids wouldn't evaporate into the air. I took a picture of this setup and recorded what I saw in my data table. I continued this process every eight hours, so I had seven photos and 14 trials (seven observations for each soda). On the last three trials for both of the bones, I used a glove to pick them up and place them on a napkin, and checked to see if there was any change in hardness.

Of the 14 trials I performed, only a few of them had different results than the others. When I first poured the sodas in the cups, they were very bubbly and gassy. For example, in the first trial, the Ginger Ale was a bubbly, golden color. By the last trial, the liquid changed to a foggy, light yellow color. This shows how acidic and sugary the soda was that it took some color away from the beige bone and added it to itself. The Sprite began affecting the bone right away, starting from causing pieces of it to peel off and float around, to making it possible to scratch some skin away in the middle of the bone, as if it was crumbs of a cake. The Ginger Ale affected the bone by changing the color of it and making the bottom half that was in the liquid white, and the other half light brown. The meniscus of the Ginger Ale even created a visible line on the bone right in the middle of it. The mineral calcium phosphate is a combination of calcium and phosphorus, and it is what keeps the bone strong. Since the bones became weaker and softer, I learned that the soda must have pulled out this mineral from them, causing them to become frail and delicate. This data tells me that my hypothesis was partly true because I was right about the amount of time it would take for the bones to become softer and smoother, but they didn't necessarily "dissolve" in the sodas like I thought they would.

The results of my experiment convinced me to drink much less soda and replace it with something healthier for me, and that is what it should convince other people to do too. One of the main problems in sodas is the complex sugars. Since your body requires energy and effort to break down and digest these sugars, your body will most likely gain weight and you will need to increase your activity level in exercising to make up for this. As people age, bones without calcium are not able to retain their density and structure, unfortunately leading to a condition called osteoporosis. So instead of drinking sugary, acidic sodas, you should think about replacing them with fruit drinks instead. They will help your body with important vitamins it needs rather than adding on extra pounds

because of a soda that tastes good. So the next time you are about to grab a can of soda from your fridge, think about which is more important to you: syrupy drinks that will affect your body in horrible ways, or your health?

5322

Will Bean Seeds Grow in Polluted Water?

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I am choosing this experiment because it has a deeper meaning because there is an increasing danger that our food and water supply is becoming polluted. In this experiment I will try to germinate two types of bean seeds in environments with differing levels of a pollutant. I think that both of the two types of bean seeds used will not grow at all if they are polluted by a solution of 50% water and 50% Cascade dish detergent.

To complete this experiment you will have to follow these steps. First gather these materials: dropper, cups, Cascade container, water bottle, black-eyed pea seeds and adzuki bean seeds. Once you have these materials, grab the Cascade container, an empty glass and some water. Then pour the Cascade into the container at about halfway. Then pour in the water to fill it up all the way. To mix the solution, stir thoroughly with a spoon. Then, fill eight cups with 1 1/3 cups of water. Then put eight seeds into each cup, putting black-eyed peas in four of the cups and the adzuki sprouts in the other four. Then pick up your dropper and suck up the solution with it. Then put two drops of the solution into both sprout cups. After, put 20 drops into the next two and 50 into the next two, but leave the last ones without the solution. Then, put them where they can get direct sunlight, such as a window sill. Wait five days and then record your conclusion. The variables I am using are the different amounts of the solution applied to the different sets of seeds. The constant variable I am keeping is the amount of water they are sprouting in and the amount of light they receive.

I had performed one trial over the course of five sunny days. None of the black-eyed peas sprouted when polluted by the solution, but four of the black-eyed peas grew in the cup with pure unpolluted water. None of the sprouts grew at all when touched with more than two drops of the solution. Without the solution, in just water, four of the black-eyed peas grew significantly. However, I was surprised to find that six out of eight adzuki seeds grew significantly in five days in the cup with the two drops of the Cascade solution. In the two cups with greater amounts of Cascade, no seeds sprouted. In the cup without any Cascade solution, four adzuki seeds sprouted.

The data that I gathered told me two things. First, the black-eyed peas could not grow because of the ingredients in the Cascade. However, the adzuki seemed to be fertilized by the Cascade when exposed to only a small amount of Cascade.

This data told me that my hypothesis was half right. I was right about the black-eyed peas not being able to grow in the solution, but wrong about the adzuki. The adzuki seemed to have had its growth rate increase by the solution if it was used in a small amount. It may have been that one ingredient was good for the adzuki bean but bad for the black-eyed peas.

These results are important to other scientists because they prove that not all sprouts and plants react the same to an environmental

influence. This is important to the world because this shows that a pollutant we release might actually act as a fertilizer for some plants while being toxic for others. Although this experiment did not turn out the way I expected, I did learn something new and it might be interesting to duplicate the experiment to verify that my results would continue to come out the same.

5323

Is DG a Successful Bee Relocation System From Urban Tree Trunks?

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Bees are vital to our ecosystem, but when they get a little too close for comfort (in the tree trunks of an urban environment), is there a way to successfully relocate them? For years bee removal specialists have experimented with methods to remove bees from tree trunks. One prominent way was to simply kill off the entire bee colony with a powerful pesticide. This not only eradicated all of the bees we desperately need to pollinate our environment, it also introduced harmful toxins to all living things. The L.A. City Urban Forestry Division uses a product it calls DG. DG stands for decomposed granite, which is an all-natural nontoxic compound that keeps approximately half of the bees from tree trunk hives alive upon relocation. DG is mixed at the site of an infested tree trunk by specialists in full protective suits. The specialists place the moist mud-like mixture into the tree trunk by hand plugging the hole. Approximately half of the bee colony located outside the hive at the time of the plugging forms a swarm and then moves to a new home (hopefully a habitat where they can now live undisturbed). The question I asked about this DG procedure was: Is DG a successful bee relocation method from urban tree trunks? My hypothesis from initial discovery of DG and early brief research was yes.

To confirm my hypothesis I needed to do some research and observe at least two examples of beehives in tree trunks where DG was applied. Luckily, the weather had been warm enough and there were two beehives in trunks of city-owned sidewalk trees located within walking distance of my house. One of the beehives, Hive A, had already received DG before I started observation. The other, Hive B, received DG midway through my project. I observed the two hives over 19 days (March 10-28) at different times of the day. To supplement my in-person visual observation, I took photographs and videos. To ensure safety, I examined the hives during the day from many feet away or up close in an enclosed car. At night I was able to observe from only a few feet away as bees are docile in cool air. On the evening of day one of my project, I applied two control elements to Hive A. One was a white grate to track the DG in order to see if it changed over time in size or color and also to track the bee activity around this plug. The second control element was a temperature gauge to observe if temperature had any effect on the DG and bee activity.

From observing Hive A, which had been plugged at the start of my project, I noted the following: There were two smaller tree trunk openings. One was located at the upper right and one at the lower left of the main large opening that had been plugged. I found both smaller openings had bee activity and the temperature gauge helped me find that the activity was highest at the warmest part of the day. I figured these access points probably led to the original

hive. From my research I found that bees could not have eaten away the DG or tree trunk to access the hive, and the grate tracking confirmed no change in either DG and tree trunk. I concluded that the original application of DG did not cover enough of the trunk. The main hole was plugged but the two smaller holes were probably not noticed at the time of plugging. Therefore I feel this DG application was a partial success. I called a representative from the L.A. City Urban Forestry Division and reported my findings. The representative was interested in my observations and conclusion and as a result stated he would send specialists out to plug the two smaller openings. He was confident this would be all that would be needed to relocate the colony, as he stated they have been using this method for more than 15 years. He also stated that if this second application of DG did not work, it was possible the tree anatomy might be too complex and the hive too large, and therefore in rare cases the complete tree would need to be removed.

From observing Hive B I noted the following: First, the bees were flourishing in their home in the tree trunk. Second, the moist DG plug was placed over the tree trunk beehive opening. Third, the bees swarmed below the DG plug on the tree trunk. Fourth, the DG plug dried and hardened and the swarm moved closer to the DG plug. Lastly, the swarm positioned itself overlapping the lower part of the DG plug. It appears this was a successful DG application, as I did not see any bees entering or exiting the trunk. I noted, though, that the bees were taking a long time to leave the tree trunk and relocate. I told the representative from the L.A. City Urban Forestry Division about this observation. He informed me the bees typically relocate within a day or two but they might be taking longer in this case, as it was spring and the Carob tree they were located in was blooming and they really like the nectar from this tree. I agreed with this, but also thought the bees swarming on the tree trunk may have been hearing their fellow bees inside and did not want to leave them.

My observations, data collection, research and conclusions stated above proved my hypothesis true but not 100%. Applying DG to urban tree trunks is a successful bee relocation method if the hole is, or holes are, completely plugged. Also, it became clear that although DG takes more effort, time and therefore probably more money (sometimes two visits are needed by specialists), it is a much better, more natural relocation method than using chemicals and pesticides to kill all of the bees for quick removal and introduce more toxins into our environment. I'm glad I was able to help my local neighborhood and beehives by observing and making conclusions and sharing the information with you and the L.A. Urban Forestry Division.

5324

Can Soft Drinks Cause the Loss of Tooth Enamel?

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The reason I am performing this experiment is because when I grow up I want to be a dentist. I heard that soda could decay fallen out teeth. Therefore, I decided to do an experiment on soda causing the loss of tooth enamel. Tooth enamel is a hard white substance covering the crown of a tooth, which is mostly made out of calcium. This experiment is important to other people because it could teach them not to drink soda often because it could damage their teeth by having tooth enamel loss. I think what will happen in this experiment is that Coca-Cola will be the soda that causes the

loss of tooth enamel the most out of the other three sodas that I am using. I think this because Coca-Cola has the lowest pH at 2.52, causing it to be the most acidic soda. Even though Mountain Dew has the highest amount of sugar of 3.92 g/oz., I think having the most acid affects the tooth enamel the most.

The materials that I used in this project were 6.5 oz. of Mountain Dew, Ginger Ale and Coca-Cola; three fallen out teeth; Chinet premium plastic 10 oz. cups; and a spoon, a paper and a pencil to record data. The variable that would be changing in this experiment was the sodas. What was kept constant was the fallen out teeth. The procedure of my experiment was to first put the three different sodas in three different cups, filling them up to a little more than halfway to make 6.5 oz. of soda. There was Mountain Dew in one cup, Ginger Ale in another cup and Coca-Cola in the last cup. Next, I put one fallen out tooth in each cup and left it in there for three weeks. It was checked once a week to record it on a data table.

During the three weeks, I checked the teeth once a week. By the end of the first week, nothing had happened. After the second week, there was only a little discoloration on the fallen out teeth, except for the one that was in Coca-Cola. In that cup, fungus started growing and the tooth turned black with decalcification, causing the loss of tooth enamel, especially at the edge of the tooth. Decalcification is the loss of calcium. On the third week, there was discoloration of the tooth in the Ginger Ale, lines of discoloration on the back of the tooth in the Mountain Dew, and the same happened with the Coca-Cola one as the week before, except a little worse.

My data proved my hypothesis. Coca-Cola caused the loss of tooth enamel on fallen out teeth the most for the reasons I mentioned above. I also observed that the coloring of the soda affected the loss of tooth enamel. The two other sodas that I used for my experiment, Mountain Dew and Ginger Ale, have light colors. Mountain Dew is bright dark yellow and Ginger Ale is a gold-like color. Considering this, I noted that the teeth had to stay in the cup of the other sodas longer to cause the loss of tooth enamel.

The results are important to other scientists. My project can provide enough details for them to reproduce the experiment. Another reason is by seeing the effect of some sodas on tooth structure, scientists could try to come up with dental products that could prevent or slow down the harmful effects. One example of these products is a type of toothpaste that hardens and repairs tooth enamel. The results are important to the world to inform them that they should lower their intake of soda with high sugar and acidic content, primarily Coca-Cola, which causes the loss of tooth enamel.

5325

Does Price Matter When Purchasing Golf Clubs?

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In this experiment, I wanted to deduce whether "better-brand," more expensive clubs are really worth buying. The problem is that golf is getting very expensive. I wanted to see if the expense is really worth it. My hypothesis is that for the more advanced golfer, the expensive clubs will work better; however, for the beginning or novice golfer, the cheap and lesser-known branded clubs are more suitable.

My materials for this experiment were a Titleist AP2 712 8 iron, with a Dynamic Gold R300 steel shaft. I also used a cheaper Mizuno MX-950 8 iron, with a Mizuno Exsar IS2 graphite regular shaft. The retail price for the Titleist club is \$154. The retail price for the Mizuno is \$90. I also used a Bushnell laser rangefinder to calculate how far I hit each ball. The golf balls I used were from the Woodley Lakes driving range. The driving range was the scene for my experiment. The first thing I did was hit the driving range golf balls with the heavy Titleist golf club. I did this 15 times so I could average out any bad shots I hit. Then I did the same thing with the light Mizuno club. Finally, I gathered all of the data and made my conclusions.

I got very distinct data from hitting both clubs. The approximate average distance I hit the Titleist club was 127.5 yards. The approximate distance I got from hitting the Mizuno iron was 114.1 yards. When I hit both irons I also got very distinct differences in ball flight. The balls I hit with the Mizuno club went much higher than with the Titleist club. But even with that data, the time the ball was in the air when I hit with the Mizuno club was much longer than when I hit with the Titleist club. Another piece of data I picked up with ball flight was that I was hitting the Mizuno club much more to the right than I was with the Titleist.

By looking at all the data, most people would say that the Titleist was the better club. But that is not certainly true. You have to keep in mind that I am a well-above-average golfer. My handicap is 5 compared to the average male handicap of 16. The result is that, yes, you want to get the more expensive golf clubs if you are well above the average golfer like me, but what about the average and well-below-average golfers? I assume that because they are less experienced, they would want to use the Mizuno club first because it is easier to hit.

These results helped me deduce that my hypothesis was correct. The reason for that is because their swing speeds are much less than for a golfer like me. This means that they wouldn't have enough pace to hit the ball with the Titleist club in the air. But a player with a handicap of 10 or less should be able to hit the Titleist club with his/her higher swing speed. I learned while doing research that a faster swing speed means that when you hit the golf ball, the shaft will bend. This results in the shaft getting weaker and ultimately leads to hitting the ball shorter. I also realized that just because you hit the ball higher doesn't mean that the ball will go farther. I realized that there are a lot of variables involved in doing this experiment: wind, type of golf ball and the terrain in which the ball lands.

5326

Properties of Reflective Light

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The purpose of this experiment was to see if light gets brighter or dimmer when reflected off mirrors. I chose this experiment because the way light reflects off mirrors interested me. I thought that the light wouldn't get brighter or dimmer in lux units, but just stay the same, when reflected off mirrors.

My materials for the experiment were six 5.5 x 4.25 centimeter mirrors, four flashlights, four black paper tubes, a stand for the flashlights, one digital lux meter and a scientific notebook. I set up two rows of three mirrors, each mirror 1.524 meters apart from

the one across it, and 0.6096 meters away from the one next to it. The source (flashlights) was equidistant from the mirrors as well, and everything was angled so the light accurately hit and reflected off of each mirror. I did four trials where I tried to read a page from the notebook in front of each mirror, starting with one flashlight, adding one additional flashlight each trial, and recording how easy it was to read the page. I did four more trials the same way, but I held the lux meter in front of each mirror (the same distance every time). I recorded the lux value of the light after it reflected off the mirrors. In every trial, the number and placement of the mirrors and source were kept the same. The target object held in front of the mirror and the number of flashlights used changed each trial.

All of the data for the visual tests followed the same pattern. With just one flashlight, it was very easy to read the page in front of the first mirror. The second and third mirror lights were dimmer and the page was harder to read. By the fourth mirror, I could only read big words, and by the fifth mirror, barely any words were visible. By the light of the last mirror, the words were unintelligible. The second test with two flashlights was the same idea. By the sixth mirror, it was just squiggly lines, but it took more mirrors for the light to be extremely dim. With three flashlights, only big words were readable at the sixth mirror, but just barely, and I could read by all of the other mirrors' light. For the last tests with four flashlights, all of the words were readable by squinting at the sixth mirror. Then I used the lux meter to measure the light value. One flashlight was (in order of the mirrors, starting with the source) 158, 14, 4, 2, 1, 1, 0 lux. Two flashlights were 338, 34, 10, 5, 2, 1, 1 lux. Three flashlights were 387, 28, 9, 4, 2, 1, 1 lux. Four flashlights were 593, 56, 17, 7, 3, 2, 1 lux.

All of the data proved my hypothesis wrong. The light definitely got dimmer at the end no matter which way I measured it. The light for the visual tests kept getting dimmer, but at a slower rate every trial. When I measured with the lux meter, the lux numbers decreased at the end. No matter how big or small the light source was, the light was dimmer by the last mirror.

This information is relevant to some forms of solar energy, which use mirrors, absorption and reflection to get energy, like the 19.9-MW Gemasolar solar plant in Spain. Every time light hits a mirror, some of the light is absorbed into the mirror and the rest is reflected out. For every mirror after the source (sun), more light is lost when it is reflected out. When there are more mirrors directly in front of the source, that light could be absorbed and made into energy. Less light is lost.

5327

Will a Population of Collembola Increase If They're Fed Grapes?

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The purpose of this experiment is to explore how a population of collembola reacts to eating grapes instead of yeast. It is believed the population of collembola will increase. First, one part charcoal to nine parts plaster of Paris was placed in a container and stirred. It was poured into two petri dishes labeled control and experiment. For a few days it was allowed to dry. Water was added to the environment to moisten it for the collembola. Pieces of grapes were placed in the experiment for the collembola to eat and yeast

was added to the control. Fourteen collembola were placed in each petri dish. Then data was collected after counting the number of collembola for seven weeks. For the collembola in the control, there were 43%, and in the experiment, there were 57%. As for the eggs in the control, there were 35%, and in the experiment, there were 65%. My hypothesis was correct.

5328

Will Music Affect a Person's Hand-Eye Reaction Time?

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The purpose of this experiment is to measure reaction time, hand-eye quickness and attentiveness, with music and without. As a hypothesis it is believed music can affect hand-eye reaction time by lowering the reaction time of the test subjects, thus making the subjects catch the meter stick at a high number of centimeters. The assessor had the subjects stand near the edge of a table. The assessor released a meter stick without warning the subjects. The subjects then caught the meter stick between their thumbs and fingers. The distance the meter stick fell before being caught was recorded as data. This process was completed with each subject with and without music. Half of the subjects were started with the music and half of the subjects were started without music to make the process fair. At the end of the experiment the assessor discovered the average for the control (no music) was 17.13 cm and the average for the experiment (with music) was 27.56 cm. The hypothesis was correct; music did affect the hand-eye coordination by distracting the human mind from concentrating.

5329

Collembola and Graham Crackers

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Will a population of collembola survive if fed graham crackers for food? The purpose of this experiment is to find out if collembola can survive if they are fed graham crackers for food. It is believed that the collembola will survive if fed graham crackers for food. To begin, nine parts plaster of Paris, powdered charcoal and water were stirred in a container. It was then dropped into two petri dishes and allowed to dry. One petri dish was labeled control and the other was labeled experiment. Yeast and water were added to the petri dish labeled control and graham crackers and water were added to the petri dish labeled experiment. Nine collembola were put into both petri dishes. The experiment was repeated for a second time with 12 collembola in each petri dish and named trial 2. In the first test, 56% of the collembola were in the control, and 44% of the collembola were in the experiment. Fifty-four percent of the eggs were in the control and 46% of the eggs were in the experiment. In the second trial, 61% of the collembola were in the control and 39% were in the experiment. There were 39% of the eggs in the control, while 61% of the eggs were in the experiment. The results show that the hypothesis was correct. The collembola survived when fed graham crackers for food, although not as well as when they were fed yeast.

5330

Will a Population of Collembola Increase If They Are Fed Waffles for Food?

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The purpose of the experiment with the waffles was to prove that collembola (*Onychiuridae encarpatus*) survive by eating a human breakfast. As a hypothesis, the population of collembola will remain the same or constant if they are fed waffles for food. One part charcoal to nine parts plaster of Paris, and water, were placed in a container and stirred. Then it was poured into two petri dishes and labeled control and experiment. It was allowed to dry for a few days. Water was added to each petri dish. Pieces of waffle were added to the experiment and yeast was added to the control for the collembola to eat. Thirteen collembola were placed in each petri dish. At the end of the experiment, 17% of the collembola were counted in the experiment and no eggs. Eighty-three percent of the collembola were counted in the control and no eggs. The data then suggests my hypothesis was incorrect.

5331

Environmental Peace-Building

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I have always been interested in international peace-building and wish to seek employment with the United Nations after my graduation from college. I am hoping to be a part of UNEP (United Nations Environment Programme) and be given conflict projects in different parts of the world to resolve, utilizing our environment and its natural resources as a platform. My main goal is to use natural resources for environmental peace-building to overcome some of the extremely hard global assignments that I may get from UNEP's disaster and conflict operations. In this scientific report I will discuss some of the major conflicts among the countries of Rwanda, Uganda and the Democratic Republic of Congo (DR Congo) and how such conflicts can be mitigated and hopefully resolved through environmental peace-building.

I reviewed some of the case studies conducted by UNEP in Rwanda and DR Congo that address the notion of "from conflict to peace-building, the role of natural resources and the environment." I also researched historical facts and how conflict among these nations was created and dealt with in the past and the present.

It is hard to believe that human beings can be so evil and capable of committing such heinous crimes as documented throughout world history. In 1994, the Hutu majority in Rwanda massacred 800,000 Tutsis after blaming Tutsi leader Paul Kagame for assassination of their (Hutu) leader, President Habyarimana, on April 6, 1994. After Paul Kagame and RPF (Rwandan Patriotic Front) took over Rwanda on July 17, 1994, Hutu people had to flee to the refugee camps in the northeastern section of DR Congo to avoid being massacred by people (Tutsis) they had massacred a short time ago in Rwanda. In the meantime, Tutsi refugees who had migrated from Rwanda to Uganda in 1994 to escape the Tutsi genocide by the Hutus started their migration back to Rwanda after the Tutsi takeover of Rwanda in July 1994. The hatred between Hutus

and Tutsis is ongoing and millions of Rwandans are still displaced and are living in refugee camps in DR Congo. Innocent people are being raped and killed every day due to unresolved conflicts that relate back to problems dealing with prejudice, hatred and lack of sympathy from the world, particularly the United Nations.

Being a scientist, I have traced my hypothesis to abstract causation issues such as prejudice, hatred and lack of global sympathy, which do not seem to have clear-cut and pointed scientific resolutions. This is what makes this endeavor worthy of further investigation for me. Steps that I will recommend to resolve such global conflicts are the following: The United Nations must become a true global power and must take immediate action in emergency situations against the perpetrators of heinous crimes such as the Tutsi massacre of 1994 by the Hutus in Rwanda. If the entire world (United Nations) had spoken soon enough, this calculated genocide would have remained as an attempt, and would have fallen short of becoming a completed act. All people of the world must be treated with dignity and equality, and must be beneficiaries of the equal protection that is promulgated and targeted by the United Nations.

The Democratic Republic of Congo is a sizable country. To resolve the border conflict it is involved with its neighbor Rwanda, DR Congo can offer to provide both the Hutu and Tutsi refugees with land on the northeastern part of DR Congo. This will provide the refugees with a sense of ownership, encourage them to build their permanent homes, reduce their daily stress and stop them from pursuing their unwanted nomadic lives. In return, DR Congo can barter with Rwanda and receive natural resources that are needed by the Congolese people.

Conflict among the neighboring countries of Rwanda, Uganda and DR Congo can also be resolved by environmental pacts such as the Gorilla Pact that was signed in February 2008. The three countries agreed to cooperate on a 10-year conservation plan for the animals. Only 720 mountain gorillas remain in the wild, all of them in the misty hills of central Africa, where the three countries' borders meet. Other pacts on natural resources, especially charcoal, will keep a definite balance on production of wood and control excessive deforestation.

5332 Will a Population of *Onychiuridae encarpatus* Decrease If They Are Fed Vanilla Frosting?

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The purpose of this experiment was to see if collembola does survive by eating only vanilla frosting. As a hypothesis, it is believed that the population of collembola will decrease if fed vanilla frosting. One part charcoal to nine parts plaster of Paris and water were poured into a container and stirred. It was then poured into two petri dishes and allowed to dry for a few days. Water was added to create a moist environment for the collembola. Ten collembola were placed into each petri dish. The experiment was observed using stereomicroscopes for 12 weeks. Fifty-nine percent of the collembola were counted in the experiment and 41% of the collembola were counted in the control. My hypothesis was incorrect, as the collembola excelled eating vanilla frosting.

5333 Will Radish Seeds Germinate Faster If Grown Inside a Balloon?

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The purpose of this experiment is to determine if radish seeds will germinate faster inside a balloon instead of pots. Consumed throughout the world, radish is an important vegetable whose leaves and roots are used. The hypothesis is that radish seeds will germinate faster inside a balloon. A funnel was connected to a balloon and filled half with soil. Then 15 seeds were placed inside the balloon and soil was added to cover the seeds. Three-quarters of a cup of water was poured inside the balloon. The funnel was then disconnected and the balloon was blown up. The balloon was hung in the roof, where it received a little touch of sunlight. For the control, half a pot was filled with soil, and 15 seeds were poured inside the pot. After the seeds were covered with soil, $\frac{3}{4}$ of a cup of water was poured into the pot. For 10 weeks data was recorded. In the first experiment, 13% of the radish seeds germinated in the control and 22% of the radish seeds germinated in the experiment. In the second experiment, 11% of the radish seeds germinated in the control and 62% of the radish seeds germinated in the experiment. The results proved that my hypothesis was correct.

5334 They Grow Mold Too Fast: How Does Increased Light Affect Mold Growth on White Bread?

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We all know that bread starts molding after the expiration date. Usually, visible mold doesn't show until a week after, and that's just when we leave the bread in its original plastic covering in the fridge. Mold is a fungus. A fungus' growth is affected by light because of the heat it produces. What will happen if we increase that heat? In this experiment, we'll find out how the mold growth on white bread is affected in different controls. I observed the changes over a period of time, about two months into and past the expiration date. Those controls were no light, partial light and full light, with bread slices in a Ziploc bag. The no light control was completely covered up, while the cover of the partial light had tiny holes. The full light was completely exposed to the light. At the end of my experiment, only the full light control had grown mold. The other controls didn't. This means that the Ziploc bag used to cover the bread stunted the growth of mold.

5335**What's Cleaner, Air Inside or Air Outside?***M. Singson and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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This experiment studied the question of how much cleaner air is inside when compared to outside. Eight coffee filters were set up in different locations, four of them inside and four outside. The cleanliness of the air was based upon the amount of dust each filter collected in grams. The starting weight of the filters was first measured and recorded, after which they were left to gather dust for six days. This experiment was repeated three times. Over the three trials, the outside locations collected a total of 0.6 grams of dust. The indoor locations collected a total of 0.1 grams of dust. This suggests that the air inside is much cleaner than the air outside.

5336**Let's Bounce***M.N. Nolte and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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This project is an experiment to find out what kind of ball is the bounciest, and what factors of the different types of balls contribute to the height of their bounce. Four types of balls – a basketball, golf ball, tennis ball and baseball – were dropped from a height of one yard. There were six trials made for each ball. The height of each ball's bounce was averaged out of the six trials. Then the balls were weighed and the equation for force and work was done to figure out if that made a difference in the balls' height. Research about what each ball was made out of was also done. In the end it was the basketball that bounced the highest. Following the basketball was the golf ball, then the tennis ball, and the lowest bounce was made by the baseball. These results suggest that the basketball bounced the highest because of its balance in weight and size, along with its rubber shell.

5337**Sugar Plants***Sheila Eve Pham and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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The purpose of my science project was to see how sugar would affect my plants. I hypothesized that if you added sugar to your plants, then they would grow bigger and better than the rest. In three medium-sized pots, I planted three sprouts in each of them. I did this so I could make sure the plants were similarly affected and that the weather or something else didn't significantly have anything to do with the outcome. For Controlled Plant, it would be watered every day with nothing added into it. Plant X would be watered with one tablespoon of sugared solution once a week, while Plant Y would get it every day. Results were that the Controlled Plant appeared to be the healthiest plant compared to the others. Plant X was almost the same as Controlled, but the leaves were slightly droopy and were a shade lighter. Plant Y was very sick: very droopy, shriveled and with dirty-colored leaves. It didn't grow after a few days from the added sugar water. Insects such

as ants, bees and flies were attracted, including growth of smelly microbes like mold. To conclude, it's best not to add sugar, but just water, to your plants.

5338**Which Material Makes the Best Airplane?***Alfred Bartel and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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The purpose of this project was to determine which of these materials – wax paper, notebook paper, copy paper and construction paper – would make the best working paper airplane. Many tests were done to determine which material was the best used under different weather conditions on various days. The weather conditions were temperature, weather forecast, such as sunny, cloudy, wind speed, visibility in miles, and percentage of humidity. The tests were performed either against the wind or with the wind. The shape of the airplane played an important role in the project. There were two groups of airplanes: the original control group (general paper airplane) and the enhanced group (the original models with extra folds at the end of the airplane). This way not only the material of the plane could be judged, but also how it was made. For example, in the control group, the wax paper airplane could cover a longer distance than a copy paper airplane, but in the enhanced group, a copy paper airplane could be better than a wax paper airplane. It was my belief that copy paper is the best material for an airplane because copy paper is very smooth, and it makes the airplane very stable, because it is firm, stays in place and stays in shape – compared to wax paper, where the material gets out of shape easily because it is too light and difficult to fold. The construction paper material is too heavy, and, thus, hard to fly. The notebook paper material has binder-ring holes, which disturb the flight pattern. Therefore, copy paper would be the best material to make an airplane. The procedure was as follows: First, I had to make airplanes from four different types of paper – wax paper, notebook paper, copy paper and construction paper. Then I recorded what day it was and what the weather was. Each time I went outside with the airplanes, I used measuring tape, camera, writing utensil and paper to record data. I pulled the measuring tape up to 12 feet and placed the measuring tape on the floor. After I placed the airplanes lined up with the mark "0." I took pictures of the airplanes. I lifted the airplanes one at a time, flew them along the measuring tape and examined where they landed. When the airplanes landed I made sure that they were all facing forward. I took a picture of their positions and recorded how many centimeters each airplane flew (if airplanes flew beyond the measuring tape, I estimated how many centimeters they flew). I lifted each airplane up. I adjusted the wings so the planes would not be in the control group anymore, but in the advanced models group instead. As soon as the models had been enhanced as described above, I placed them in the starting positions, where the line on the measuring tape said 0 and the airplanes were facing forward. I took pictures of the now-enhanced airplanes, lifted each airplane up one at a time, and flew them along the measuring tape. I made sure that the airplanes were facing forward. I took pictures of the airplanes' positions. I recorded the distance that each airplane flew in centimeters in the table for the enhanced models. I released the measuring tape and picked up all of the materials brought outside. Finally, I went to my room and recorded on my computer all of the data I received from my

experiment as well as the weather conditions, which were taken from the forecast website, www.weather.com. Wax paper had the best results when tested with the wind. The reason why is because the wind carried this light material for a very long distance. Wax paper, however, had the worst results against the wind, since the wind pulled it back. The material with the best results against the wind was copy paper. Its firm and smooth body could withstand the wind the most. In this project a much unexpected conclusion was reached. Although the copy paper airplane had the best tests against the wind, the wax paper airplane had the best tests with the wind. The wax paper was the best material to make into an airplane when it was tested with the wind. The reason why was because when the tests with the wind were done, the wind carried the wax paper for a long distance. However, the wax paper showed the worst results when tested against the wind, because the wind made it go backward. The copy paper airplane had the best results when tested against the wind, because it had a firm and smooth quality and it was heavier than wax paper, which allowed it to keep its shape. Thus, the best materials to make a paper airplane with would be copy paper when tested against the wind, and wax paper when tested with the wind.

5339

How Does the Different Number of Cores in a Processor Affect the Speed of the Computer?

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This experiment is trying to figure out how the number of cores in a processor affects the speed of the computer. The hypothesis is that there will be the biggest difference in overall speed between a dual-core and a quad-core processor.

The result of the experiment was that the greatest percentage of difference was between the 6-core and the 8-core. This means that the hypothesis was incorrect. The single-core processor got an overall score of 1255. The dual-core got a score of 2090, which is an improvement of 60% over the single-core. The quad-core processor got an overall score of 3883, which was an improvement over the dual-core of 53.8%. The 6-core got a score of 5333, which was an improvement over the quad-core of 72.8%. The 8-core got an amazing score of 6450, which was higher than the 6-core by an astonishing 82.7%.

In conclusion, there was little chance that the highest percentage of speed difference would come from the two highest-performing processors, but it did. This means that the 8-core processor has the highest speed difference than the processor one step below it (6-core). This means that the computer does use the extra cores to speed it up and it is very useful to go for the extra cores.

5340

Ice Melt Rate: Does Shape or Surface Area Matter?

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Ice cubes melt because of heat transferred via conduction. Previous research states that objects with equal thickness, but unequal surface areas, will heat up at different rates. Research has also shown that the more surface area an object has, the faster it will heat up because of an increase in heat transfer. Therefore, I hypothesized that it is not the shape of an ice cube that affects how it melts, but the surface area. Specifically, the greater the surface area, the faster the ice cube will melt. I measured the surface area of ice cubes of varying shapes and volume. Then I recorded the time it took for each ice cube to melt to see if it was the shape or the surface area of the ice cube that affected melting speed. I found that ice cubes with greater surface area melted faster, even when they had the same shape.

5341

Effects of Solar Energy on Remote-Controlled Cars

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This study examined the question: Is solar energy efficient enough to power a normal RC car more efficiently than a battery-powered car? Two remote-controlled cars were purchased. The car with batteries added to it was the control and the car with the solar panel attached to it was the experiment. Batteries were placed in the control group car and it drove perfectly fine. A solar panel was attached to the car belonging to the experiment by using a soldering iron to apply the connections of the red wire to the positive battery terminal and the black wire to the negative battery terminal. The solar panel was mounted to the top of the car and batteries were placed into the experimental car remote. Both the remote's and car's power switches were turned on. The experiment car wouldn't run or move. The process was repeated many times and the same results were produced. A new solar panel with battery clamps and a new remote-controlled car were purchased. The solar panel wires were connected to a solar controller and the controller had wires with battery clamps attached to it. Those clamps were connected to the positive and negative battery terminals. The negative terminal was flat and with great difficulty the clamp was connected to it. A 9-volt alkaline battery was inserted into the remote. The buttons on the remote were pressed and the car would not work or move. After repeating the process several times, it produced the same results as the other car. The results suggest that solar energy can't power a remote-controlled car because it has special battery terminals that restrict or limit the connection between the wires and solar panels. In conclusion, the results suggest that a remote-controlled car cannot get powered through the use of a solar panel.

5342

Which Paper Airplane Proves to Be Most Effective?

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This study was about which paper airplane proved to be most effective of the five paper airplanes chosen. The five paper airplanes were thrown at a paper plate in the middle of the room to see which one could touch it and also to see which one was the closest to the plate. The experiment was done three times with each paper airplane. The next experiment was to see which paper airplane went the farthest. The paper airplanes were thrown outside, measuring which one went the farthest. This was done three times. The last experiment was to see which paper airplane had the longest glide time. The planes were thrown and timed to see which paper airplane stayed in the air the longest. After all of these experiments, they were then averaged to see which had the highest numbers and also lowest. The result of this experiment was that the "Stingray" was proven to be most effective out of the five paper airplanes chosen. During this experiment it explained the different variations of paper airplanes that vary by accuracy, curvature and design. The stunt planes are very uncontrollable, but have a great glide in the air whether the planes are twisting, turning or even making a full 360-degree turn. The accurate paper airplanes have a straight and fast flight. The accurate paper airplanes have an average glide time and are very accurate if you are aiming at a target. Paper airplanes are not very accurate, but they are able to curve to the left or right. Oftentimes, the paper airplanes with curvature can be aimed knowing where and when the planes will curve. From the results that I discovered, the Stingray was the definite winner because the Stingray was able to touch the plate multiple times. It was also able to achieve the longest distance, as well as one of the longest glide times.

5343

Free Throws: Does Noise Matter?

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I chose this experiment because I have always wondered why the crowd goes silent when a basketball player shoots a free throw. With this experiment I will be answering whether it really affects the player's chance at scoring the free throw if there is noise or silence. This experiment is important to every single basketball player out there who shoots free throws. It is also important to the crowds at the basketball games who make a bunch of noise because they want the player to miss. In this experiment I think I will find out that you don't need silence for concentration. My hypothesis for this experiment is that it does not matter whether the crowd makes noise or not. For example, when a player shoots a free throw, the crowd for the opposite team makes a bunch of noise in hopes that the player shooting will miss. My experiment will answer whether it really matters if the crowd makes noise or not.

The materials that I used to complete this experiment were the GameMaster 2600G Junior Orange Rubber Basketball, Balboa Park's outside basketball court, Balboa Park's basketball hoop, paper, pen and my younger brother. My constant variables are the

25 free throws that I am shooting for each scenario and the 13 feet and 9 inches of distance that I am shooting from the free throw line to the basket. My changing variable is the noise vs. silence situation. To do this experiment you have to find a basketball court whose free throw line is 13 feet and 9 inches away from the basket. Then, start with the silence scenario. To do the silence scenario you have to shoot the ball 13 feet and 9 inches away using nothing but concentration. Every shot that you take you have to record whether you missed or you made it. Once you have finished shooting 25 baskets without any noise and recording every shot, you move onto the noisy scenario. To do the noisy scenario you need to have a person next to you who will try to break your concentration. That person will have to keep on talking and screaming, just like a normal crowd would. After every shot that you take, you will have to record whether you missed or made it. After you are done recording the 25 shots you took in the noisy scenario and the silence scenario, you are done!

I compared the two different scenarios, noise vs. silence. I recorded 25 shots for each scenario, for a total of 50 shots in all. For the silence scenario, I missed 18 shots and made 7 shots. For the noisy scenario, I missed 23 shots and made 2 shots. The data I collected proved my hypothesis wrong. I thought that noise would not affect making the free throw. My data tells me that noise does affect your chances of making the basket. Therefore, my data does not prove my hypothesis.

The results that I collected are important to scientists because this experiment not only relates to basketball, but also relates to everything that includes concentration. My experiment allows people to now know that noise does affect concentration. Concentration in my experiment was changed to a basketball shot. Now scientists will know that concentration is the key. My results are also important to the world because people use concentration every day. So when someone says, "Leave me alone I'm trying to concentrate," it means that you are affecting his/her concentration. Therefore, if he/she doesn't concentrate, he/she can make a mistake. Most importantly, my experiment will help basketball players and crowds all over the world. It will help the player shooting because now the crowd will go silent when he shoots the free throw. It will help the crowd because now they know to be silent so their favorite team's player can make the free throw shot.

5344

Ball Rolling Distance on Turf vs. Grass

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Will a ball travel farther on a grass field or on a turf field? This experiment's results could be useful to sports players, sports teams and fans of sports, since how far a ball can travel can greatly affect the results of a game. Knowing the distance a ball may travel could affect team member lineups, strategies and their odds of success. We often see sports that are played on different turf fields, including very popular sports like soccer, baseball and football. These are highly competitive sports with much at stake to the professionals and even the viewing public. Knowing the distance of ball travel can affect a team's chances of winning or losing. For example, if a baseball team knows a baseball travels farther on a turf field over a grass field and the game is on a turf field, then the lineup may include a fast-running player with weaker hitting

skills. If a ball travels differently on one field vs. another, then it could give an advantage to one team and therefore change the entire game. I believe the ball will always roll farther on a turf field regardless of ball type, because it is consistent in height, texture and harder than grass.

I used two straight and sanded pieces (each 5.1 cm x 10.2 cm x 3.048 m) of wood that were nailed together to form a "V" shape for the ball to travel down. The wood was raised on one end and placed on a medal stand, resulting in one end of the wood being 76.2 cm off the ground and the remaining piece touching the ground. I then used five different ball types (soccer, baseball, golf, lacrosse and softball) that I rolled down the wood from the highest point to the lowest point a total of five times for each ball on each field. After reaching the lowest point, the balls rolled onto the test field of turf or grass. I used these types of balls because they are from sports that could be played on either field type and are of different sizes. Lastly, I used a tape measure to measure the length the balls rolled on the test surfaces. After the five rolls, I averaged the number of millimeters each ball rolled and compared the averages for each field type. The only change was the surface type. Variables that could have affected the results over which I did not have sufficient control were the quality of the grass field (i.e., different heights of grass), moisture on the surfaces, wind, flatness of each field, quality/age of the turf (I used a new turf field), consistency of friction on the balls from the wood surface, and if the surfaces were the same as used in real-life sports.

After rolling each ball five times on each field, I collected five length metric measurements. Given five balls, there were 25 measurements collected for each field, resulting in a total of 50 ball rolls/measurements. For all of the data that was collected on each different ball, on each different field, my data showed very similar results with each ball roll. I averaged the lengths of the ball rolls. Results of each ball demonstrated the following balls went farther on grass than turf: baseball 17% and lacrosse ball 28%. The results also demonstrated the following balls went farther on artificial turf than grass: soccer ball 12%, golf ball 10% and softball 13%.

From the experiment I conducted, I was able to conclude many things. To begin with, there was a significant and consistent difference in ball roll length on each different type of field. The differences were dependent on the ball type. The smallest balls (lacrosse and baseball, except for golf) went farthest on the grass field, while the largest balls (soccer and softball) went farthest on the turf field. When analyzing the results, I discovered that the size might not be the reason for going the farthest, but instead might be due to the ball's mass. For example, the lacrosse ball, which weighs the heaviest for its size, had the largest roll variance at 28% farther on grass over turf. The soccer ball, which weighs the least for its size, rolled 12% more on turf than grass, similar to the 13% of the softball. Similar results were shown for all of the balls when referring to their mass.

The experiment I conducted could help many people in different ways. It would begin with helping scientists because they would be able to see what kinds of fields work the best with different sports balls. They could then use the information to create a newer, better kind of field that would be relevant to all different types of sports. Most of all, the results of my experiment are important to people all around the world. It gives sports fans the chance to understand why a certain play in a game may happen. They could understand more details about sports and how they are played on the different

fields, and altogether be more involved with the sports. This experiment is also very important for athletes and teams' coaches, as they may use different play strategies based on different field types.

5345

Maintain Your Skin's Health

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The purpose of my abstract is to find out how not removing makeup affects the skin. Many men and women wear makeup without knowing the dangerous effects it has if it is not properly removed. Also, skin is a living organ that constantly needs to breathe. It will consume just about anything that comes in contact with it. Makeup contains many toxic chemicals that carry the risk of premature aging, cancer, acne and discoloration of skin. I chose this experiment to prove that taking care of your skin is obligatory. Not removing your makeup properly can cause many harmful diseases. My educated guess toward this experiment is that the "fake skin" will dry up and develop wrinkles.

In this experiment you will create two pieces of "fake skin" to test the makeup on. One piece will be left untouched and the other will have the makeup. The materials you will need are makeup sponges, foundation, a ruler, scissors and liquid latex for building a prosthetic. The brand of the liquid latex is Forum Novelties Inc. To conduct this experiment you must have a hard surface to start building your prosthetic. First, you must apply liquid latex on your makeup sponge and dab it on the hard, smooth surface. Wait until it dries and apply another layer the same way. Keep doing this until you have about six or seven layers of the liquid latex. Once the liquid latex is completely dry, take the scissors and carefully scrape off the "fake skin." Be extremely cautious with the scissors to not cut any of the skin. Then, with your ruler, measure the length and width of the two pieces of liquid latex that you made. Now, use a clean makeup sponge to apply the foundation on the prosthetic. As the foundation, I used Almay's TLC (truly lasting color) naked 03 160. Wait a day and reapply the foundation at around the same time that you put it on when you started the experiment. Keep doing this for four days and record your results of the texture and size of each prosthetic.

The data of my experiment was different each day. The first day of the experiment I noticed that the piece of skin with the makeup on it had curled up on the edges, while the untouched piece of skin remained the same. The second day the untouched piece was tightening up a bit and the piece with makeup curled up a little bit more. During the third day, the texture of the pieces seemed to change. The one without makeup was a little more smooth than sticky, and the piece with makeup felt dry around the edges. Also, on the third day when the makeup was applied, it took longer for it to dry. Plus, the piece with makeup scrunched up a bit. The results of my experiment were that both pieces scrunched up and curled up a little bit. But the difference was that the texture of the curled up parts on the untouched piece were smoother than on the piece with makeup. The data disproved my hypothesis. Yes, the ends did dry a little, but there were no wrinkles. I believe that the experiment did not prove my hypothesis because the skin was not authentic. The fake skin did not have pores and it didn't consume oxygen like real skin.

The results that I recorded are relevant to scientists because the "fake skin" showed that not removing the makeup causes the ends to dry up. I deem that scientists should be conducting experiments similar to mine to find makeup that is organic and helpful to skin. Also, they should try to remove all of the toxic chemicals to try and make the makeup a benefit to skin. I believe that if this experiment was conducted on real skin for a month, the skin would definitely dry up and have wrinkles and acne. My results are significant to the world because many people wear makeup. My results showed that the fake skin with makeup was not as smooth as the untouched piece. If people do not remove their makeup properly, their faces will dry up. Also, it will clog their pores with bacteria and toxic chemicals, risking cancer, premature aging, acne and discoloration of skin. Taking care of their skin by moisturizing and washing off their makeup will prevent these types of harmful results.

5346**Salty Ice Cubes**

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The purpose of this experiment was to see which would melt slower: a regular ice cube or an ice cube made of water and salt. I heard that if you put salt over an ice cube, it makes the ice cube even colder. For this reason, I think that an ice cube that has the salt frozen into it will melt slower than an ice cube made of only water.

The experiment required the following materials: $\frac{3}{4}$ of a teaspoon of Morton iodized salt, one silicone ice cube tray (mine was purchased at IKEA), two teaspoons of tap water and a freezer set to 1°F . Two ice cube molds were each filled with two teaspoons of water. The only difference between them (the variable) was that one of the two water-filled molds also contained $\frac{3}{4}$ teaspoons of salt. Care was taken to make sure that no water spilled in the process. The ice cube tray was then placed in the freezer over two nights.

After 48 hours, the two ice cubes had a completely different appearance. The ice cube with only water was frozen solid and the one with salt was still liquid but foggy looking.

These results did not answer the question of which ice cube would melt slower. The saltwater cube never froze. Confused, I did more research and discovered that salt lowers the freezing temperature of water. That is why my ice cube with saltwater never froze in my freezer. The experiment was conducted twice and provided the same results both times. My hypothesis was not proven correct, but was also not incorrect. I actually found the answer to a different question: Does saltwater freeze at the same temperature as tap water?

In conclusion, the results of this experiment can be useful to many people, including scientists. For safety purposes, people who live in very cold climates can (and often do) use salt on their driveways to help prevent snow and rain from turning into slippery ice. Additionally, because water with a high level of salt freezes at a very low temperature, it protects sea animals from dying and losing their habitat. Some follow-up questions to this experiment might be:
1) How does the amount of salt affect the freezing point of water?
and 2) How does salt affect boiling water?

5347**Effects of Light and Heat Concentrated on Fibers**

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The intention of this experiment was about the power of light being directed at an object through a magnifying glass, and observing the damage. Three experiments were conducted to see if a piece of string could be cut by concentrating light. The first two involved a white piece of thread being suspended from the inside of a jar. In the first experiment, light was projected from a 300-watt lamp. No success. In the second experiment, the light source was the sun at high noon. There was no success using the thread and jar. In the third experiment, the thread was replaced with a thick polymer string, and the jar was excluded from the experiment. The string split within two minutes of light concentration.

5348**Effects Music Has on the Heart**

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This experiment helped examine the results different types of music have on the heart. The types of music used for conducting this experiment were rock, classical, pop, country and R&B. The participants were seated and given a pair of earphones with a ready-to-go list of the different songs they needed to listen to. I took their resting BPM to help see the effect of the different types of music on the heart. I put my fingers on their wrists, and counted the number of beats for 15 seconds. After, I multiplied it by four to find their beats per minute after each song. I repeated this six times, for rest, rock, classical, pop, country and R&B. The results suggested that rock and pop had the biggest influence on the heart, while classical had the least. It was actually slowing down the heart rate.

5349**Floating Eggs in Water Using Salt**

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This experiment covered the question of the differences in salinity levels to make different states of the egg float. First, I got six eggs – two were raw, two were boiled and peeled, and two were boiled and unpeeled – and I dropped each into half a liter of water in a container. Then I added salt to the containers one tablespoon at a time. However many tablespoons it took to make the egg float was the number recorded. My results were as follows: The raw egg and the boiled and unpeeled egg both required 12 tablespoons of salt in order to float, and the boiled and peeled egg required $7\frac{1}{2}$ tablespoons to float. This experiment proved that my hypothesis was incorrect. I predicted the raw egg would require the least amount of salt. However, the boiled and peeled egg required the least amount of salt. This happened because the raw egg and the boiled and unpeeled egg had the same volume and the same mass, giving them the same density. However, having the shell peeled off gave

the boiled and peeled egg less mass and less density. All in all, the results showed the boiled and peeled egg required the least amount of salt to float in half a liter of water.

5350

Effects of Using Functions in Code on the Time the Code Takes to Be Executed

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This experiment tested if “grouping” code into functions affects the time that the code takes to run. The code was run 10 times with functions and 10 times without functions, and the results were recorded. The average times that the code took to run were about the same, regardless of whether functions were used. The results suggest that using functions in code does not affect the time that the code takes to be executed by the computer.

5351

Hair Strands

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This study examined different hair strength according to the age of the strand it was from. Different hair strands were tied to an end of a pencil at a height of 18 inches. Pennies were weighed by attaching them to the other end of the strand with tape. This was done to record their breaking point and compare with the different age groups. This was repeated nine times, but with different strands. The average breaking point for the 10-year-old group showed to be 76.66 grams, while the 70s age group showed to be 78.33 grams. The hair strands in the 30s age group showed to be stronger than the ones in the 10s and 70s group, with a breaking point of 92.5 grams.

5352

Collembola vs. Oreo Cookies: Will a Population of Collembola Increase If Oreos Are Added to Their Food Source?

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The purpose of this experiment is to determine if a population of collembola increases if crushed Oreo cookies are added to their diet of yeast. Collembola are described as small hexapods that have a springtail (furcula). They live in soil and feed on soil fungi. It was hypothesized that the number of collembola would increase if crushed Oreo cookies were added to their food source of yeast. The procedure involved adding one part charcoal to plaster of Paris, and stirring in water in a small container. The liquid was poured into two petri dishes and they were left to dry until they were solid. Both petri dishes were watered, with one labeled control and one labeled experiment. Yeast was placed into both petri dishes and crushed Oreos were placed into the experiment. Ten collembola were placed in each petri dish. Data was collected by

using stereomicroscopes and counting the number of collembola and the number of collembola eggs in each petri dish. After eight weeks, 28% of the collembola were counted in the control and 71% of the collembola were counted in the experiment. Twelve and one-half percent of the collembola eggs were counted in the control and 87.5% of the collembola eggs were in the experiment. The evidence suggests that adding Oreos to the collembola's diet helps increase the population rate, although more tests should be performed.

5353

Will the Population of Collembola Increase If They Are Fed Doritos?

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The purpose of this experiment is to determine if the population of collembola (*Onychiuridae encarpatus*) will increase if they are fed Doritos. Collembola are tiny hexapods that are commonly called springtails. *Onychiuridae encarpatus* is a blind collembola. As a hypothesis, it was determined that the population of collembola would decrease if fed Doritos. I took one part charcoal to nine parts plaster of Paris and added water and stirred. It was poured into two petri dishes and allowed to dry for a few days. Water was added to moisten the environment, and Doritos were added to one petri dish and yeast to the other for the collembola to eat. Ten collembola were placed into each petri dish. For about two months data was collected by counting the live collembola in each petri dish. Thirty-three and one-third percent of the collembola were counted in the control and 66.6% of the collembola were counted in the experiment. These results show that there was a large increase in collembola in the experiment. This suggests that my hypothesis was incorrect.

5354

Which Containers Can Block Ultraviolet Light?

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The study was done to explore what materials will block ultraviolet light. As a hypothesis it was determined that the prescription bottle will block the most ultraviolet light. To begin the procedure, two ultraviolet-sensitive beads were placed in each container. The containers were placed in direct sunlight and a timer was set for two minutes. When the timer went off the beads were checked for color. This determined if UV light passed through the container or not. The experiment was done five times each with a water bottle, prescription bottle, clear glass bottle, colored glass bottle and a Gatorade bottle. The water bottle and clear glass bottle blocked the UV light 0% of the time. The prescription bottle and colored glass bottle blocked the UV light 100% of the time, and the Gatorade bottle blocked the UV light 40% of the time. The prescription bottle and the colored glass bottle were the containers that blocked the UV light. The Gatorade bottle also blocked the UV light once. The data suggest that my hypothesis was correct, as the prescription bottle and the colored glass bottle did block the UV light.

5355

Will a Population of Collembola Increase If They Are Fed Goldfish Crackers?

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The purpose of this experiment was to determine if collembola would increase if they were fed Goldfish crackers. As a hypothesis it was determined that the population of collembola would remain constant. Collembola are tiny arthropods that use a special jumping organ called a springtail when frightened. They can be found in dirt or sometimes at the seashore. One part charcoal to nine parts plaster of Paris were added to water and stirred. It was allowed to dry. Water was added again to moisten the environment and then Goldfish crackers were added for the collembola to eat. For the control part of the experiment, yeast was added for the collembola to eat. Twenty-four collembola were added in each petri dish. After 20 weeks, 87% of the collembola and 20% of the collembola eggs were counted in the experiment. Thirteen percent of collembola and 0% of collembola eggs were counted in the control. The hypothesis was incorrect because the collembola thrived being fed Goldfish crackers.

5356

Will a Population of Collembola Increase If They Are Fed Cheetos for Food?

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The purpose of this experiment is to determine if a population of collembola will increase if they are fed Cheetos for food. Collembola, commonly called springtails, are microscopic invertebrates. As a hypothesis, it was determined the population of collembola would increase if fed Cheetos for food. One part powdered charcoal was added to nine parts plaster of Paris, to which was added water. It was stirred, poured into 10 petri dishes and allowed to dry for a couple of days. The petri dishes were moistened with water and yeast was added to the control for the collembola to eat. Cheetos were added to the experiment for the collembola to eat. Equal numbers of collembola were added to the petri dishes in the control and the petri dishes in the experiment. Data was collected by counting the live collembola and collembola eggs. Collembola were observed and data was collected for five weeks by using stereomicroscopes and magnifying glasses. Fifty-one percent of the collembola and 54% of the collembola eggs were counted in the experiment. Forty-eight percent of the collembola and 46% of the collembola eggs were counted in the control. These results showed a slight increase in the experiment. This suggests my hypothesis was correct.

5357

Adaptations of the Polar Bear

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It has always been a mystery for us as to how some animal and plant species survive in freezing temperatures of the Arctic and Antarctic ecosystems. Animal and plant cells are composed mostly of water and it is a scientific fact that water freezes at 0 degrees Celsius – the freezing/melting point of water. Temperatures can reach as low as -50 degrees and -89 degrees Celsius in the Arctic and Antarctic regions, respectively, during winter. Therefore animals in Arctic and Antarctic ecosystems must have special adaptations that will help them survive in these extremely cold and intolerable ecosystems. In this submission we will discuss adaptations of the polar bear in the Arctic ecosystem.

We were very fortunate to receive a small sample of polar bear fur from the Los Angeles Zoo to carry out our investigation. We also researched several scientific journals, including the *National Geographic Magazine*, for details on polar bear adaptations to below-freezing temperatures in the Arctic ecosystem.

The results were most amazing and enlightening. Polar bears have small ears and tails to minimize heat loss. They have a fat (blubber) layer under their skin that can get as thick as 11 centimeters. They have a thick black skin under the fur that protects them from heat loss and helps them absorb solar radiation. They have thick hollow fur that is transparent and can trap air.

In conclusion, we discovered that polar bears are warm-blooded animals and keep their body temperatures constant at about 37 degrees Celsius. Polar bears are so equipped against heat loss that they are actually prone to overheating if they walk fast and for long periods of time. They often swim after having physical activities so they can cool their body temperature back to 37 degrees Celsius.

Excess heat is released from the body through areas where fur is absent or blood vessels are close to the skin. These areas include ears, tail, muzzle, nose, footpads and a few other areas. Smaller ears and tails provide smaller surface areas for body heat to escape from. Polar bears have body fat (blubber) that can reach 11 centimeters in thickness. Fat is an organic insulator and is composed of the elements of carbon, hydrogen and oxygen that are classified as nonmetals in the periodic table. Nonmetals are not good conductors of heat and electricity and therefore stop efflux of heat from the body, and influx of cold to the body, maintaining thermal homeostasis in polar bears.

The thick black skin under the fur is a physical barrier to heat loss from the bodies of polar bears. The black color of the skin also helps absorb the full spectrum of visible light from the sun's electromagnetic spectrum and keeps polar bears warm. The thick and transparent fur of polar bears consists of hairs that are transparent hollow tubes that are filled with air. The trapped air in the shaft of the long hollow tubes warms up from polar bears' body heat and keeps the animals warm at all times. All of these magnificent adaptations help polar bears survive in the Arctic ecosystem.

5358

How Will the Size of a Glider's Wingspan Affect How Far It Can Fly?

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The purpose of this experiment is to determine if the length of a glider's wingspan affects how far it can fly. It was decided as a hypothesis that a glider with a longer wingspan will fly a farther distance. Three balsa wood gliders were bought from an arts and crafts store: one with a 27-cm wingspan, another with a wingspan of 33 cm, and the last with a wingspan of 38 cm. Each glider was thrown the same way 20 times each. A tape measure was used to measure how far each glider flew in inches and the data was recorded. Later the data was converted from inches to meters. The glider with a 27-cm wingspan flew an average of 6.67 meters. The glider with a 33-cm wingspan flew an average of 7.18 meters. The glider with the longest wingspan flew the farthest, with an average of 11.93 meters. My hypothesis turned out to be correct.

5359

The Plant Race

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Which seeds will germinate faster if treated equally: the Roma tomato, jalapeño pepper or Lisbon Onion? The purpose of this project is to learn more about plants by studying seed germination. The hypothesis is that all of the seeds will germinate the same if treated equally. First, 25 seeds of each kind were planted in two pots with organic soil. They were watered and then placed outside during the day and brought inside at night. Of the tomato seeds, 23 seeds germinated in 46 days; of the Lisbon Onion seeds, 24 seeds germinated in 46 days; and of the jalapeño pepper seeds, 25 germinated in 45 days. The hypothesis turned out correct. The plants did not exactly germinate the same, but the rate and time were almost the same by a day.

5360

Evaporation of Two Different Mixtures of Water

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The purpose of this study was to see if sugar or baking soda is more soluble than the other because if it is more soluble, then it will not evaporate as quickly with the sunlight. This was simply done by filling two cups with equal amounts of water and adding a tablespoon of sugar to one cup and of baking soda to the other cup. After we mixed each cup, we took the cups outside and let them sit there for five days with the sunlight. We checked the amount of water every day and brought the cups inside when the sun went down and put them back outside in the sunlight when the sun rose. After the five days, we brought them both in and measured the amount of water left in each cup. The results were that the water mixed with sugar evaporated more than the water mixed with baking soda. From this, we can conclude that if the substance added to the water is less soluble, then it will evaporate faster.

5361

Glider Flight

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The purpose of this experiment was to determine if a glider would fly farther with weight on its wings than a glider without weight on its wings. As a hypothesis it was believed that the glider would fly farther with weight on its wings, because the weight would help to stabilize the glider in flight. The glider was made out of foam, 12.5 cm long with a wingspan of 12 cm. A handheld rubber band launcher was stretched to the same distance and angle for each flight of the glider. A penny was attached to both of the wings of the foam airplane with Scotch Tape during the experiment. The experiment and the control were tested eight different times on three different days. The average distance the experiment flew was 127.54 cm. The average distance the control flew was 213.75 cm. The hypothesis was incorrect, as the foam airplane flew farther without the penny attached to the wings.

5362

Electromagnets

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Will an electromagnet pick up more paper clips depending on the times the wire is coiled around the nail? The purpose of the experiment is to find out whether an electromagnet has more power when the wire is coiled more or fewer times around a nail. It is believed that the electromagnet will pick up more paper clips if the wire is coiled more times around the nail. The electromagnet was built by taking the insulated wire and coiling it around the nail. Then the ends of the wire were slipped under the rubber band on the positive and negative sides of the battery. Second, paper clips were left on the table in a pile. Third, the nail was placed into a pile of paper clips to pick them up (each magnet was tested three times). Finally, all of the results of the experiment were recorded. All of the scores were averaged and the results were 1% for the 5 coils (2/200 paper clips), 3% for the 10 coils (7/200 paper clips), 9% for the 20 coils (18/200 paper clips), and 14% for the 30 coils (29/200 paper clips). These results show my hypothesis was correct.

5363

Which Resource, Sand or Soil, Will Make Plants Grow Taller?

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The purpose of the experiment is to see if sand is suitable to grow plants in. As a hypothesis, it is believed that soil will grow the tallest plants. Arugula lettuce seeds were used during this experiment and did not do well when the climate started to fluctuate. Soil was placed into one pot out of a total of two pots. Sand was then placed into the other pot. Twenty-four seeds were planted in each pot. They were both watered daily and data was collected. At the end of two and one-half weeks, the control (soil) had a 3-cm average height, while the experiment (sand) had an average of 1 cm in

height. So the plants grew taller in the soil. In the soil 90% of the seeds germinated and in the sand 74% of the plants germinated. The hypothesis was correct.

5364 Which Seed Will Germinate Faster?

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The purpose of the experiment was to determine if sunflower seeds or coneflower seeds germinate faster. As a hypothesis, it was decided that the sunflower seeds would germinate faster. Soil was placed in 12 miniature pots. Six of the pots were labeled sunflower and six were labeled coneflower. Two sunflower seeds were planted in each of the six pots and two coneflower seeds were planted in each of the other six pots. The plants were placed in a sunny location and watered every two days. At the end of two weeks, 100% of the sunflower seeds germinated and 91% of the coneflower seeds germinated. The sunflower seeds started to germinate on the third day and stopped on the ninth day. The coneflower seeds started to germinate on the sixth day and stopped on the 13th day. Most of the sunflower seeds did indeed germinate first, so the hypothesis was correct.

5365 Heavy Metal or Classical?

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This study examined whether or not music affects memorization skills. Subjects were given a list of 30 random words and 1 minute to memorize as many as they could. Subjects experienced different conditions when memorizing words. There were six subjects per condition: six listening to no music (control), six listening to classical music and six listening to heavy metal. When the minute was up, the list was taken away, and the subjects received a blank paper. The subjects were given 5 minutes to write down as many words as they could remember. The average number of words memorized when listening to no music was 14/30. The average number of words memorized when listening to classical music was 16/30. The average number of words memorized when listening to heavy metal music was 11/30. The results show that the subjects memorized the most words when listening to classical music and that music does affect memorization skills.

5366 Salty Science

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This study examined how much salt it would take for an object to float. Four containers were filled with two cups of distilled water, and a paper clip, half of an apple and a whole raw egg were put into each. Two tablespoons of salt were added to each container in increments and were mixed. The measurement of the height of each object was taken and recorded in relation to how much salt

there was at the time in the containers, as well as how much the object rose from the addition of salt. Salt was added until there were 10 tablespoons of salt in each container. The paper clip never floated in this experiment, but the egg rose 7 centimeters and the half apple rose 8 ½ centimeters after 10 tablespoons of salt. The results suggest that any object will float within fully saturated water, as long as the relative density of the object is less than that of the saturated water.

5367 Do Rectangular Sails or Triangular Sails Move a Boat Faster?

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This experiment was put together to see whether the commonly used triangular sail works better than a rectangular sail. The sails were built with the same area (144 cm^2) and were both tested on the same boat on the same day. That made sure both the weather and the weight of the boat were constant. The sails were tested on the time they took to get to a finish line that was made out of rope. Both sails were tested 11 times and both sails came up with very similar results. The average time of the rectangular sail was 9.71 seconds and the average time of the triangular sail was 9.47 seconds. Although the sails had almost identical times, the triangular sail was a lot easier to maneuver and use than the rectangular sail.

5368 Does Music Affect Your Test-Taking Skills?

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In this project, I looked to see if different genres of music affected how people scored on tests. I got 12 of my peers and gave them a test I made to test them on four subjects: science, English, history and math. I gave them a certain type of music (classical, hip hop or rock) or no music at all for 2 minutes, and saw how they scored on the test. In the end, the results were all pretty much the same for all of the music types. The only one that did seem to have an effect was rock, and I believe that happened because rock has a lot of different sounds going at different pitches really quickly. Other than that, the results for all of the different types of music were the same.

5369 Solution Conductivity

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The purpose of this experiment was to test which solution conducted the most electricity and why. The different solutions that I used were tap water and salt, tap water, tap water and sugar, vinegar, and tap water and soap. The first step was building a device that could measure how much electricity each solution conducted. I got a wooden block and then drilled three nails into it. After, I coiled the LED light around two of the nails. Then I coiled an

AC adapter around one nail, with an LED light and the other end to the nail without the LED light. I then coiled audio cable to one nail, with the LED light and the other end to the nail without the LED light. The second step after the device was built was to plug the AC adapter into a socket. The third step was to put the audio cable into each solution and then place a voltmeter onto two nails to measure the number of volts in each solution. The result was that tap water and salt conducted the most electricity because it had the most ions.

5370 Different Ways to Cook Cookies

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For my science fair project I decided to try to cook cookies with different environments as opposed to just baking them. I used all of the same cookie dough and the same amounts of that cookie dough for all of the cookies, so that the only variation among the cookies was the place they were cooked. I made them in the oven, microwave, toaster and the BBQ. The conclusion I came to was that people always eat their cookies from the oven so they like them done in a different and new way. I had 15 people try the four types of cookies and the ones made in the BBQ were found to taste the best as well as look the best. It turns out that trying new things actually does pay off!

5371 Mechanics and Evolution of Hummingbird Flight

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I have been observing hummingbirds in my backyard for some time and cannot help but wonder about the beauty, strength and the intriguing flight pattern of these amazing birds. I have noticed that hummingbirds can fly in all four directions and can hover like helicopters to suck nectar from flowers that they feed upon. Hummingbirds' flight resembles that of insects more so than of birds. I have been under the impression that insects are the only animals that can fly in all four directions and hover steadily in midair like helicopters. My current investigation will shed more light on the flight pattern of hummingbirds.

I researched hummingbirds in encyclopedias and scientific journals such as *Nature* and *Science Daily*. I read some of the research done by Dr. D.R. Warrick, a zoologist at Oregon State University. Scientists are extremely interested in the convergent evolution of hummingbirds and insects. How could two groups of animals so distantly related obtain similar feeding and flying characteristics through natural selection?

Hummingbirds are very small animals that belong to Class Aves, which includes all birds. They are 5 to 13 centimeters in length and 2 to 20 grams in body weight. Hummingbirds spend 10 to 15 percent of their time feeding, and spend the rest sitting, perching and digesting food. Their heart rate can reach as high as 1,260 beats per minute. They are nectarivores and insectivores and can consume food up to 12 times their body mass. Hummingbirds have very strong wings and their wings beat at 10 to 100 beats per sec-

ond. Birds, in general, produce 100 percent of their weight support (lift) during downstrokes. Insects generate 50 percent of their lift during downstrokes and 50 percent of their lift during upstrokes. Hummingbirds produce 75 percent of their lift during downstrokes and 25 percent of their lift during upstrokes.

In conclusion, hovering capability has evolved only four times in nectar feeders (nectarivores): in hummingbirds (birds), certain bats (mammals) and in hoverflies and sphingids (insects). Sphingids are also known as hawk moths and are often mistaken for hummingbirds. Birds, mammals and insects all belong to the animal kingdom, but are very distantly related. All three animal groups, through convergent evolution, had to develop hovering capability using analogous body parts to extract nectar from flowers.

Analogous body parts refer to body parts that evolve separately and independently and can be structurally different, yet serve the same function. Wings of hummingbirds, certain bats and some insects are structurally different, yet they serve the same function, which is hovering. Structurally, hummingbird wings are flight adaptations of forelimbs with feathers attached to the carpus (wrist) and ulna bones of the wings. Bat wings are also modified tetrapod forelimbs with a thin membrane (patagium) extending between the hand and the body and between the elongated finger bones. Insect wings are membranes that are supported by a system of veins. It is hard to trace the origin of insect wings due to lack of fossil records. The three main theories on the origins of insect flight are that wings developed from paranotal lobes, that wings are extensions of the thoracic terga, and that wings may be modifications of movable abdominal gills. Other adaptations of hummingbirds that make them such amazing long-distance flying machines are their wings with short and light humerus bones, wing feathers that are light and stiff, strong and massive pectoral (chest) muscles and a large heart-to-body ratio.

5372 Cell Phones: Communication Aid or Car Accident Waiting to Happen?

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The project conducted here was to test people's reflexes while they're on the phone and off the phone and to compare the results. This is very important because there is a law about talking on the phone and driving and this experiment fully supports the law and gives proof as to why it is so helpful. The point was to test people's reflexes while they were on the phone and then while they were off the phone, and then to compare. First, objects were thrown at a subject who was talking on the phone. The subject either reacted to the object or didn't, and the results were recorded. The same procedures were taken while the subject was off the phone. After running the experiment using four different objects, the results clearly showed that people have better reflexes while not talking on the phone. The results were obvious. While off the phone the subject reacted to three out of the four objects, or 75 percent, and while on the phone the subject only reacted to one of the four items, or 25 percent. The results clearly show that talking on the cell phone lowers your reflexes.

5373

Are Copper Pennies Really Copper?

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We have been fascinated by so many different types and colors of pennies that we had to ask ourselves if there was a scientific reason behind making different types of pennies. We had to investigate the history of pennies and come up with hypotheses as to why our government would manufacture pennies using different elements and alloys.

We investigated the history of pennies and discovered that pennies were 95% copper and 5% zinc from 1864 to 1982. Since 1982, pennies have been manufactured as alloys containing 97.5% zinc and 2.5% copper. We selected 15 pre-1982 pennies and 15 post-1982 pennies as our two subgroups. We measured the mass and volume of the 15 pennies in each subgroup, repeating the experiment five times for each subgroup. We used an Ohaus Scout Pro Digital Scale to measure mass, and 100-milliliter clear graduated cylinders to measure the volume of the pennies. We then divided the experimental mass numbers by their respective volumes and obtained five experimental densities for each subgroup. We averaged the density values for each subgroup and compared the two average densities to the two theoretical densities that we calculated using our periodic table of elements. We then tested to see if the disparity between our theoretical and experimental density values for our two subgroups had statistical significance at 95% and 99% confidence levels.

The theoretical value for the density of pennies manufactured prior to 1982 was obtained using the following equation: $0.95(8.96) + 0.05(7.13) = 8.87$. In the periodic table of elements, the density of copper and zinc are calculated to be 8.96 gr/ml and 7.13 gr/ml, respectively. The five experimental values for mass, volume and density for the 15 pre-1982 manufactured pennies were 46.31 gr, 46.30 gr, 46.30 gr, 46.28 gr, 46.30 gr – 5.5 ml, 5.2 ml, 4.8 ml, 4.9 ml, 4.8 ml – 8.42 gr/ml, 8.9 gr/ml, 9.64 gr/ml, 9.44 gr/ml, 9.64 gr/ml. The average experimental density for the first subgroup (pre-1982 pennies) was 9.21 gr/ml.

The theoretical value for the density of pennies manufactured after 1982 was obtained using the following equation: $0.975(7.13) + 0.025(8.96) = 7.18$. The five experimental values for mass, volume and density for the 15 post-1982 manufactured pennies were 37.48 gr, 37.50 gr, 37.51 gr, 37.52 gr, 37.51 gr – 5 ml, 5 ml, 5.5 ml, 5 ml, 5 ml – 7.50 gr/ml, 7.50 gr/ml, 6.82 gr/ml, 7.50 gr/ml, 7.50 gr/ml. The average experimental density for the second subgroup (post-1982 pennies) was 7.36 gr/ml.

The standard deviation for the theoretical and experimental values of the first subgroup (pre-1982 pennies) was calculated to be 0 and 0.478. The standard deviation for the theoretical and experimental values of the second subgroup (post-1982 pennies) was calculated to be 0 and 0.272.

In conclusion, we were able to verify that coins manufactured between 1864 and 1982 are 95% copper and 5% zinc. Coins manufactured from 1982 to the present are 97.5% zinc and 2.5% copper. The above-mentioned facts were proven when we used our mean (average), sample size and standard deviation figures from our theoretical and experimental subgroups to demonstrate that

the disparity between the theoretical and experimental means (averages) has no statistical significance at 95% and 99% confidence levels. Continued use of copper for making pennies would seriously deplete our copper reserves and shatter our dreams of having a sustainable future for generations to come. We need to stop using our mineral resources and think of other alternatives to coins.

5374

Red Cabbage, the Accurate pH Indicator

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What was needed to be found out in this project was if red cabbage is an accurate pH indicator. The purpose was to determine which chemicals are acids and which are bases. To sum up the procedure, you had to cut up cabbage, boil it and pour the water of the cabbage into whatever was in the test tubes (laundry detergent, tartar sauce, soda, etc.). You just had to make sure the boiled water didn't spill anywhere. Then you looked at the pH scale, looked at the numbers and looked at the actual pH balance to see if it was acidic, basic or neutral. The results came out to be that red cabbage actually could determine the pH of a substance better than you'd expect a typical cabbage to do.

5375

Spiders Eating Food Out of Their Usual Diet

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This study involved a spider eating out of its diet. There were two spiders, one that was fed other insects in its usual diet (Spider A), and another (Spider B) that was fed processed meat. The meat used to feed Spider B was organic beef and ham. Spider A was given crickets and other insects found in the backyard. Every night, the spiders were given the food and data was recorded on how they reacted. Spider A usually went after the food if it was crickets, but otherwise the food was ignored. Spider B didn't even touch the food. In conclusion, only feed spiders their normal diet, or they will die after a few weeks.

5376

What Is the Effect of Caffeine on Blood Pressure?

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The purpose of this project is to understand how caffeine can affect the human body. Caffeine can be taken in the form of foods and drinks. Caffeine affects blood pressure. In this project, use four types of liquids: water, Diet Coke, coffee and Coca-Cola. Test it on two adults' normal blood pressure first, and then ask them to drink 8 oz of one of the liquids. Before consuming the liquid, the adults should have an empty stomach for the last 30 minutes. Finally, test their blood pressure after 30 minutes and see if the liquid made a difference and affected their body. For all the liquids, do the same procedure for several days at the same time. The results for me were that coffee affected blood pressure the most. Then,

Coca-Cola and Diet Coke came in the middle. Lastly, water had the least caffeine. Coffee created the highest blood pressure. Water caused a drop by one number from the normal blood pressure. Coca-Cola and Diet Coke were close to each other, except Diet Coke has less sugar, but it has almost the same amount of caffeine as Coca-Cola. The conclusion for Diet Coke and Coca-Cola is that the more sugar you eat, the more your blood pressure will be affected, which is one of the results of having too much caffeine. We can't forget that blood pressure can vary depending on a person's height, age and weight.

5377

Will a Population of Collembola Increase If Natural Cane Sugar Is Added to Their Food Source?

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The purpose of this experiment is to determine if a population of collembola (*Onychiuridae encarpatus*) will increase if natural cane sugar is added to their diet. Collembola are tiny wingless hexapods that have a springtail to help them escape from danger. As a hypothesis, it was decided that the population would increase if natural cane sugar was added to their diet of yeast. One part charcoal, nine parts plaster of Paris, and water were stirred into a small container. The thick liquid was poured into two petri dishes and then was allowed to dry for a few days. One petri dish was labeled experiment and the other one was labeled control. Water and yeast were added to both petri dishes. "Sugar In The Raw" natural cane sugar was added to the petri dish labeled experiment. Thirteen collembola were placed in the control and the experiment. Stereomicroscopes and hand lenses were used to count the number of collembola and collembola eggs in each petri dish. At the end of five weeks, 99.8% of the collembola were counted in the control and 0.2% of the collembola were found in the experiment. The population of the collembola dropped drastically when natural cane sugar was added to their diet of yeast. The hypothesis was incorrect.

5378

Will a Population of Collembola Increase If They Are Fed Ritz Crackers for Food?

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The purpose of this experiment was to determine if a population of collembola (*Onychiuridae encarpatus*) would increase if they were fed Ritz crackers for food. Collembola, commonly known as springtails, are tiny hexapods that eat mold. As a hypothesis it was determined the population would increase if Ritz Crackers were used for food. To begin the procedure, nine parts plaster of Paris, powdered charcoal, and water were stirred in a container. It was then dropped into two petri dishes and allowed to dry for a few days. One petri dish was labeled control and the other petri dish was labeled experiment. Yeast and water were added to the petri dish labeled control, and crushed Ritz Crackers and water were added to the petri dish labeled experiment. Twelve collembola were added to both the control and experiment. At the end of five weeks, the number of live collembola and the number of collembola eggs were counted as data. There were 11 collembola left in the control and there were nine collembola left in the experiment. There were four eggs in the control and one egg in the experiment. The data suggest that collembola can survive, although their numbers decrease in a population when they eat Ritz Crackers or the mold growing near the pieces of Ritz Crackers.

5379

Will Magnets Affect Radish Germination?

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The purpose of this experiment is to determine if magnets affect radish seed germination. The hypothesis was that magnets do affect radish seed germination. Soil was poured into two containers, one labeled control and one labeled experiment. Then, six magnets were pushed into the container labeled experiment. The 24 seeds were planted in each container, watered and placed outside on the balcony. At the end of six weeks, 24 seeds in the control grew and 22 seeds in the experiment grew. The data suggest the hypothesis was correct because not all of the seeds in the experiment germinated and all the seeds in the control germinated.

5380

Does a Human's Sense of Smell Worsen As a Person Ages?

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The purpose of this experiment was to determine if as a person ages, does his/her sense of smell decrease? The hypothesis is that the human sense of smell does worsen as people age. People smelled foods that had strong odors. The food was held below the nose and the person guessed what it was. The smells used in the experiment were Nutella, peaches, oranges, papaya, grapefruit, peanut butter, strawberry jam and strawberries. Different foods and orders of the foods were used to make sure prior information was not received by the subjects. Peach was the one smell people had the most trouble guessing. The data was recorded. In the experiment the percentage of people over the age of 40 who guessed the foods correctly was 45%. The percentage of people under the age of 40 who guessed the foods correctly was 60%. In conclusion, the hypothesis was correct; the people who were older could not guess the foods as well as the younger ones could.

5381

Producing Electricity With Magnets

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To prove that mechanical energy can be transformed into electrical energy, a device was built with magnetic wire. By swinging a magnet back and forth over the pole of the 200 turn coil of magnetic wire as quickly as possible, measurable electricity was generated. The faster the swing, the more voltage was produced. The eight tests conducted showed that approximately 248.8 millivolts on

average could be generated. This experiment proved that the energy from my arm can be transformed into electrical energy by the magnet. This is possible because the changing magnetic field can induce electrical force to drive electrons in an electric circuit loop. This experiment demonstrated that energy can be transformed into different forms.

5382**Nanowire Mystery***Kevin Saeidian and D. Gaughen (teacher)*

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Nitinol (nickel-titanium) is among a class of metals known as shape memory alloys (SMAs). It has structural properties that allow it to be deformed at a given range of temperatures and returned to original shape at another range. I compared the SMA properties of Nitinol to other common metals such as copper, steel and aluminum. I found that I could "train" Nitinol to remember the shape I gave it at high temperatures close to boiling, then letting it cool to near freezing. The original shape was restored in ice water. The other metals did not demonstrate the shape memory effect (SME) at any range of temperatures. I had to be careful not to exceed the threshold of even Nitinol's shape transitioning temperatures, which meant the water would be at near boiling (200°F), or slightly red from a Bunsen burner. Tests showed that beyond this temperature, Nitinol's "memory"-restoring ability could be destroyed. I suspect that other alloys have SMA: gold-cadmium, nickel-chromium (Ni-chrome), iron, copper and titanium from my research. SMAs have been used in frames for eyeglasses, in braces for straight teeth, and in actuators for hydraulic pneumatic-based motor systems. An interesting future application may be in restoring car bodies that have experienced dents and dings.

5383**Is the Heart Rate for Younger People Higher Than for Older People?***Claire Cho and G. Zem (teacher)*

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This project showed whose heart rates were slower or faster. The heart rates for people of different age groups were recorded. The first age group was people under 20 years old, the second age group was 20 years to 40 years old, and the final age group was over 40 years old. These people had their heart rates recorded three times and the average was found for every person in each age group. Then the average for the entire age group was found. This process was repeated three times just to make sure. The heart rates were indeed different for younger people and older people. Younger people had a faster heart rate than those who were older. Factors of the people tested can change the results. If a person is a little larger than normal, that person's heart rate would be a little slower because he/she could reach his/her maximum heart rate with little intensity. Older people have natural changes in their hearts that slow the heart rate down. This is why if the heart rate of an older person goes up very quickly, a heart attack can happen. The results show that younger people do have a higher heart rate than older people.

5384**Mnemonics Assistance in Memorization***Shilpa Nath and G. Zem (teacher)*

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The purpose of this experiment is to see if mnemonics assist in memorization. My hypothesis is that the experimental group will have a higher percentage of words correct because they have the aid of the mnemonic. Your first step is to split your volunteers into the control and experimental groups. Give each individual five minutes to study either the list or the mnemonic, but only once. Conduct a series of tests as follows: one hour after studying, then three hours, then five hours, then the next day. In all of the tests, Volunteer A memorized four words. Volunteer B memorized five in the first three, then four in the last test. Volunteer C memorized all of the words in all tests. Volunteer D memorized all of them in the first test, but got five in the next three tests. Overall, the control group got 72% of the words correct, while the experimental group got 93%. The experimental group members had success because they had the aid of the mnemonic. The mnemonic made it easier on their brains. Two of my volunteers from different groups had a constant number, while the other two had a constant number in the last three tests. I noticed that the people who missed some words always missed a different word every time. I think the first test was the easiest for everyone because it was only one hour after studying. Maybe there might have been a difference in the results if I increased the studying time or if there was a bigger gap between tests.

5385**What Is the Best Shape of a Parachute to Provide the Slowest Falling Speed?***Stephanie Huynh and G. Zem (teacher)*

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The purpose of this experiment is to see what the best shape is of a parachute to provide the slowest falling speed. The five different shapes used to test this experiment are hexagon, circle, rectangle, square and triangle. The first step is to create the five shapes. Punch four equally spaced holes about 0.25" away from the edge. Then put a hole reinforcement above and below each hole. Tie each string to the hole to prevent it from falling. Then tie all of the strings together and tie the strings to a brass barrel. If the parachutes collapse, repeat the test. Test each parachute five times and use a timer to record the elapsed time. The test results show that the circle and the hexagon are the best two. To tell which one is better, remove one ring from these two and test again. The circular parachute's elapsed time increased 50% and the hexagon parachute failed to stay open. This proves that the circular parachute shape is the best among all five shapes that were created.

5386

EMF: Electromagnetic Fields

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This study proved that electromagnetic fields (EMF) exist and we are exposed to them every day. The KII-EMF Meter was used in this study. The EMF meter was used to record EMF readings of common household appliances, such as the television and the refrigerator. Readings were taken and compared with each other in four different scenarios, with the point of maximum reading taken as well. All devices that have electrical wiring in them emit electromagnetic fields. That is why electromagnetic fields are present in most households. People are exposed to electromagnetic fields every day. It does not seem like a big deal. However, overexposure to electromagnetic fields can lead to diseases like leukemia and brain cancer. This can be avoided by just minimizing exposure to objects emitting electromagnetic fields. To conclude, there are many devices that emit electromagnetic fields. Humans are exposed to EMF every day and the fields are present almost everywhere.

5387

Which Seeds Will Be Better to Take Into Space?

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The purpose of this experiment is to determine which plant is more efficient for life in space. The hypothesis is that more spinach seeds will germinate faster and more often than the basil seeds, thus being a better plant to take into space. First the seeds were planted into a pot of soil according to the directions. They were watered about every other day. The experiment was observed three times a week and data was counted every time the seeds germinated. The spinach seeds took six days to germinate and 80/80 grew. The basil seeds took nine days to germinate and only 69/80 grew. At the end my hypothesis was correct, with the spinach seeds germinating faster and more growing.

5388

Can Silver Metal or Ions Kill Yeast Beads in a Standard Microbial Lava Lamp (MLL)?

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It has been known for centuries that silver is a germicide. The Romans used silver coins to keep water fresh for their moving armies. We employed the standard Microbial Lava Lamp invented at California State University, Northridge (CSUN), to test our hypothesis. If silver is truly a germicide as used in many nanoscale (10^{-9} meters) commercial applications such as socks, fresh food containers, toothpaste, etc., then it should kill the yeast embedded in glass/alginate beads used in MLLs. After finding the optimal sugar solution in the MLLs for maximum CO_2 production, we inserted silver shot into beads of one MLL bottle and silver nitrate in another. We found that CO_2 production ceased in the MLL

bottle with the silver nitrate, but continued though lessened with the silver metal. Our conclusions are that silver ions (AgNO_3) penetrate the glass/alginate bead mixture, but the silver shot is too large. Further experiments require silver metal to be of nanosize.

5389

Effects of Music on the Growth of Plants

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This experiment was intended to find how music affects plant growth, as well as what type is most effective. Three radish seeds were planted in each of three cups and were left to grow by a music system playing continuous music. The genres of the selected music were rock and classical. A third plant was used as a control for the experiment. The plants were then watered and measured every three days. After 22 days, results showed that the rock-influenced plants grew the tallest, with measurements of 8, 11 and 12 centimeters for the plant heights. Classical-influenced plants had the second most growth, with plant heights of 6, 8 and 9 centimeters. The control group finished with measurements of 6, 7 and 8 centimeters. These results conclude that plants influenced by rock music will grow the tallest, and also conclude that plants influenced by any music will grow taller regardless of the genre.

5390

Where Is the Best Area to Shoot on a Basketball Court?

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This study examined where the best place to shoot a basketball on a basketball court is for right-handed and left-handed people. Two people participated in the experiment. One was right-handed and one was left-handed. There were 10 shots taken from several lengths from the basket. Also, the measurements were done from both sides of the basket. This experiment was supposed to be done twice to have accurate data. The results were as predicted. The right-handed person did better than the left-handed person on the right side of the basket. The left-handed person, however, did better on the left side of the basket. That brings the conclusion up. The best place for right-handed people is 3 feet from the right side of the basket. For the left-handed person, the best place to shoot is 3 feet from the left side of the basket. This is valuable information that could be used as a way to win basketball games.

5391

Pop Bubble Pop!*F. Briones and G. Zem (teacher)*Earnest Lawrence Gifted/Highly Gifted Magnet
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For my 8th-grade science project I decided to conduct a project that would determine what variables affected the life span of your average soap bubble. The variables indicated are lemon juice, rubbing alcohol, corn syrup and sugar water. What I did was empty each bubble solution of two teaspoons of liquid and replaced it with one teaspoon of the selected variable for that container. I labeled these containers A through E. This meant that I had to test out five different containers, four of which had a variable solution in them and one of which was my control group. What I did was blow 10 bubbles with each container, while recording the time with a stopwatch until that bubble popped. I then calculated the average time that a bubble lasted for each container. This entire process of blowing the bubbles and recording their times was then repeated on a different day when the weather conditions were decidedly different. The results of this experiment were, as a whole, depressing. It turned out that my topic of choice was flawed from the beginning. No matter what is in the solution, a bubble will react the same way. I learned through this project that the main factors that affect the time of a bubble are the conditions and environments the bubble is exposed to. For example, the first day I conducted the experiment it was quite windy out, so the bubbles had a tendency to float out of sight before they popped. The second day there was not wind but rather a lot of moisture in the air, which meant that most of the bubbles could last longer. In conclusion, I would like to say that even though this project did not turn out how I had planned it to, I still learned from it and gained a lesson in the process: Always make sure a project is worth doing before you do it.

5392

Which Fruit Can Blow the Biggest Balloon?*Elizabeth Pitpitan and G. Zem (teacher)*Earnest Lawrence Gifted/Highly Gifted Magnet
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This study examined which fruit could release the most ethylene gas. The fruits used in this experiment were a banana, an Asian pear, a Fuji apple and a grapefruit. These fruits were separately cut up, smashed and put into individual bottles. A balloon was then placed over the mouth of each bottle. All of the bottles were placed in an area with sunlight for 17 days. While rotting, each fruit released ethylene gas that was trapped into the balloon. Day after day, each balloon's diameter was measured in centimeters and recorded. By the last day of the experiment, the banana had the biggest balloon diameter of 5 cm. The Fuji apple and Asian pear had 4 cm and the grapefruit had 0.5 cm. The results showed that the banana released the most ethylene gas in 17 days.

5393

Solidifying Liquids*David Minasyan and G. Zem (teacher)*Earnest Lawrence Gifted/Highly Gifted Magnet
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We all know that liquids freeze when they are put in low temperatures. But not all of us know that when liquids are put in low temperatures, not only do they freeze but they expand! I was interested in the expansion of liquids enough that I based my science project on it. I got six liquids, all with different properties, and put them in the freezer for two days, giving them enough time to fully freeze. I used drinking water, 7UP, tap water, vegetable oil, Gatorade and milk. I looked up the physical and chemical characteristics of all of these liquids, and although most of this was gibberish to me I got a pretty fair understanding of what would happen. My hypothesis was based on the sugar levels of each liquid. I thought that the liquid with the most sugar would expand the most, because it would add onto the expansion of water. By the end of my experiment I realized that my hypothesis was correct. The most sugar was contained in 7UP, and 7UP had the most expansion of any other liquid. In my first trial I was truly surprised at the results. I didn't think that my hypothesis would be correct at all, so I tried it again and again, for a total of three trials. By the end, 7UP had the most expansion out of any other liquid. I also realized that not only does the sugar level of each liquid come into play, but so does its density. For example, vegetable oil was the densest, so I'm sure that it had the hardest time freezing out of any other liquid. My experiment proves that liquids not only freeze but also expand. The properties of liquids come into play in how much they expand. My experiment goes to show that you should never leave a can of 7UP in the freezer for too long. So have fun and be smart future scientists; there is a lot to know and find out.

5394

The Effects of Chlorine-Based Bleach*Connor Oswalt and G. Zem (teacher)*Earnest Lawrence Gifted/Highly Gifted Magnet
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This study was to see how chlorine-based bleach affects living and nonliving objects. The things I tested were lemons, denim, toothpicks and rose petals. These items were submerged in a half cup of bleach for five days. I observed the chemical and physical changes over the course of these days. The oxidizing elements inside the bleach showed more effect on nonliving objects than on living objects. The results also showed slow deterioration of the lemon. I think the reason for this is that they are on almost opposite sides of the pH scale. The denim reacted quite fast with the bleach's oxidizing elements. It took only two hours for the denim to change its color from blue to white. This shows that the reasons the objects I tested changed were because of the bleach's oxidizing elements and the pH acidity of the bleach.

5395**Flame Intensity and Particle Size**

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Chemical rates of reactions can be dramatically increased by the lowering of the particle size of the reactants. This can be demonstrated by combustion reactions of various materials of varying particle size. Starting with the largest particle, a steel nail, we placed it over a Bunsen burner. The nail got red hot and could burn through paper at 451°F. Decreasing particle size over the same Bunsen burner showed a dramatic intensity increase. We derived a simple intensity index for items in decreasing order of size from steel wool, iron filings and nondairy creamer. Flames of the latter materials were dramatically increased. Particle size for the nondairy creamer was so small that we witnessed combustion. Prior to this demonstration we compared ground-up chalk using a pestle and mortar to put the pieces in vinegar. The scale effect was again demonstrated as the manganese dioxide (MnO_2) collided with hydrogen peroxide (H_2O_2). These demonstrations showed the impact of catalysts. Our flame intensity demonstration could be further proved scientifically by varying the size of similar materials such as iron, chalk, carbon and graphite. In conclusion, decreasing sizes of particles increase flame intensity in a manner of cataclysm, where in the nano-level possibilities to create energy are proved to be very viable and effective due to their small size.

5396**All in the Soil**

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The study of this experiment is to see how bacteria affect the growth of plants and how it can be harmful or helpful. The idea of this project is to get sterilized and fertilized soil. The sterilized soil has no bacteria, while the fertilized soil has bacteria that can help nourish the plants' growth; however, it can also kill them. To sterilize soil, you must bake the fertilized soil in the oven at 375°F for three hours. This enables all of the nutrients and bacteria to be destroyed or dead. In three cups evenly put sterilized soil and in three other cups put fertilized soil. Finally, plant two radish seeds in each cup. You have to make sure you water them every day in an even amount and also record data. In the end, the fertilized plants grew the most, because there were nutrients. However, in two cups the sterilized soil had two radish plants and in one cup the fertilized soil had two radish plants. The sterilized soil was much more efficient in growing the most plants, but in terms of helping the plants grow, the fertilized soil was the most efficient. The fertilized soil plants grew 4.1 cm, 4.2 cm, 4.2 cm and 4.3 cm. The sterilized soil plants grew 0.1 cm, 0.2 cm, 0.2 cm, 0.3 cm and 0.4 cm. Overall, the best choice is fertilized soil to help your plants grow.

5397**Cheerio Swing**

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I decided I am going to test the static electricity by doing a Cheerio swing. I wanted to see how far back the hanging Cheerio would go once I held a balloon to it that had a negative charge. I wanted to see if the Cheerio would have a different reaction based on what was rubbed on the balloon. The balloon's negative charge will rub off on the balanced Cheerio, causing it to repel the balloon. To be balanced out the charge will need the same number of negatives as positives. I hung the Cheerios by tying them each to a thread and taped it on a wall overhang. I labeled multiple balloons and rubbed each on a surface to see how much static they generated. I held the balloons up to the hanging Cheerio and calculated their movement with a ruler. The results of my experiment were that the balloon would attract the Cheerio and then repel it. This happened because when the Cheerio hit the balloon, the charge of the Cheerio became unbalanced. Sweatshirts, pillows and hair have the most static when rubbed against the balloon. Using another balloon didn't have an effect.

5398**Life-Sustaining Liquids for Cut Flowers**

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The purpose of this study was to learn if there was any other liquid besides water in which cut flowers could live longer at room temperature. Cut flowers were placed in vases and bottles of various liquids. The total duration of their life span was recorded from the moment they were placed in the vases to the moment they withered away. Ten liquids were tested, with each liquid tested one to five times. On average, cut flowers in water lasted 4.62 days; in tea they lasted 3.1 days; in orange juice they lasted 1 day; in milk they lasted 1 day; in coffee they lasted 2.9 days; in a solution of $\frac{1}{2}$ cup of detergent and 3 cups of water they lasted 2.1 days; in a solution of $\frac{1}{4}$ cup of soap and 2 cups of water they lasted 2.85 days; in glue they lasted 1 day; in honey they lasted 0.9 days; and in mustard they lasted 1.06 days. The results of this study suggest that water remains the primary life-sustaining liquid for cut flowers.

5399**Effects of Microwaved Water on Plant Growth**

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The purpose of this experiment is to test how electromagnetic energy (microwaves) can cause unseen damage to water. Microwave ovens work by sending out electromagnetic waves called microwaves. These waves are then absorbed by water, sugars and fats found in the objects you are microwaving. This process of absorption turns the waves into atomic motion, also known as heat. To test this experiment, I grew four individual groups of radish plants, each watered with water treated differently. Group 1 was watered

with plain tap water. Group 2 was watered with water microwaved in glass until boiling point. Group 3 was watered with water microwaved in plastic until boiling point. Group 4 was watered with water that was boiled on a stove. I grew the radish plants for 14 days, recording the height of the plants from each group daily. In the end, the order of the tallest plant group to the shortest plant group was 1, 4, 2 and 3, where Group 3 was only 1.5 centimeters (18.75%) shorter than the tallest plant group (Group 1). The results showed that the harmful carcinogens released from the microwaved plastic container may have caused Group 3 to grow the least. Group 1, on the other hand, grew the most because it was watered with plain, untreated tap water.

5400**How to Make an Aircraft Invisible to Radar***Kruti Patel and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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Invisibility? Isn't it cool? My project is all about that, not with humans but with airplanes. Radar is a system that tracks where all planes are, but some planes don't show up. You can have this happen by making the point of the airplane in a V shape. This makes the plane stealthier, so the plane becomes invisible to the radar. The first thing is to take a box and cover the inside with black paper. On the side through the cardboard stick in a flashlight and below that a lux meter. Then make shapes like a V, W and a cylinder. Then close the box, turn on the flashlight and record what it says on the lux meter. From that you figure out what shape the tip of the airplane has to be for it to become invisible to the radar.

5401**Weight and Trajectory***Eduardo Rios and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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The study of this experiment examined the question of how weight can affect time, distance and velocity. (Note: These three factors relate to trajectory.) I first took a 1/8-oz deflated basketball, a 3-oz wooden whistle and a 5-lb barbell and threw each object like a catapult. Next I timed each object to see how fast it would take for it to hit the ground. Then I recorded the distances by measuring the distance of each object. Finally I used the formula $VO = R \times \sqrt{G/2H}$ to find the speed of each object. According to my research, the fastest object was the deflated ball, with a speed of 9.9 mph and a time of 0.75 seconds. The slowest was the 5-lb barbell, with a speed of 6.6 mph and a time of 0.97 seconds.

**5402****Densities of Liquids and Their Effect on Buoyancy***E. Cheng and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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This experiment tested how the density and characteristics of a specific liquid affect the buoyancy of a given object. Water, rubbing alcohol, grape-seed oil and vinegar had their densities tested with a variety of objects, including a rubber band, a balloon and a foosball. The objects were dropped into the bowl of one of the given liquids. I observed whether the object seemed to be floating or not, and how fast it sank or floated back up. Each of the objects was placed inside each bowl of liquid. After looking through the results of the experiment, I could see more objects floated for water and vinegar, while more objects sank when placed in alcohol and oil. This data showed that vinegar was denser than water, water was denser than grape-seed oil, and grape-seed oil was denser than alcohol. However, the oil and the vinegar seemed to be somewhat oily, causing the objects to move slowly inside the liquid, creating a few anomalies in the data tables. But for the most part, the results matched up with the researched data.

5403**The Growth of an Icicle***Carissa Lee and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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This experiment was done to examine how an icicle forms. In this study, three different cups were used. The first cup was 7 ounces, which was labeled Cup A; the second cup was 5 ounces, which was labeled Cup B; and the last cup was a plastic glass. Inside the bottom of Cup A, a small pinhole was made using a pushpin, which was then covered on the bottom of the cup with a piece of tape. Cup A was filled three-fourths of the way with water and put in the freezer for 30 minutes. Inside the bottom of Cup B was a cutout circle from a paper towel, made to fit inside the bottom of the cup. Then a pencil was used to poke three evenly spaced holes inside the bottom of Cup B, allowing the paper towel to extend through the holes. After that, a hole was cut in the center of an index card so that Cup B could fit into the hole with about 2 inches of the bottom extending below it. Once Cup A was taken out of the fridge, the tape was removed. Cup A was placed on top of Cup B, which was then placed on top of the plastic glass. The plastic glass acted as a stand, while the index card was the support for the two cups (Cup A and Cup B) stacked on top of each other. This whole stack of cups was placed in the freezer for one hour, and, when removed, icicles formed on the bottom of Cup B. The paper towel that extended through the holes of Cup B was the freezing nuclei (the surface on which ice crystals can be built). When water droplets drip out of the cup, some of the water molecules stick onto the paper towel fibers that extend through the holes. Those water molecules are a surface for other water molecules to attach onto. Gravity pulls each water molecule downward as they freeze onto the outside surface of the ice. Eventually an icicle is formed and continues to grow longer as small amounts of water are added onto its entire length.

5404**Which Liquid Will Corrode Zinc Nails the Fastest?***An Dang and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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The purpose of my study was to show which liquid would corrode zinc nails the fastest. The liquids were water, Coke, apple juice, orange juice and vinegar. The five liquids were put into five small water bottles. Then there was a two-inch zinc nail in each of the five water bottles. I left the bottles for eight days in a separate room. Every day I took the zinc nails out and examined what happened over time. I also took pictures of the nails with my camera to put in my data. When the experiment was over, the vinegar was the liquid that corroded the zinc nails the fastest. I found that the vinegar has the acidity level with a pH level of 2.4. Coke was second in causing the most corrosion because Coke is approximately 2.6 on the pH chart. Orange juice was third because it has a level of 2.8 and apple juice has a pH level of 3.35-4.0. Water was last because it has the least acidity. Its pH level is 7 and water is neutral. The pH level (acidity) is a factor that contributes to the corrosion of zinc nails.

5405**Poor Pouring***Alisha Hacker and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
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For my project I tested whether or not different high-acid and caffeine liquids would affect the growth of plants. The purpose of my experiment was so I could educate others about the dangers of pouring their excess drinks into the plants around them. My hypothesis was that the coffee would have the most negative effect on the plants. I was surprised that the orange juice and Coke were about as harmful. The procedure was quite easy but required daily attention. The first thing you must do is purchase plants from your local hardware store or nursery. You then must purchase four different liquids. For example, I used water, coffee, Coca-Cola and orange juice. After this you must measure one cup of each drink. Then you must pour the cups on the labeled plants. You must repeat this for about 10 days to get accurate results. After about three days you will definitely see a distinct difference in the coloring and feel of the plants. This is proof that it takes only a little bit of a certain drink to completely affect the growth and development of plants. As you go into the next couple of days you will definitely notice a change in the leaf texture of the Coca-Cola plant. The plant has a sticky texture that leaves a residue on your fingers. In the end my hypothesis proved correct: By just supplying plants with water they are more likely to grow and prosper. I think that this is an important lesson that all people should know about before they pour their drinks in plants.

5406**Effects on Visible and Invisible Note-Taking***Jasmine Shaibani and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This study examined the question of how students take notes when they are able to see and revise what they are writing vs. when they are blind to their notes. The students will first use a regular retractable ballpoint pen. Then they will use "invisible ink," which is when the students write with an empty ballpoint pen on a regular paper on top of a carbon paper, backed by another blank paper. Using ink students can revise notes, which may distract, but retracting the ink so the notes will be "invisible" can make the note-takers become more focused on the subject they are supposed to be writing about. When they retract the ink from the pen and write on the carbon, they cannot see their notes and they can write what comes to mind; therefore there are more ideas about the subject than when writing with ink. But on the contrary, results suggest that the 4th-, 5th- and 7th-graders had worse notes, less writing, and larger and sloppier handwriting when writing with invisible ink. The grade that had the best results using invisible ink was 5th grade, in which 85% of the students had better results with the ink. As the subjects got older, in 7th grade, they assessed themselves as bad note-takers, but they had better notes than other grades for the regular ink, or the control. This suggests as students get older they become more cautious of their skills. By practicing writing with invisible ink at an elementary age, students would take better notes without ink, therefore concentrating more on the task at hand.

5407**Experimentation of Dissolving Substances Within Water to Conclude Which Mixture Would Lose the Fewest Number of Its Entrails Within a Set Time***Cha Andrew and D. Shah (teacher)*Portola Highly Gifted Magnet Center
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This experiment tested a group of cups that all contained their own mixture of a unique substance and water, in the matter of which respective cup would lose the least amount of water in a set amount of time. Six cups filled with 140 ml of water were fused with $\frac{1}{2}$ tbsp of their own respective unique substance and were set outside for 30 days, along with another cup filled with 140 ml and $\frac{1}{2}$ tbsp of pure water. Daily observations were made. There were several problems that were solved with brainstorming in the beginning of the experiment. The experiment resulted in no difference in the amount of water lost. A second test was made, but ended with the same result. The experiment concluded that water evaporates at the same rate no matter what is poured into it.

5408

Can a Momentum Rollercoaster That Simulates Real-Time Motion and Angulations Used in Amusement Parks Today Be Constructed Using Recycled Drinking Bottles?

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This experiment explored the study of force and motion as they relate to amusement park roller coasters. As a STEM team we wanted to construct a roller coaster using plastic water bottles and other recycled materials in the duplication of a roller coaster. Our experiment measured 20 feet in length and 7 feet in height. The selection or use of recycled water bottles provided the surface area tension needed in the acceleration of a golf ball, providing a similar slickness to offer greater acceleration and less drag. Using more than 500 bottles (various sizes, from 16.9 fluid ounces to 32 ounces), we determined that the smooth surface area allowed for greater acceleration. We demonstrated the role of slope (rise/run), as steepness of a linear area dictates pitch, and its relation to acceleration.

The actual design of the roller coaster was achieved by using computer simulation as to the most effective design. This took several tries before the right design was achieved. Construction of the roller coaster took more than 300 hours to complete. Differences in acceleration and speed proved correct or the results matched the computer simulation for our experiment. Thus it is possible to design and construct a roller coaster simulating theme park roller coasters of today.

5409

What Is Muscular Dystrophy and How Does It Affect the Development of Teens?

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My research and study were on the topic of muscular dystrophy. I have a keen interest in the subject, as I developed muscular dystrophy at age 7. I believed learning all I could about the disease could greatly help me improve the quality of my life. I did not know what information was available to me as a person with the disease. My main focus was to find out what effects the disease has on teens and adults. By researching this information, I learned that the disease affects muscle density and motion as well as the heart. There are different types (six) of MD (muscular dystrophy). Duchenne muscular dystrophy (DMD), which affects more boys than girls, is caused by a mutation of the dystrophin gene. Dystrophin connects fibrous tissue. Becker muscular dystrophy affects women and men because women carry two XX genes, which the muscular dystrophy affects. Next is congenital muscular dystrophy, which is present at birth. Distal muscular dystrophy affects the hands and feet and is an inherited gene that can show up as early as 5 years old. In this type of MD people may not realize they have the disease until they are in their 40s.

My research led me to the following facts about MD in teens: Duchenne and Becker are the most aggressive. Most teens suffer from these two types. My research led me to the belief that I can

slow the progress of the disease by muscle exercises, as well as with constant physical therapy. Medications such as Prednisone can sometimes help. In addition, watching my lungs is important. Staying well and cold- and upper-respiratory-free is also important. In conclusion, researching my disease gave me a great deal of information that can help improve the quality of my life, allowing me to have experiences that are like those of other teens my age.

5410

Is There an Increase in Thyroid Cancer in the Children of Japan Due to Nuclear Energy Increases Caused By the Meltdown of the Fukushima Nuclear Reactor?

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The study examined the effects of increased levels of radiation and how or if radiation had a direct increase in the people exposed to it. In 2011, Japan was hit with a 9.0 earthquake and subsequent tsunami that destroyed a large section of Japan's shoreline and caused Fukushima to malfunction and have a core meltdown. Tons of radioactive cesium and plutonium still are leaking into the ocean. This led us to question how radiation might have a direct effect on the people of Japan. The human thyroid is an important organ of the body, as it regulates needed hormones. Exposure to high doses of radiation, which is measured in REM (50 REM), can cause the thyroid to fail and cause a variety of different cancers or acute radiation syndrome. The higher the REM exposure, the sooner the results on humans show up.

People within a 40-mile radius of the reactor were exposed to 25 to 100 REM or more. Finding out the exact number was hard because many facts about what really was happening were not available. We did find many instances of people having red sunburned skin and nausea, evidence of radiation exposure. Our data showed the farther away children were from the reactor, the less their radiation exposure was; however, food and water were affected by radiation. Milk in Japan had high levels of radiation. In addition, radiation was found in some California milk supplies due to wind currents. Research illustrated that children's thyroids were affected by the radiation, probably through food and water as well as the air.

The Tenth Report of Fukushima Prefecture Health Management Survey showed that 44.2% or 94,975 children who had thyroid ultrasounds had abnormalities. These could be cysts or nodules (tumors), etc. Ten children out of 186 had been diagnosed with thyroid cancer. Our study indicates that there is a connection to the increase in thyroid cancer in Japan and the nuclear accident that happened at Fukushima.

5411**The Effects of Temperature on Battery Shelf Life**

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This project was to determine the effect of temperature on battery shelf life. To conduct this experiment, two batteries were placed in a refrigerator at approximately 40 degrees F. A second set of batteries was placed in a homemade incubator at a temperature of about 85 degrees F. The batteries were tested every day for 12 days and the results were recorded.

5412**Effects on Dogs' Reactions to Sounds**

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This study examined the question of different dogs' reactions to sounds. Each group of dogs listened to a variety of sounds. The experiment was repeated five times. One group had a different sound than the other. The results show that the dogs' reactions ceased after a matter of time.

5413**Colored Water and Colored Light**

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This experiment examined the difference in light with light and light with water. Flashlights were covered with colored transparencies and shined on a wall with different variations of light and brightness adjustments. This experiment was repeated multiple times. Then in the next set of the experiment, flashlights shined light on colored water and the colors varied. This was also repeated multiple times. The results came back and there really wasn't a difference. When you mix colored light with colored light you will most likely get white. When you mix light with colored water you also will get clear or white. This is due to ultraviolet light, but there wasn't much of a difference and my hypothesis was wrong.

5414**Effects of Hands-Free Driving**

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This study examined the question of safety involving talking while driving hands-free vs. hand-operated. Five licensed drivers, two women and three men, were used on a custom vehicle simulator. They were instructed to comply and briefly answer to a prerecorded conversation while a ruler was dropped in between the outstretched fingers of each driver's dominant hand at a random time. Two sets of each trial were conducted to ensure the accuracy of the conclusion. The free-to-ear ratio was 0.3688 seconds to 0.437 seconds. This information clearly demonstrates the advantage of

having both hands free. The percentage difference is approximately 15.61%. These results suggest that hands-free driving is certainly safer than driving with a phone to your ear.

5415**Refrigerating Cookie Dough**

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This study examined the possibility of better-tasting cookies by refrigerating cookie dough beforehand. Two batches of the same cookie dough were made and one batch was left in the refrigerator for 12 hours. The other batch was left in the refrigerator for 24 hours. After their respective times in the refrigerator, the cookie dough was baked for 7 minutes with the oven turned to 350°F, and then tasted. Out of the three tasters, all of them liked the cookie that was refrigerated better. The result suggests that the 24-hour refrigerated cookie dough had a better taste than the one that was only refrigerated for 12 hours.

5416**What Temperature of Water Freezes Faster?**

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I wanted to find out which temperature of water freezes faster, so I tested two different temperatures of water: hot water (100°F) and cold water (61°F). I prepared 150 ml of hot water (100°F) and I put it in the freezer with a thermometer inserted in it. I measured the freezing speed by checking the thermometer every 15 minutes. Then I did the same with 150 ml of cold water (61°F). I found out that hot water was a little faster to start freezing and was about 30 minutes faster than cold water to finish freezing. My hypothesis was that cold water would freeze faster than hot water because the temperature of cold water is closer to the freezing point (32°F), but my hypothesis was wrong. In conclusion, if you want to freeze water faster, do not cool down warm water before you freeze it.

5417**What Whitens Teeth Better, Natural Substances or Whitening Toothpaste?**

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For my science fair project I wanted to find out if natural substances could whiten teeth better than commercial whitening products. For my experiment I dyed two white eggs with coffee for one hour and left them to dry for one day. Then I brushed one egg with hydrogen peroxide and baking soda and the other with whitening toothpaste. I brushed them both for one minute and observed that the hydrogen peroxide and baking soda whitened the egg better. On a scale of 1 to 10, the egg with hydrogen peroxide whitened at about 7, and the whitening toothpaste at about 5. My hypothesis was that the commercial product would work better since research has been done on it, but according to my results, I concluded that natural products work better and are less expensive.

5418

Can Our Sour Taste Buds Taste Bitter, Sweet and Salty Foods?

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The purpose of our project was to see if our sour taste buds could also taste bitter, sweet and salty foods. According to our research, the sour taste buds are located on the sides of our tongues. For our experiment, we got different foods and liquids for each type of taste and tested them on only the sour sections of our tongues. We found out that we could taste sweet and salty items on our sour taste buds. This concluded that bitter items were not tasted on the sour sections of our tongues. Our sour taste buds simply did not taste the bitterness. These results contradicted our hypothesis, which was that sour taste buds would only taste sour food.

5419

Do Different Brands of Popcorn Leave Different Numbers of Unpopped Kernels?

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The purpose of this experiment was to see how four different brands of popcorn – Pop Secret, Gourmet, Act II, and Springfield – leave different numbers of unpopped kernels. Each brand of popcorn weighed 3.5 oz and each brand was heated up to a minute and one-half in the microwave. After we popped the popcorn, we counted each unpopped kernel. Act II had the highest number of unpopped kernels and Gourmet had the fewest. Since all of the brands weighed the same, our hypothesis was that all would have the same number of unpopped kernels. Our conclusion was that Gourmet Popcorn is the best choice because of the fewest number of unpopped kernels.

5420

Which Drink Has More Electrolytes?

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In this science experiment we tested orange juice, Gatorade, 5-hour ENERGY and coconut water to see which drink has the most electrolytes. Electrolytes are ions in solution that the human body needs to conduct electricity, to stimulate nerve endings and to keep the body moving. Electrolytes come out in perspiration so people who work out a lot need to restore them. The results of this experiment can help people decide which sports drink is best for them. We used four containers that were well cleaned with warm water and soap, and then rinsed out and dried well. We filled them halfway with each liquid and inserted a tube, which was attached to a multimeter. The multimeter recorded the amount of electrolytes in each drink. We repeated the experiment three times and found out that orange juice had the most electrolytes compared to the other three drinks. The amount of electrolytes in orange juice was on average 65.3. In Gatorade the average was 48.2 electrolytes, in coconut water it was 42.2, and in 5-hour ENERGY it was 45.8. These results were different than our hypothesis, in which

we thought Gatorade would have the most electrolytes. In conclusion, orange juice had the most electrolytes, which will give you the most energy.

5421

Which Food Group Has the Highest Amount of Starch?

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The purpose of this experiment was to find out which food group has the most starch, because starch is very important in our diet. Many people in the U.S. are overweight and some people go on starch-free diets that result in not getting enough starch. We thought it would be good to find out which foods contain the most starch to help us with our diet. We tested two samples of each of the five main food groups: grains, vegetables, fruits, dairy and meat. Then we put a few drops of iodine on each of the food groups. If the iodine turns black or dark blue, the food is very starchy. If the color of the iodine stays brown, the food group has very little or no starch at all. After we tested all of the samples, we found out that grains have the most starch, just as we predicted. Fruits are second and vegetables are third, while meat and dairy products have no starch at all. In conclusion, if you need starch, eat a lot of grains, and if you are overweight don't eat as many grains.

5422

How Do Different Surfaces and Weights Affect a Hovercraft's Movement?

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According to our research, a hovercraft is a vehicle that moves by gliding over a surface on a cushion of air. The cushion is created by pushing air downward against the surface underneath the hovercraft. The bottom of a hovercraft is flat, which allows the air cushion to be distributed evenly beneath it.

Our hypothesis was that the best way for the hovercraft to move freely was by reducing friction between the hovercraft and the surface beneath it and putting it on a flat, smooth surface. At the same time, weight could be used to increase friction and slow a hovercraft's movement. In this experiment, I built a small hovercraft using a DVD, a sports bottle cap and a balloon. I tested the hovercraft's movement over a tile floor, sandpaper, carpet and grass, using the same volume of air to power it. During each test, I observed its movement as it traveled, and how long it traveled for. I used coins for weights and repeated the experiment five times. The tests showed that different surfaces do affect the way a hovercraft moves, and the surface the hovercraft moved most freely on was the tile floor. The measurements and observations showed that the less smooth the surface, the less the hovercraft moved. On the grass, the hovercraft did not move at all because the air cushion could not be created. The experiment also showed that when too much weight was added, more friction was created and the hovercraft would not move at all. Our hypothesis was proven right.

5423**Keep Candy From Melting**

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The purpose of this experiment was to find the best wrapping material that would keep candy from melting in the sun. We used a Thin Mint as our specimen and a lamp as a substitute for the sun. We wrapped the candy in tinfoil, a paper towel and thin paper napkins in each trial and placed it under the lamp, which was covered with regular paper to prevent the heat from melting the Thin Mint too fast. We repeated the experiment three times with each material and found out that the paper towel kept the Thin Mint from melting the longest. In conclusion, the Thin Mint melted in both tinfoil and the thin napkin, making the paper towel the best insulating material that kept the candy from melting the longest. These results did not agree with our hypothesis, which was that the foil would keep it cool the longest.

5424**What Has a Greater Effect on a Human Heart Rate, Fear or Exercise?**

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The purpose of our experiment was to see if fear or exercise would raise the heart rate of a human heart faster. Our hypothesis was that exercise would have a greater effect on a human heart rate. To test our hypothesis, we experimented on five people. We first recorded their resting heart rates. Then we made each person run in place for a minute, do 10 jumping jacks and 10 push-ups, and we recorded their heart rates after they were raised and the people were out of breath. Then we let the people rest until their heart rates went back to their original pace and made them watch a scary movie. Once they were scared and their heart rates went up, we recorded their heart rates. We found out that exercise had a greater effect on different people's heart rates, which agreed with our hypothesis.

5425**How Does Our Brain Deal With Perception?**

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The purpose of our experiment was to observe if incorrectly named colors distract or confuse our ability to read the colors correctly. In other words, we wanted to prove or disprove John Ridley Stroop's Stroop Effect theory, which is about how our brains deal with perceptions by just reading items rapidly as our minds think they're just regular words/colors, but in the process we mix up the ideas of words and colors. In our experiment, we made a Stroop Effect test and tested 21 people with it. Our results were that 11/20 people were wrong in these tests and messed up. Our results then proved that our hypothesis was true, because 55% of the people were wrong because they wanted to read it fast; when they started to try to go faster they started to mess up more. In conclusion,

the brain can be confused with the different mixtures provided to make a word look or seem different and John Ridley Stroop's theory is correct. If one works hard enough, he/she can practice getting better at these perceptions and overcome the confusion.

5426**Which Nail Strengthener Makes Your Nails Grow Faster and Stronger?**

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The purpose of this experiment was to find out which nail strengthener makes nails grow faster and stronger, and if what the companies advertise is true. For our experiment, we tested three nail strengtheners that claim they can make nails grow faster and stronger. We applied the nail strengtheners to our nails and recorded how much they grew each week. Our hypothesis was that the Sally Hansen Vitamin Treatment would work the best because it had the most vitamins. After observing our nails for six weeks, we found out that the Sally Hansen Vitamin Treatment made our nails grow faster and made them stronger. The Nail Envy Nail Strengthener made them stronger but did not help them grow. Our results agreed with our hypothesis that the Sally Hansen Vitamin Treatment would help our nails grow faster and be stronger.

5427**Does Adding Salt to Water Affect Its Temperature?**

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The purpose of this science fair project was to find out if adding salt to water affects its temperature. Our hypothesis was that the salt would make the temperature decrease. The materials we used were salt, water, plastic cups, a thermometer and a measuring cup. We measured one cup of water, poured it into nine cups and recorded its temperature. Then we added various amounts of salt in each cup and measured the temperature of the saltwater. Our results were that the more salt we put in the water, the colder it got. By conducting this experiment, we learned that it takes energy for salt to dissolve and it gets that energy by taking heat from the water, thus making the water temperature colder. After completing this experiment, we learned that salt does decrease the temperature of water, thus proving our hypothesis to be correct.

5428**Which Liquid Boils Faster?**

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The purpose of our experiment was to find out the boiling rates of different liquids. We used bottled water, saltwater, tap water, sugar water, milk, orange juice with pulp, and orange juice without pulp. We placed 2 cups of each liquid into the same type of pot and set them on the same heat. Most of the liquids started bubbling in 2 to 3 minutes and then started to boil, but the milk started bubbling

in 5 to 6 minutes. The first liquid to boil was the plain drinking water. Saltwater came in second and the milk was the last to boil because it had a higher fat content. Our hypothesis was that saltwater would boil the fastest, but our results did not agree with that.

5429

How Fast or Differently Do Cut Apples Brown in Different Conditions?

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The purpose of this experiment was to see which storage conditions prevented apples from browning. This meant no additives to the apples, such as salt or lemon juice. I chose three locations: table (control), drawer (low oxygen) and refrigerator (cold area). The table is where I usually leave cut apples, which is why it was the control in this experiment. I also chose three types of wraps: plastic, tinfoil and uncovered. I let all apples sit for three hours while recording my observations each hour. My hypothesis was that tightly wrapped apples in the fridge would brown the least, while uncovered apples on the table would brown the most. According to my research, the browning is literally rusting, which is caused by iron in the PPO (polyphenol) enzyme within the apple when it oxidizes. Salt, lemon juice and very low oxygen prevent this enzyme from acting. During my experiment, I noticed that apples under tinfoil browned more than the other apples, which I learned was due to a reaction between the iron and the aluminum. In conclusion, to keep apples fresh, wrap them tightly in plastic and place them in the fridge. If you really enjoy brown apples, place them in a drawer wrapped in foil. My hypothesis for the freshest apples was correct, but it was incorrect for the brownest apples.

5430

Which Permanent Colors Are More Permanent?

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The purpose of our experiment was to find out what color Sharpies were the easiest and the most difficult to remove. We have noticed that some Sharpie markers can be removed easily so we wanted to test that. According to our research, a Sharpie mark can be removed with alcohol. We got 12 different colored permanent markers and drew a 1 ½-inch line on a whiteboard, waited 15 to 30 minutes, and wiped it off using a cotton ball dabbed with alcohol. We found out that black was the hardest to remove after 15 minutes and magenta was the hardest to remove after 30 minutes. Light blue was the easiest to remove after 15 and 30 minutes. This shows that light colored permanent markers erase easier than dark colors. Our hypothesis was wrong because we thought that the yellow Sharpie was going to be the easiest to remove and that the black would be the hardest.

5431

Which Cheese Do Mice Like the Best?

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We wanted to find out which cheese mice actually preferred because in the cartoons, a mouse almost always is eating cheddar. We wanted to know if mice really did have a cheese preference. We tested four different cheeses – ricotta, cheddar, jack and Parmesan – three times on three different mice and recorded the cheese the mice chose. After the trials, we noticed that the mice did not favor a particular cheese, but ricotta and jack were a little more popular than the other two cheeses. Our hypothesis was that the mice were going to like cheddar the best, but we were wrong. Mice did not favor a particular cheese. We think that in general, they prefer softer cheese over the harder kinds.

5432

Which Material Is the Best for Soundproofing?

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The purpose of our experiment was to find out what materials would be the best to use for soundproofing. We made boxes out of glass, wood, cardboard and plastic. To do this experiment, we played music covered with each box and measured the sound with a decibel meter that was set 8 feet away from the music. We measured the intensity of the sound in the unit dB. We repeated the experiment for all four boxes two times. Our hypothesis was that wood would be the most soundproof, since it has the highest density. Our results were: glass: 49 dB; wood: 66 dB; cardboard: 64 dB; and plastic: 60 dB. We observed that glass was most soundproof, because its decibel levels were the lowest. All of the materials were of the same volume and thickness, so nothing had an advantage over another. Our control was the regular volume of a sound by itself, with no other material covering it. The control sound was 73 dB, so all of the materials were a bit soundproof, but the best was glass. This was because out of all of the other solids, glass was the least dense in terms of atoms. In our research, we learned that the denser an object is, the easier sound will travel through it. Wood has the highest density, so that's why it was the least soundproof. Cardboard has the second-highest density and plastic the third. In conclusion, our hypothesis was proven to be incorrect. Wood was the least soundproof material and glass was the most. These results are useful for everyday life situations, especially for construction.



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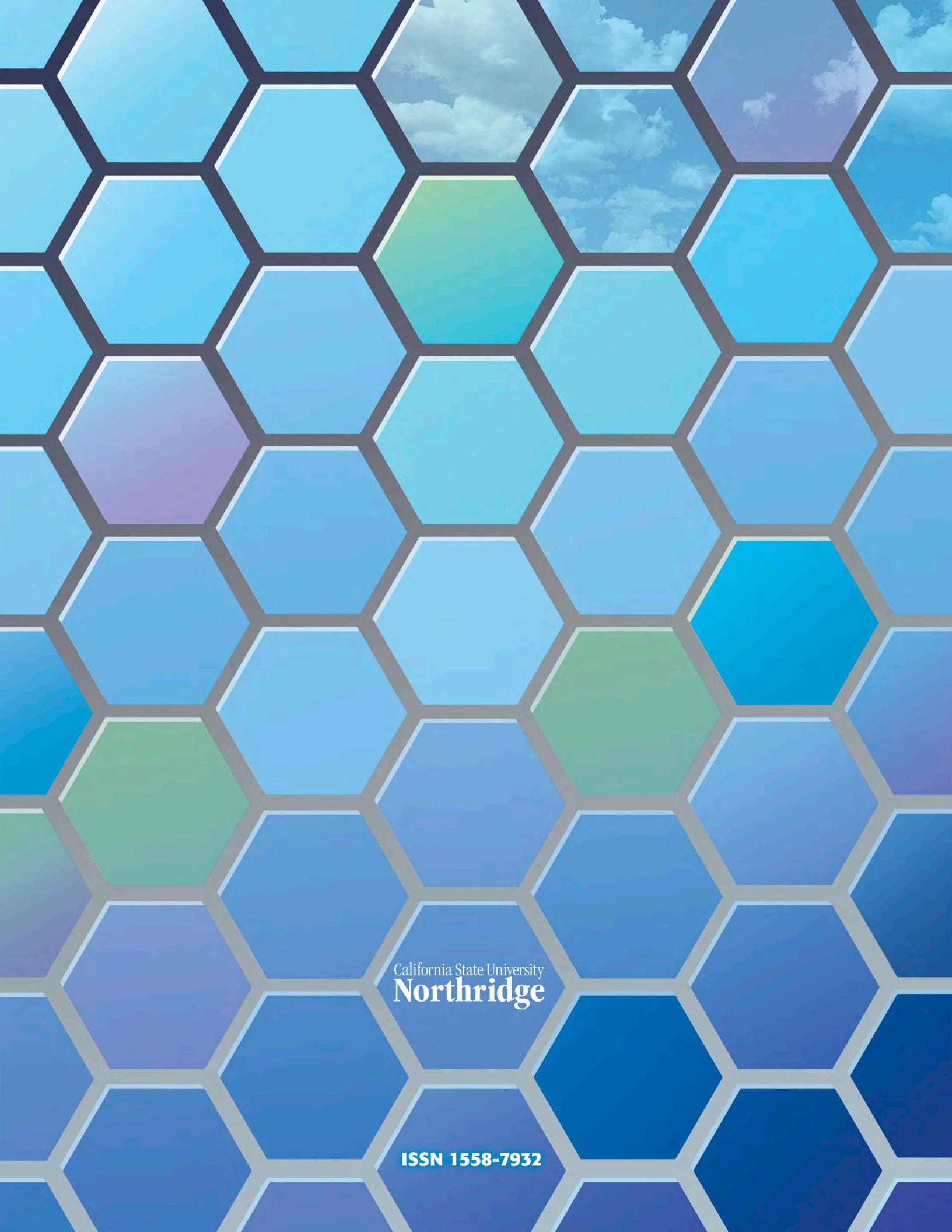
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