

VOLUME 21 / 2016

The New Journal of Student Research Abstracts

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VOLUME 21 / 2016

Editor

STEVEN B. OPPENHEIMER, Ph.D., Professor Emeritus
California State University, Northridge

Sponsor

CALIFORNIA STATE UNIVERSITY, NORTH RIDGE

The New Journal of Student Research Abstracts 2016

Volume XXI

*An Annual Journal For Young Investigators
and Their Teachers*

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We are pleased to welcome you to the 2016 edition of the *Journal of Student Research Abstracts*. The innovative brainchild of Dr. Steven Oppenheimer, Professor of Biology at California State University, Northridge, the *Journal* for more than 26 years 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. As Thomas Jefferson wrote long ago, democracy cannot survive without the unending "diffusion of knowledge."

The excitement of conducting true, hands-on research and seeing the results of their work published in the *Journal* provides students with the kind of experience, confidence, and pride that are essential to encouraging them 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 Obama with a U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring in 2009.

CSUN is pleased to make the journal available online free of charge to students and teachers who wish to be inspired and see the innovative research conducted by their peers.

We are proud to support the work of Dr. Oppenheimer and the teachers and students whose outstanding work is included in the journal.


Dianne F. Harrison, Ph.D.
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Dianne F. Harrison, Ph.D.
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HONORING A GREAT MENTOR AND DONOR

Julie Gorchynski, M.D., Professor

Thank you to Dr. Gorchynski for also sponsoring five awards, including a K-12 teacher research award!

IN HER WORDS

As Professor and Research Director in emergency medicine, my interest in research and education began during my graduate studies at California State University, Northridge (CSUN), in biology as a master's student under the supervision of Steven B. Oppenheimer, Ph.D.

I received two bachelor's degrees at CSUN, in public health and biology. During the master's program I taught CSUN biology laboratory courses to undergraduate students. My mentoring of students began during this time and continued through my medical training. After obtaining a master's degree in 1987, I went to medical school at Creighton University School of Medicine in Omaha, Nebraska. I returned to California in 1991, where I completed my specialty residency training in emergency medicine at Loma Linda University Medical Center in 1994.

As an academic faculty for the past 20+ years, I have mentored hundreds of high school, undergraduate premedical and preprofessional health students, medical students and residents. Since 2011, selected graduate students in the master's program in the Center for Cancer and Developmental Biology at CSUN receive a *Julie Gorchynski, M.D., MSc Research Scholarship Award* for research supplies to advance graduate student research. Most recipients are now in post-graduate Ph.D., M.D., dental and law programs.



I also have been involved in clinical emergency medicine, research and education since 1991 in California at Loma Linda University Medical Center and at the University of California, Irvine, Medical Center, as well as in Texas at Texas A&M and the San Antonio UT Health Science Centers. I have been an invited speaker for local, state, national and international emergency medicine conferences, where I had also been selected to present my research. I have numerous publications in medical journals for my clinical research in emergency medicine. One of my numerous awards in research includes a Certificate of Recognition from the National Science Foundation and Research Director Program awarded to me by Dr. Oppenheimer, NSF/U.S. Presidential Award recipient, Director for Cancer and Developmental Biology. This certificate was signed by Dr. Oppenheimer and by the late Francis H.C. Crick, Nobel Laureate, Honorary Project Chair.

Many of the students I have mentored in the past 20 years have entered into professional postgraduate training in medical, dental, veterinary, pharmacy, nursing, physical therapy, law and Ph.D. programs.

It has been said that “as a teacher, it isn't someone who teaches something, but someone who inspires the student to give of their best in order to discover what they already know.”

CSUN STUDENT RESEARCH JOURNAL CELEBRATES 21st Year of Changing Young Lives

For more than two decades, *The New Journal of Student Research Abstracts* has been sparking the scientific imagination of K-12 students for the present and future.

Watch our video and read more about the excitement the journal generates at <http://bit.ly/1MaPsGF>.

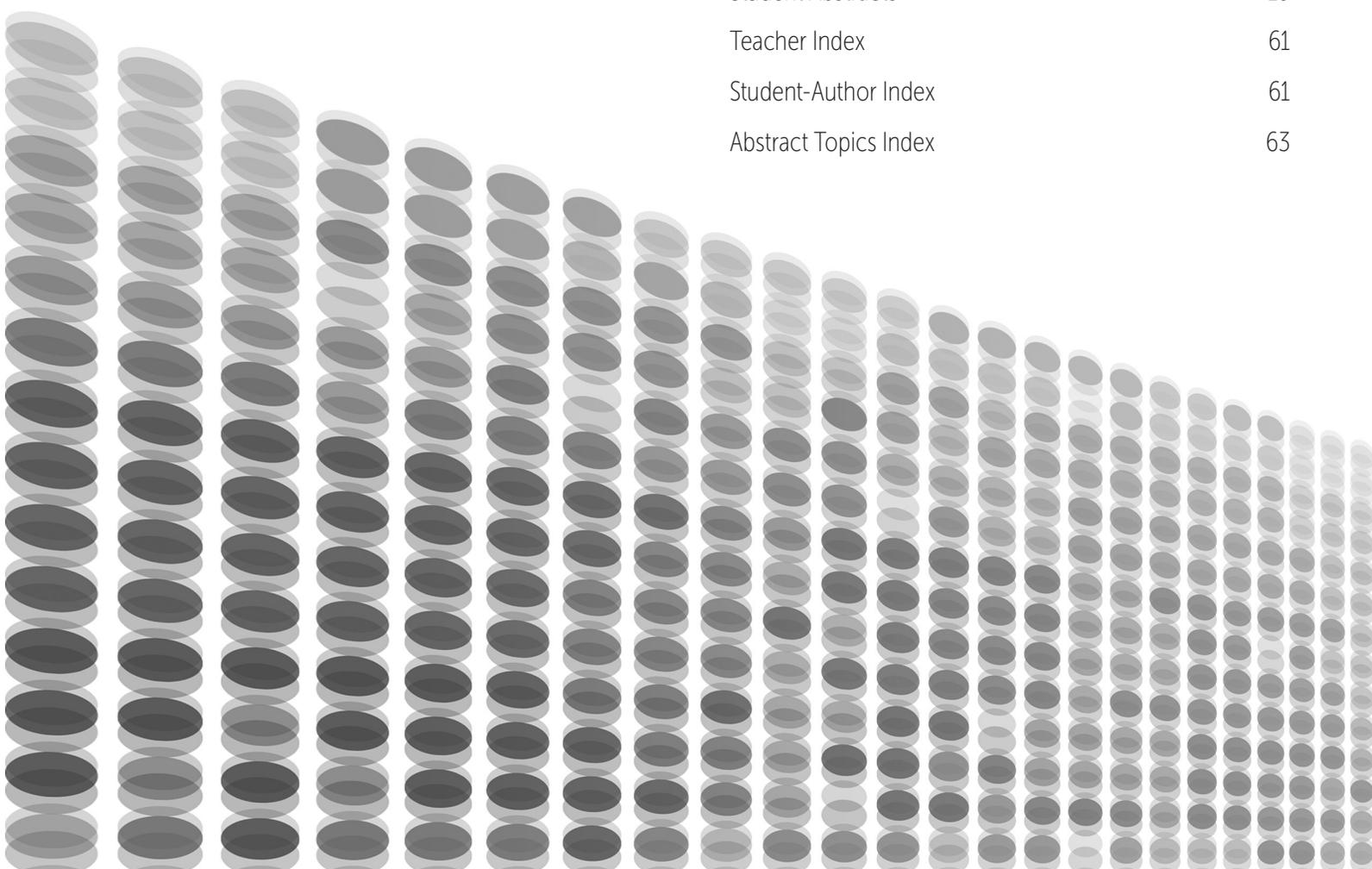
For more information, contact Steven Oppenheimer at steven.oppenheimer@csun.edu.



The New Journal of Student Research Abstracts

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ABOUT THE EDITOR

Steven B. Oppenheimer, Professor Emeritus, received his 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 more than 300 publications and national presentations, 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.

In addition, he serves on the editorial board and is editor for the United States, Canada and South America of the more than 60-year-old 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 its past support of the journal, helping give wings to students' educational dreams!

Editor's e-mail address: steven.oppenheimer@csun.edu

Editor's program websites:

www.csun.edu/biology/faculty/oppenheimer.htm
www.youtube.com/watch?v=JQCd5NIFVoQ
www.youtube.com/watch?v=KmlN6DHW3nQ

ABOUT THE ASSOCIATE EDITORS

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.

Mindy Berman, owner of Mindy F. Berman Communications, has nearly 30 years of experience in public relations and marketing communications. She has coordinated numerous successful communications and educational programs, and — bringing organizations the "write stuff" — also has written and edited all types of materials. This work includes authoring a book titled *Celebrate Pasadena's Vision: 100 Years of Community-Owned Power*, and editing *The New Journal of Student Research Abstracts* since 2006. She earned her bachelor's degree in journalism from CSUN and her MBA from Pepperdine University, and previously taught public relations and writing courses at UCLA Extension, CSUN and Woodbury University.

Website: www.mfbcommunications.com

ABOUT THE DESIGNER

Alvalyn Lundgren has designed *The New Journal of Student Research Abstracts* since 2006. She is the founder of Alvalyn Creative, an independent design and illustration practice located in Southern California. She assists businesses, organizations and entrepreneurs in building their visual platforms and brands through print and website design, logos, publications and books. She has received national design awards for her work, including *The New Journal of Student Research Abstracts*. A graduate of the Art Center College of Design in Pasadena, CA, she also is a part-time instructor of design in the Interior Architecture program at UCLA Extension.

Website: www.alvalyn.com

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.

CSUN Science has been ranked No. 1 in North America in the largest percent increase in publications in high-impact journals 2012-2015 by Nature Index.

Website: www.csun.edu

WE'RE ONLINE!

The New Journal of Student Research Abstracts is published online at <http://bit.ly/1NkuzYH>.

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, and may be edited for clarification or grammar corrections. 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 versus 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 a **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.



A Golden Opportunity For Underrepresented Science Students Interested in Careers in Biomedical Research

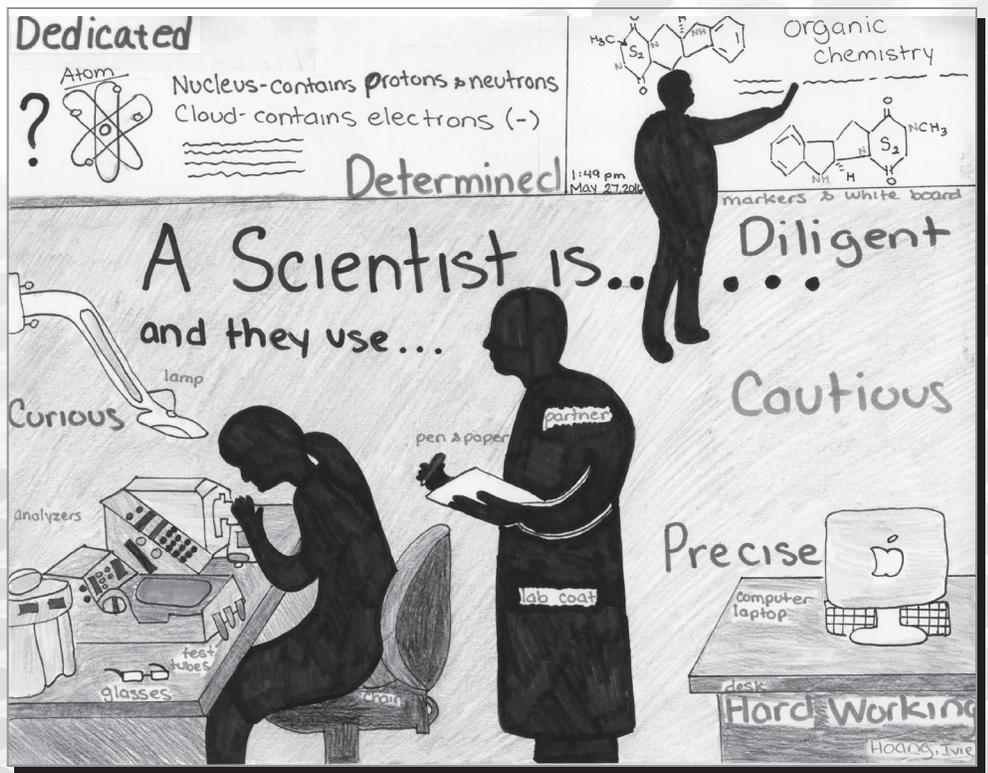
To those underrepresented science students who select California State University, Northridge, for your college experience: We have a golden opportunity for you. If you are a U.S. citizen or permanent resident and if you are possibly interested in a Ph.D. degree in biomedical science, you can apply for 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**.

What Is a Scientist?

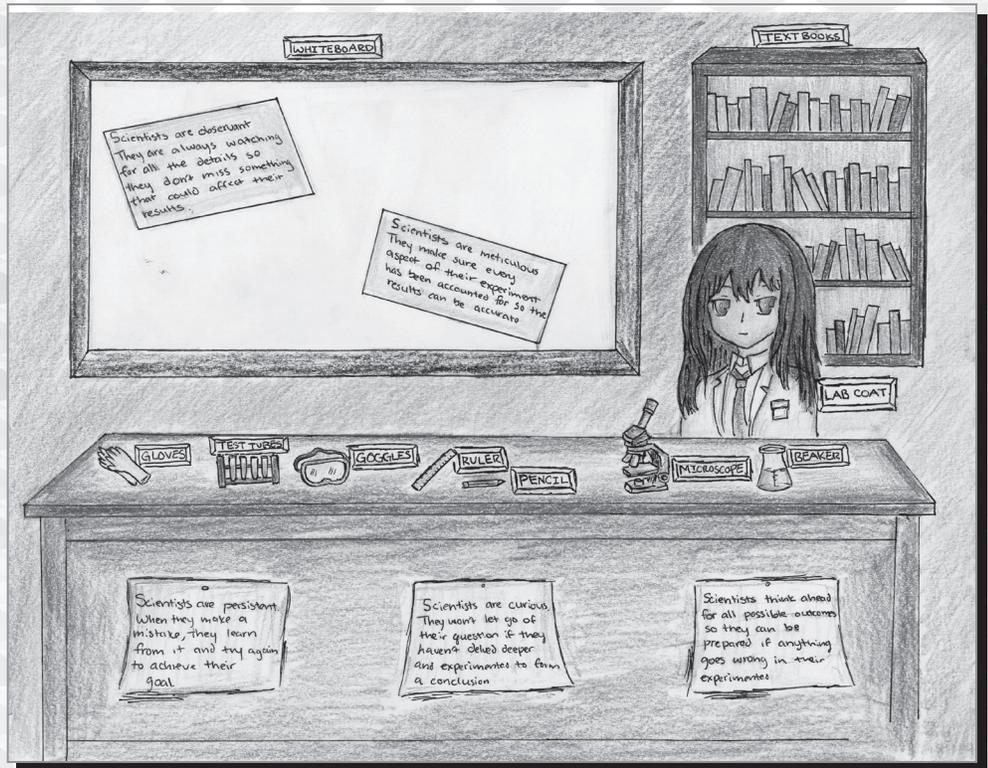
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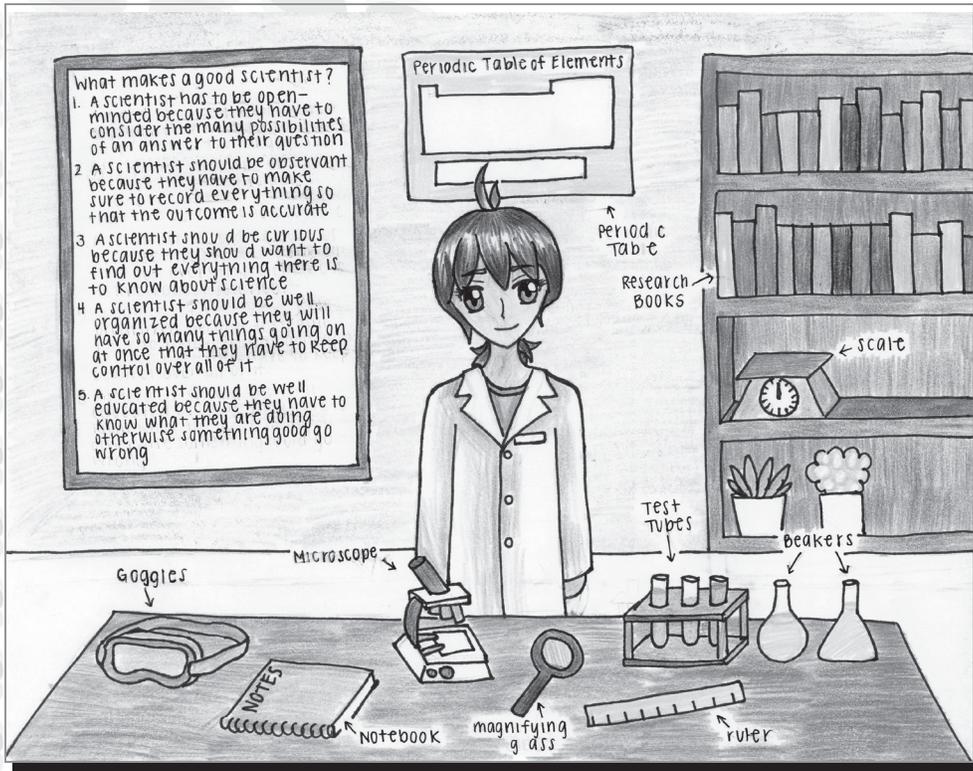
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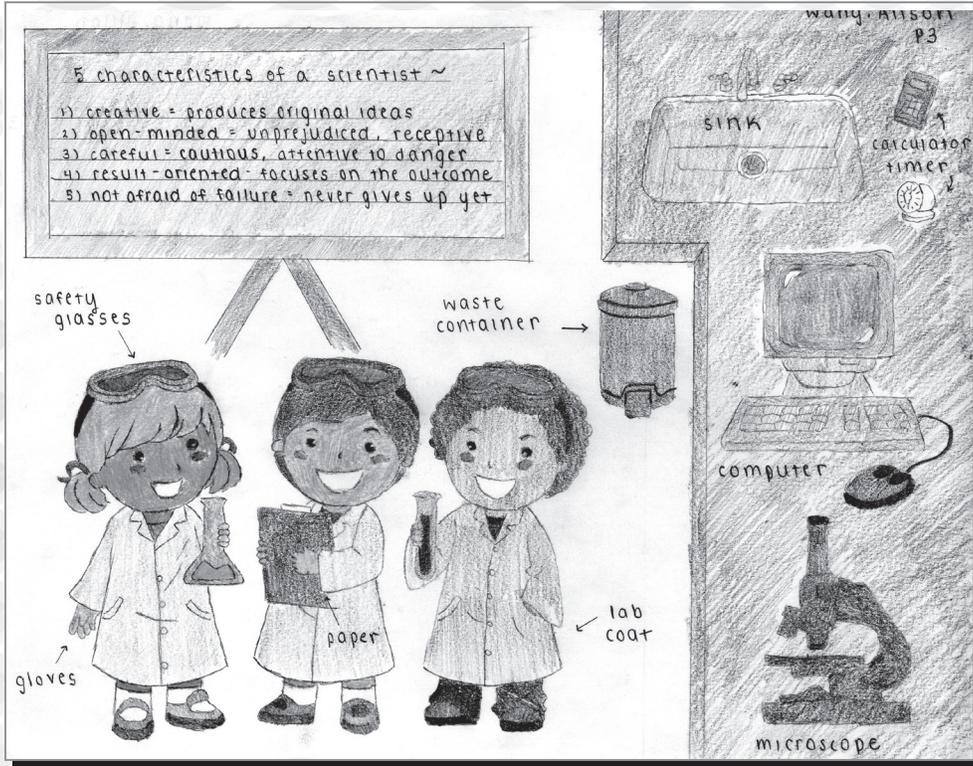




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The New Journal of Student Research Abstracts

ABSTRACTS

5959

Finding *Photorhabdus luminescens* in the Santa Monica Mountains

Alex Bermudes and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was based on trying to find the nematode *Heterorhabditis* and its mutually symbiotic partner *Photorhabdus luminescens*, a gram-negative bacterium, in the Santa Monica Mountains. First, I collected three soil samples from each of three locations, putting five wax worms in each sample for three to five days. Once those days passed, I found each red worm, which was tested for bioluminescence. If it passed that test, which none did, I would have done a polymerase chain reaction (PCR) to identify *Photorhabdus*. In the end, no *Photorhabdus* was found.

5960

The Race to Relief

Adam Hussain and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment tested the possible effects of water temperature on the dissolve time of a 200-mg ibuprofen pill in water. A pill was dropped into a glass bowl that contained one cup of 16°C, 26°C or 36°C water, and the dissolve times were recorded. Three different types of 200-mg ibuprofen pills were used in this experiment, which were tablet, caplet and softgel. Each different combination of pill type and water temperature was tested three times. The water temperature that all three types of pills dissolved in the fastest was 36°C. The pill fastest to dissolve overall was the caplet, which had a faster dissolve time than the tablet or softgel in all three water temperatures. The tablet was second fastest and the softgel was third. This showed that the caplet in 36°C water dissolved faster than any of the other eight combinations of 200-mg ibuprofen pill types and water temperatures that were tested.

5961

Solar Versus Battery

Aileen Fateha and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment examined whether a battery-powered car would go faster than a solar-powered car. Two remote control cars were bought and the hood of one car was removed. The first car had batteries and the hoodless car had a solar panel inserted on top. Each car was tested on how far it would go in a second. Both cars were tested three times in different weather: once while it was sunny, once while it was cloudy and once while it was raining. On the sunny day, both cars traveled at 6 ft/sec.

On the cloudy day, the battery-powered car traveled at 6 ft/sec and the solar-powered car at 2 ft/sec. On the rainy day, the battery-powered car traveled at 6 ft/sec and the solar-powered car at 0 ft/sec. Based on this experiment, the battery-powered car is faster than the solar-powered car.

5962

The Effects of Caffeine on the Emergence Rate of Fruit Flies

Alex Kegel and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment investigated whether caffeine could potentially affect the emergence rate of fruit flies, known as *Drosophila melanogaster*. Three groups of three vials of flies were tested. Each group contained a Control Vial (no caffeine mixed into food), a Low Vial (50 mg of caffeine mixed into food), and a High Vial (100 mg of caffeine mixed into food). Of all three groups, the Control Vials had the flies to lay eggs more quickly, and for the flies to emerge as larvae. Worth noting is that the Control Vials also had the most eggs, larvae and flies. The Low Vials had slightly fewer larvae and slower emerge times, but eventually caught up to the Control Vials. In the High Vials, there was a very significant drop in larvae count, hatch times and even life span. In fact, in High Vial 3, it took 13 days for one fly to hatch. The results strongly suggest that caffeine does have a significant effect on fruit fly emergence rate.

5963

Reaction Times With Covered Eyes

Andrew Domingo and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

Do people react differently when certain eyes are covered? That was the purpose of my experiment. For my experiment, I covered a person's eyes (independent variable) to see how his/her reaction time (dependent variable) changed. My hypothesis was that when he/she had both eyes covered, the reaction time would be the fastest. The experimental results showed that the person with both eyes covered had the best reaction time. My experiment also showed that people reacted faster when their hand and eye on the same side were paired.

5964

The Effect of Water Depth on Wave Velocity*Andrew Nguyen and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project covered the subject of tsunamis and the effect of water depth on a produced wave's velocity. This experiment required filling a large plastic container with water and dropping a wood block into the water to find the average amount of time in seconds it took for the produced wave to reach the other side of the container. There were 90 tests: nine trials with 10 tests each. The experiment included three trials for each depth, with three depths of 1 cm, 2 cm and 3 cm. Average wave velocity for 1 cm was 0.31 meters per second, 0.44 meters per second for 2 cm, and 0.54 meters per second for 3 cm. Naturally, the conclusion was that the greater the depth, the greater the velocity.

5965

Measuring the pH of Saltwater After It Gets Purified*Andy (Seongjune) Cho and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

Studies show that when saltwater evaporates, it leaves the salt crystals behind. Boiling speeds the process of evaporation. Ocean water has salinity between 4% and 6%, and has a pH of around 7.25. Distilled water has a pH of around 6.25 or lower. Ocean water has a higher pH because salt is in the water. More salt causes the pH to rise higher. With this, water can turn into distilled water if it is evaporated. This was measured using pH measuring paper. Each experiment was repeated three times. First the saltwater had a dip and it had a pH of around 7.28. After it got boiled and the water was put into a bowl, it had a pH of around 6.23. The results suggest that when saltwater is boiled, it can turn into drinking water.

5966

The Most Efficient Pitch Angle of a Wind Turbine Airfoil*Anson Noland and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project studied the efficiency of wind turbine airfoils set at different pitch angles at increasing wind speeds. Rotor hubs with airfoils attached at 0, 15, 30, 45, 60 and 75 degrees were connected to a drivetrain and generator. They then were tested at speed 1, speed 2 and speed 3 of an adjustable fan for 1 minute, and the average of the range of milliamperes was recorded. Each experiment was repeated five times. At 0 degrees, the overall average number of milliamperes produced was 10.56 at speed 1, 14.25 at speed 2, and 16.02 at speed 3. At 15 degrees, the average number of milliamperes produced

was 21.2 at speed 1, 27.27 at speed 2, and 30.87 at speed 3. At 30 degrees, the average number of milliamperes produced at speeds 1, 2 and 3 were 28.16, 35.68 and 41.25, respectively. At 45 degrees, the average number of milliamperes produced at speeds 1, 2 and 3 were 32.55, 42.27 and 48.51, respectively. At 60 degrees, the average number of milliamperes produced was 37.55, 53.79 and 63.23 at speeds 1, 2 and 3, respectively. At 75 degrees, the average number of milliamperes produced was 0.06 at speed 1, 42.6 at speed 2, and 54.59 at speed 3. These results suggest that 60 degrees is the most efficient pitch angle for a wind turbine airfoil.

5967

Colors, Shapes and Time*Anthony Bermudez and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment tested whether or not peripheral vision is affected by the time of day. Nine different shapes (three squares, three triangles and three circles) were used. There were three different colors used, and one of each shape was one of those colors. For example, there was one pink square, one black square, one green square, one pink triangle, one black triangle, etc. The three colors used were red, purple and yellow. The data showed that, on average, it was easiest to see the red circle. The data also showed that it was hardest for most subjects to recognize the purple triangle. On average, the test subjects saw the best at 9 a.m. and the worst at 6 a.m. In conclusion, the data suggests that the time of day does affect your peripheral vision.

5968

Does Taste Threshold for Sweetness, Sourness, Saltiness and Bitterness Depend on Age, Gender and Genetics?*Anya Ekizian and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this study I examined if age, gender and genetics have anything to do with the way someone tastes sweetness, sourness, saltiness and bitterness. Participants were given 10%, 1%, 0.1% and 0.01% sucrose, sodium chloride, vinegar, and lemon solutions. If they could taste the solutions, a check went onto a data table. The lowest concentration at which you can still taste the sweetness, sourness, saltiness or bitterness is your approximate taste threshold. The results were that age, gender and genetics did not play a role in the way someone tasted sweet, sour, salty and bitter tastes.

5969

Reading Music: Color Versus Black and White

Bridget Weingart and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was designed to find out if music can be read and played faster when the notes are in color versus in black and white. Twenty subjects each played the same section of 25 notes from four different songs. Two of the songs were in color, and two of the songs were in black and white. The average times it took to play each song were as follows: 7.8975 seconds and 8.195 seconds for the colored music, and 8.286 seconds and 8.331 seconds for the black and white music. Thus, the subjects played the colored music faster than they played the black and white music. This indicates that when subjects read and play music in color, they read and play music faster.

5970

The Effect of Different Amounts of Electricity on Mung Bean Growth

Cameron N. Middleton and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project looked at how different amounts of electricity affect the growth of plants (mung beans). Mung beans were supplied with three different electric voltages (9 volts, 4.5 volts and AAA) for a week. This process was carried out three times. The results of each trial showed that the plants with the highest voltage (9 volts) grew faster than the plants with the lower voltages (4.5 volts and AAA) or no voltage.

5971

Ballet Dancers' Brains Adapt to Help Them Avoid Feeling Dizzy When They Turn

Carolina Ivchenko and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment investigated the question of how dizziness affects dancers and non-dancers. Recently, scientists have uncovered differences in the brain structure of ballet dancers that may help them avoid feeling dizzy when they perform a type of turn called a pirouette. The research suggests that a couple of years of training can enable dancers to suppress signals from the balance organs in the inner ear. For my experiment I gathered 10 test subjects, half who have performed ballet for at least two years and half who have never tried ballet, and tested their responses to being spun in a rolling chair 20 times. My five dancer test subjects stopped feeling dizzy after 10-14 seconds. My five non-dancer test subjects stopped feeling dizzy after 17-29 seconds. My experiment

was a success that showed dancers do have the ability to build up a resistance to become less dizzy compared to people who don't dance.

5972

Studying the Effects of Weight on Different Roof Structures

Carter Whetstone and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study investigated the effects of weight applied to three different roof structures to identify the strongest roof design. Weight was applied to three styles of roof designs: double W, trussed and low profile. The test was conducted a total of nine times, with three experiments for each style. For each test, weights were added until each roof collapsed, and the total weight that each roof withstood was measured in kilograms. The double W withstood an average weight of 12.7 kg. The trussed roof frame withstood an average weight of 10.43 kg. The low profile withstood an average weight of 7.67 kg. The double W withstood the most weight of the three styles, making it the most ideal choice for roof manufacturing when a strong roof is needed.

5973

The Effect of Ball Bearings' Temperatures on the Distance Traveled in a Linear Magnetic Accelerator

Cassidy Dalva and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study observed the effect of ball bearings' temperatures on the distance traveled by the ball bearings in a linear magnetic accelerator. For the first experiment, ball bearings left at room temperature were placed in the linear magnetic accelerator, and one ball bearing was sent down the ramp. The distance from the point where the ball landed after it left the table to the edge of the table was calculated, and the process was repeated 10 times. The ball bearings were then placed in a freezer overnight for the second experiment. The second experiment was carried out identically to the first, with the exception that the ball bearings were placed for 5 minutes in the freezer before each subsequent repetition. Lastly, the ball bearings were boiled for 5 minutes in 212° F water for the third experiment. This experiment was carried out in the same pattern as the first and second experiments, but the ball bearings were boiled as mentioned before each repetition. The results of this experiment suggested that the temperature allowing the ball bearings to move the farthest tended to be room temperature (approximately 70° F).

5974

A Tight Spiral Improves the Flight of a Football Thrown Through the Air More Than a Loose Spiral

Chance Tucker and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The purpose of this investigation was to determine the impact of a football's spiral on the distance the football travels and the smoothness of its flight. Two subjects were observed and measured throwing football passes on a sunny and windless day. The subjects used the same football inflated to the same pressure. One subject weighed 99 lbs., and the other weighed 240 lbs. Both subjects threw passes of 10, 20 and 30 yards while gripping the football's laces and without gripping the laces. Three trials at each distance for each subject were measured and recorded. The data and results were analyzed and demonstrated that footballs thrown while gripping the laces tended to produce tighter spirals and longer-thrown balls than passes made without gripping the laces – which generally produced more wobbly and shorter passes. Further observations found that footballs thrown while gripping the laces also were easier to catch and were more accurate than passes made without gripping the laces.

5975

What Is the Most Efficient Propeller Design For Planes?

Chandrahaas Mariserla and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment examined the question of what type of propeller designs would be most efficient for planes by how much thrust and lift they could create. A multimeter was attached with alligator clips to a 4.7k OMEGA resistor and a DC motor. All propellers were press fitted and drilled to the motor. The propellers were held the same distance from a fan and the efficiency was determined by the digital multimeter in the range of 10 millivolts. Each propeller was tested three times, and the average of the millivolts was calculated to get the final results. The gray plastic propeller and the broad blade had to be tested one extra time since they had the same average, 0.10. After a fourth test, the gray plastic propeller had an average of 0.13 millivolts.

5976

Effects of Temperature on the Acidity of Juices

Charis Kuok and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project was designed to test if temperature affects the acidity of three juices. Two hundred mL of orange juice, apple juice and lemon juice were boiled, and 200

mL of the same juices were put in a refrigerator for 1 hour at about 3°C (37°F). Their pH levels were recorded before and after the experiments. Each experiment was repeated three times. The orange juice's acidity didn't change in either experiment, the apple juice's acidity changed in both experiments, and the lemon juice's acidity changed when it was boiled. The results suggested that only some juices' acidities will change when their temperature changes, and also that the change in acidity may depend on whether the juices are put into a hot or cold temperature.

5977

Comparing the Amounts of Electrolytes in Sports Drinks

Charlynnne Marcos and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment determined which sports drink (Gatorade, Powerade or vitaminwater) has the most electrolytes. The amount of current in milliamperes (mA) produced by each sports drink was measured. This was repeated 10 times. The average of all 10 trials was then found, converted to amperes, and plugged into an equation to calculate conductance. Gatorade had 17.78 mA for its average current and 0.001976 siemens for its conductance. Powerade had 19.83 mA for its average current and 0.002203 siemens for its conductance. Vitaminwater had 25.124 mA for its average current and 0.0027915 siemens for its conductance. The results suggested that vitaminwater has the highest amount of electrolytes.

5978

Mathematical Patterns in Bach's Music

Chloe Park and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The purpose of this project was to find out if there are mathematical patterns in Johann Sebastian Bach's music. The hypothesis was that there are mathematical patterns in Bach's music. Several pieces of randomly selected music by Bach were searched for mathematical patterns, including translation, palindromes, inversions, glide reflections, frieze patterns and transposition. The music was written into letter music (for example, the note C). Then the letters were written into a number code and inserted into an x,y coordinate table. The numbers were plotted and graphed. Many patterns were found in the graphs, concluding that there are mathematical patterns in Bach's music.

5979

Do Video Gamers Have a Faster Reaction Time Than Non-Gamers?*Christian Peralta and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was performed to examine if video gamers have a faster reaction time than non-gamers. Eight subjects were given a test using an online application to find their reaction times. The test was repeated three times for each subject. On average, four out of five gamers had a faster reaction time of about 0.05 seconds, or 50 milliseconds. The results proposed that gamers have a faster reaction time than non-gamers.

5980

Effects of Salt, Shade Balls and a Cover on Evaporation*Collin Origer and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study was designed to investigate conserving California's limited water supply. My objective was to see if we are using the most effective method to save our water. I used a fairly simple method. I started out with 340 grams of water in four bowls, added salt to one bowl, shade balls to the second, and the cover to the third one. I left one bowl as a control cup (with no factors to slow down evaporation). I hypothesized that the shade balls were going to prove most effective, since shade balls are being used in reservoirs in California. My results, however, suggested that California is not using the most effective method to preserve our water. The cover proved to be more cost efficient and best at saving water.

5981

Effects of Action Video Games on Your Attention to Detail*Darren Chang and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study experimented with action games and the human brain. Subjects were told to play an action game for a certain amount of time. Then they each took a test to measure their attention to detail. Each subject was tested three times. Subjects played action games for a range of 0 to 4.5 hours total. The subjects who played for 1.5 hours per test for their chosen time got the highest score, followed by 1 hour (just a little bit behind), as well as the 0.5-hour and 0-hour subjects. This happened throughout all of the tests. The results showed that when subjects spend more time on action games, they improve their attention to detail, though the improvement is only very slight.

5982

Effects of Different Liquids on the Growth of Basil Plants*David Wong and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the question of the effects of Minute Maid Lemonade, Gatorade and Diet Coke on basil plants. Every other day, the plants were watered with 60 milliliters of each liquid: three basil plants were watered with Minute Maid Lemonade; three were watered with Gatorade; three were watered with Diet Coke; and three received water for two weeks. Every seven days, including the first day, the plants were measured. The plants that were watered with lemonade averaged a growth of $\frac{1}{6}$ cm over the two-week span. The plants that were watered with Gatorade averaged a growth of 1.466 cm over the span. The plants that were watered with Diet Coke averaged a growth of 3.066 cm over the span. The control group (water) averaged a growth of 4.56 cm over the span. The results suggested that Diet Coke is the most likely of the three different liquids to help the growth of basil plants.

5983

Effects of Amount of Fat in Milk on Spoiling Rate*Eliza Beam and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the question of whether or not the amount of fat in milk affects how fast it spoils. At room temperature, 20 ml of each type of milk — fat-free, 1% fat, 2% fat and whole milk — were left on a counter in containers with sealed lids. For four days, the milk was smelled and examined for any signs of spoilage. This experiment was done three times. For Trial A, 1% fat milk turned solid first, but fat-free milk smelled sour first. For Trial B, whole milk turned yogurt-like first and 2% fat milk smelled sour first. For Trial C, fat-free milk smelled sour first and 2% fat milk became yogurt-like before the rest. The conclusion of the experiment was that fat doesn't really affect the rate of milk spoilage.

5984

Drinks That Make Eggshells Rot Faster*Ellise Jaung and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

Drinks with high sugar, acidity and caffeine create a greater chance of tooth decay. Eggs symbolized teeth in the experiment. Coffee, Earl Grey tea and Coke all have caffeine. The project tested which drink rotted the eggshells the fastest. Coffee rotted the eggshells the fastest, while the eggshells in Coke rotted only a little. The eggshells in the Earl Grey tea didn't rot, but only stained.

5985

Effects of Angle of Impact on the Speed of a Soccer Ball*Emma Bartholomew and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study researched and experimented with different angles of impact and how they affect the speed of a soccer ball. A contraption was used to kick the ball with the same force for every trial. The shoe was placed at a 90-degree angle on the contraption. The ball was timed on how long it took to travel 4.5 meters. This process was repeated 30 times for each angle. An average speed was found for each angle. The 90-degree angle had an average speed of 4.58 meters per second. The 45-degree angle had an average speed of 2.27 meters per second. Last, the 5-degree angle had an average speed of 3.52 meters per second. These results indicated that the angle of impact does affect the speed of a soccer ball. The data also indicated that the 90-degree angle creates the most speed, while the 45-degree angle creates the least speed.

5986

Effects of Temperature on Freezing Time*Eric Chi and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was conducted to find the fastest way to solidify water of different temperatures. The water was heated and cooled to the desired variables, which were 10°C and 70°C, and to the control, which was 23°C. Water was confirmed frozen when fully solidified. The variables and control were retested three times. The water at 70°C froze, on average, at 5 hours and 26 minutes; the 10°C water froze, on average, at 5 hours and 37 minutes; and the control temperature water froze, on average, at 5 hours and 52 minutes. The conclusion of this experiment was that higher-temperature water freezes faster.

5987

Which Method of Soundproofing Is Most Effective?*Ezra Golub and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined which soundproofing method is most effective by treating identical cardboard boxes with different soundproofing materials. The methods were tested by using a decimeter to measure the noise from a speaker inside of each box. The noise was a consistent tone of 320 Hz with a gain of 0 dB sent via Bluetooth from a tone generator app on a cell phone to the wireless speaker inside each box. The methods used were noise reduction, sound absorption, sound dampening and sound decoupling. Also, there was a control of just a box, and a control without a box. As expected, the control

without a box was the loudest and the second loudest was the control with a box. Then noise reduction was slightly louder than the decoupling method. The second-quietest method was sound dampening. The results suggested that sound absorption is the most effective method to soundproof a room.

5988

Effects of Salt on Pinto Bean Plants*Fernando Pulido and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this experiment, the effects of salt on pinto beans were recorded. There were three plants, and each was watered normally until they sprouted. When they sprouted, they each were watered with different amounts of salt in the water. Plant #1 had 1 gram, #2 had 2 grams and #3 had 3 grams. The salt was expected to be harmful, and it was. The data recorded suggested that the research was done correctly, meaning that salt is harmful to plants.

5989

The Effects of Shin Guards on the Force Transferred By a Moving Object*Grace Shin and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment studied the amount of force absorbed by different models of shin guards. In a simulation, a shin guard was placed on a water bottle, which represented a human leg. A rubber ball was placed on a track behind the water bottle. When struck by a moving rock, the water bottle transferred some of the force to the ball, causing it to roll. The distance the ball rolled was measured, and the data was used to compare the difference in force absorbed by each shin guard. The experiment was performed with a new Nike Park 12 shin guard, a used Nike Park 12, a new Adidas Performance F50 Youth, and no shin guard. Each shin guard type was tested five times, and the same rock was dropped from the same height each time. With the new Nike Park 12, the ball rolled an average of 9.6 cm per trial. With the used Nike Park 12, new Adidas Performance F50 Youth, and without a shin guard, the ball rolled an average of 22.4 cm, 12.8 cm and 51.4 cm, respectively. The results suggested that the new Nike Park 12 shin guard absorbed the most force out of the three shin guards, and that shin guards provide less protection after being used for a period of time.

5990

Lysol Versus Clorox: Which One Kills More Bacteria?*Gregory Demirjian and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the question of which cleaning product, between the top brands Lysol and Clorox, would kill more bacteria than the other with only four drops of each disinfectant. Each one of the disinfectants had to kill 1,000 of the bacteria in each Petri dish within six days. The experiment was repeated five times. On average, Clorox killed 96.3% of the bacteria, Lysol killed 61.2%, and a control group had 0.9% die of natural causes. The results of this experiment indicated that, on average, Clorox outperformed Lysol by over 30%. The results also suggested that cleaning products are most effective during the first 24 hours of exposure to bacteria.

5991

Effects of Different Foods on Venus Flytrap Growth*Jack Stangel and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the question of possible food involvement in the growth of the carnivorous plant *Dionaea muscipula*, or its common name, the Venus flytrap. Different groups of Venus flytraps were fed rehydrated bloodworms, crickets or mealworms once a week for six weeks at 24.4°C in the same soil. The number of the plants' leaves was recorded, along with the length of the longest leaf on each plant. Each experiment was repeated three times, with 1, 2 or 3 following the letter in each plant's code name. The rehydrated bloodworms and crickets caused an overall pattern of slowly increasing growth, followed by slowly decreasing growth, until at the end of the experiment, the plants had roughly the same measurements as at the start. But the mealworms caused growth that rose, yet did not fall, suggesting that mealworms give a quite desirable effect on plant growth. The results suggested that mealworms are the most likely of the three foods tested to increase overall growth of *Dionaea muscipula*.

5992

Answering a Question on the Same Topic Faster*James Dy and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

I did this experiment because I wanted to see if being taught with only the work or the answer would allow you to answer a question on the same topic faster. The group taught the work had an average time of 138.5 seconds (with the times for each test subject being 100, 150, 150, 115, 160, 145, 165, 175, 123 and 100 seconds), while

the group taught the answer had an average time of 152 seconds (with the times for each subject being 105, 145, 160, 125, 140, 175, 200, 180, 135 and 155 seconds). The results of my experiment suggested that being taught the work allows you to understand the second question and answer it faster.

5993

Effects of Electricity on Plant Metabolism*Jason Saffer and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment brings attention to the effects of electrical stimulation of a 9V battery on the radish plant's (*Raphanus sativus*) metabolism. Individual plants received ½ cup of water and, for 5 minutes each day after watering, were stimulated with a battery pack holding a 9V battery connected to copper nails buried in the soil. The experiment included a total of eight pots, each holding two to three seeds to ensure germination. Growth averages for the electrically stimulated and non-stimulated plants were both 0 cm for the first two days. Non-stimulated averages were higher on the third day by 0.04 cm. On the fourth day, electrically stimulated averages were higher by 0.04 cm. On the fifth day, electrically stimulated averages were higher by 0.76 cm. On the sixth day, electrically stimulated averages were higher by 0.64 cm. On the seventh day, electrically stimulated averages were higher by 0.79 cm. On the eighth day, electrically stimulated averages were higher by 0.93 cm. On the ninth day, electrically stimulated averages were higher by 1.88 cm. On the 10th day, electrically stimulated averages were higher by 1.88 cm. On the 11th through 21st days, electrically stimulated averages were higher by 0.95 cm. The results showed that the electrically stimulated plants had significantly higher growth rates than the non-stimulated plants.

5994

Effects of Rap, Pop, Classical or No Music on Students Who Are Taking a Math Test*Jeissy Lee and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project focused on whether children should be able to listen to certain types of music while taking a math test. Subjects were asked to come in and choose the songs they wanted to listen to in the rap, pop and classical genres. They did 20 problems with each genre, plus with no music at all. Questions were asked to review what they thought for each genre, including, "What do you think your highest score is? Your lowest score?" Most of them thought that they got the highest with no music, and that they ended up getting the lowest with rap. Then they found out how they did the first time, and did it again, based on what they knew about how they

could do from the tests before. The actual average percentages of the scores showed that the subjects did the best with classical music (85.83%), then pop (85.56%), next rap (84.58%), and finally no music (84.03%). I think that the students could have gotten used to listening to music, or they just liked the songs that were playing, which could have motivated them. These results showed that if students have to take a math test, they will most likely get the best score with classical music playing if classical, rap, pop or no music are the only options available.

5995

Effects of Music on Memory

Jenna Yoo and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project examined the effect of music on human memory. Each human subject was tested four times (Sets A, B, C and D). While they were examining the test they also were listening to either classical, pop, rock or no music. They got 1½ minutes to memorize as much as they could, and then 2 minutes to complete the test. The results suggested that music did not really help increase memorization. Music seemed to have distracted the human test subjects rather than help.

5996

How Does Microwave Radiation Affect the Growth of Tomato Plants?

Jonathan Tran and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment studied the possible effect microwave radiation has on tomato plants. Four groups of 10 tomato seeds were placed 5 cm away from the microwave in 0-, 1-, 2- and 5-minute intervals. Then the seeds were placed in 15¼ centimeter-wide pots and filled with 120 milliliters of potting soil. The plants that were exposed to the microwave for 5 minutes ended up being shorter than the rest, with the average length being 7.8 cm. The ones that were exposed for 1 minute had an average height of about 9.6 cm. The ones exposed to 2 minutes of radiation were 8.8 cm high on average. The ones that had no exposure grew to be 10.6 cm.

5997

Effectiveness of Hand Sanitizers and Other Antimicrobials on Bacteria

Josue Rodriguez and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment tested the effectiveness of nine common store-bought antimicrobials; a 30% and 50% dilution of

ethanol; and a 5% dilution of bleach. Ten bacterial lawns were made utilizing *E. coli* K-12, *Pseudomonas fluorescens*, *S. epidermidis*, *Bacillus subtilis* and *Enterobacter aerogenes* on Mueller Hinton Agar. Sterile disks were placed on the different dilutions and antimicrobials and placed on the bacterial lawns. Plates were incubated at 37°C for 24 hours and the zone of inhibition was recorded in millimeters using a ruler. This experiment was repeated three times. Formula 409® All-Purpose Cleaner had an overall average zone of inhibition of 14.26 mm, making it the most effective antimicrobial. For the most part the antimicrobials had little to no effect on the bacteria.

5998

Background Radiation: Can It Be Created in a Cloud Chamber?

Kieran Johnson and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this experiment, I decided to find out whether or not background radiation could be created in a cloud chamber. After creating the cloud chamber and testing it two times, with both tests being successful, I found out that background radiation is actually alcohol vapor clouds forming on ion trails ripped from air molecules. With this information, I was able to conclude that background radiation can be created in a cloud chamber, and under certain conditions can be seen.

5999

Effects of Different Fibers on Amount of Felting

Larissa Chung and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study researched the effects of different fibers on the amount of felting in a knitted sample. Felting occurs when protein fibers are submerged in hot soapy water and their scales pop out and enmesh with each other. The study used five fibers — alpaca, angora, wool, superwash wool, and cotton. Superwash wool is wool specially treated to not felt. The samples were felted (washed) for 10 minutes in the washing machine and then measured for shrinkage, stretching, puncture resistance, and stitch definition. This process was repeated two more times. The average percent of area left after felting for alpaca was 59%; and the averages for angora, wool, superwash wool and cotton were 66%, 80%, 100% and 104%, respectively. The results showed that alpaca is the fiber that felts the most.

6000

Most Efficient and Green Desalination Method*Lavanya Sharma and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this experiment, three methods were used to desalinate 250 mL of water efficiently and in a “green” manner. Distillation was the first way used to try to purify the water. It was successful; however, the process took over 2 hours and was not efficient at all. The second method used was pouring the seawater through an activated carbon filter (a Brita® bottle). It didn’t purify the water or remove the salt. The last method used was performing electrolysis of the seawater using a solar panel for electricity and running the hydrogen produced through a fuel cell to create pure distilled water. This method was successful; it was green since solar energy was used for electricity and it actually made pure water that could be used for drinking, cleaning, etc.

6001

What Is the Effect of Erosion on Beaches With and Without a Headland?*Lila Au and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In my experiment, I simulated waves on a beach. I used a small-scale beach made of sand, water and aquarium gravel to represent the beach. I was trying to figure out if headlands prevented erosion of the sand around the headlands. If the sand wasn’t as eroded, then we could put artificial headlands on real beaches to save the sand from being permanently eroded away. My result was that headlands do prevent erosion on the surrounding sand.

6002

Colors’ Effects on Memory*Lindsey Ngo and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The purpose of this project was to see what color of text helps your memory. I used cool colors, warm colors and black ink to test which color affects memory the most. For the procedure, I designed three different tests: one had cool-colored text, another used warm colors, and the last one had black ink. I let the subjects study for 2 minutes and let them do anything for 10 minutes that didn’t involve the test. They took the first test in 5 minutes and repeated for the other two tests. Then I had the 10 subjects email their results to me. The results were interesting. The average for Test #1 was 47.7% correct. For Test #2, the average correct was 55%, and for Test #3, the average correct was 65%. Test #3 had the highest scores, Test #2 was the second most effective and Test #1

had the lowest scores. For my hypothesis I thought Test #1 – with cool colors – would be the most effective, then black, and lastly warm colors. My hypothesis was proved incorrect, as Test #3 had the highest scores, meaning that black text can help your memory the most. The results suggested that black is the most effective, and then warm colors, but cool colors are the least helpful.

6003

How Does the Wing Design of an Airplane Affect Its Flight and Drag?*Lorenzo Mendez and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined how the wing design of an airplane affects its drag and travel. Four paper airplanes with different wing designs were constructed using 8 ½ x 11 letter paper. Duct tape was placed on the floor of a long hallway to mark the starting line of where each paper airplane would be thrown. Each paper airplane was thrown 20 times and measured with a 25-foot measuring tape. To figure out which planes had less drag, every trial also was timed with a stopwatch. The basic dart airplane had the biggest wings with no tail or winglets. It went the fastest at a 1.9-second average, and farthest at a 121-inch average. The sailplane had big winglets and medium-sized wings. It averaged a 2.7-second speed and a 106-inch distance. The Falcon Fighter, which had small wings, no winglets and a tail, averaged a 3.6-second speed and a 94-inch distance. And finally, the Space Shuttle, which had small winglets, big wings and a tail, went the slowest with a 4.3-second average and averaged a distance of 115 inches. The results suggested that airplanes with bigger wings, no tail and winglets will have the best flight.

6004

The Effects Shape Has on Parachute Speed*Macy Pine and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment tested the effects the shape of a parachute has on the overall time it takes the parachute to reach the ground. Different-sized parachutes were built and tested by being dropped 10 meters. The square parachute had an average time of 2.56 seconds, the triangle had an average of 2.4075 seconds, the circle had an average of 1.73 seconds, and the rectangle had an average of 2.355 seconds. The data suggested that the square was the most effective, closely followed by the triangle and the rectangle, respectively. The circle repeatedly crashed and broke, and the only recorded time was when the parachute didn’t open.

6005

Effects of Mint and Sugar on Human Reaction Times*Mane Berikyan and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the question of which element in a peppermint – sugar or mint – improves human reaction times (multiple studies show that peppermints improve human reaction times). Human test subjects were asked to take an online traffic light reaction test three times a day (once in the morning, once in the afternoon and once at night), each time while eating a different variable (once with no variable, once with a sugar-free peppermint and once with a sugar cube). This process was repeated three times, on different days, with the variables' order for each experiment being changed for every trial in order to ensure that the results were completely accurate. The average reaction time for the control (no variable) was 0.3853, for the sugar-free peppermint was 0.3473, and for the sugar cube was 0.3866. This suggested that mint is most likely the element in peppermints that causes human reaction times to improve.

6006

Does the Surface Area of a Parachute Affect How Long the Parachute Takes to Reach the Ground?*Matthew Halm and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In my experiment, I tried to figure out if surface area affects the speed and time it takes for an object to reach the ground. This also showed which material is better to be used for a parachute. Using three materials and three square parachutes made of each material, I dropped each parachute five times from approximately 4 meters high, and then recorded the time it took for each to reach the ground. The parachutes were 50 cm², 40 cm² and 30 cm². The three materials were mesh, nylon and plastic trash bags. The results showed that the parachute with a smaller surface area did indeed fall faster than a parachute with a larger surface area, proving that the surface area of a parachute affects the time it takes for it to reach the ground. The times were not the same because the material also affected the time. A material with holes or anything that can let air pass through falls faster than a material without any holes. The plastic trash bag parachute stayed in the air the longest, the nylon parachute second, and the mesh parachute reached the ground the fastest.

6007

Which Common Chemical Has the Highest Solubility?*Matthew Levine and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment tested to see which common chemical – table salt, Epsom salt or sugar – has the highest rate of solubility. First the three solutes were stirred into a jar with 100 ml of water until saturated, and then the amount of the solute put in was recorded. Next, the solutions were put on a shallow saucer and evaporated. The mass of the crystals was recorded. The results were that the table salt created a saturated solution at 9.25 g, the Epsom salt at 16.25 g and the sugar at 9.25 g.

6008

Effects of Preservatives on the Ripeness of Fruits*Michael Resnick and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined how effective preservatives are in keeping fruits from browning. The objective was to see which preservative (castor oil, rosemary extract, Vitamin E oil, lemon juice, vinegar, salt, sugar, and Vitamin C tablets) would keep an orange less brown and which would attract more insects. This was tested by injecting the orange with a syringe with amounts of 5 mL. For a dry preservative, I had to dissolve it for a solution. The tablets were crushed in a dry blender and dissolved like the salt and sugar. The starting weights and weights with the preservatives were recorded. The amount eaten also was recorded to show how the effectiveness of the preservatives compared to the others. During the time of the testing the temperature was, on average, 20°C maximum, so the process of decomposition was rather slow. But this allowed for insects like flies and citrus aphids to appear in mass numbers. My hypothesis was that vinegar would be best in preventing decay and sugar would be the most effective in attracting insects. My results showed that in the process of decomposition, vinegar was effective, and in attracting insects vinegar also was better. So my hypothesis was partially wrong. I think one of the reasons why I got this outcome was due to temperature and its effect on decomposition. This showed that the riper a fruit is, the more that insects will be attracted to it.

6009

Effects of Electricity on Bean Plant Growth*Nathan Kwok and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project posed the question of whether or not electricity affects the average rate of growth in bean plants. The plants were exposed to 9 volts of electricity for 1,

3, 12 or no hours each day, and the heights of all of the plants were measured for 12 days. The plants that were exposed to electricity for 12 hours each day had an average height of 11 cm at the end of 12 days. The plants with 3 hours of exposure each day had an average height of 18.33 cm, and the plants exposed for 1 hour each day had an average height of 11 cm. The control had an average height of 16.33 cm. The results suggested that the plants receiving 1 and 12 hours of 9-volt electricity exposure per day were slowed down, and 3 hours of electricity exposure boosted the plants a little. This confirmed that electricity does affect the average growth rate of bean plants.

6010**Effects of Sense of Smell on Sense of Taste***Aliyah Nicole Pineda and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined how smell affects taste by having participants try to taste jelly beans with a plugged and unplugged nose. The participants sat down for 5 to 10 minutes to try jelly beans with a plugged and unplugged nose. They did the experiment two times, and they answered questions such as if the jelly beans were sweet or sour, if it was easy or hard, and the flavor. For most of the participants it was harder to guess the flavor with a plugged nose and easier with an unplugged nose. The results showed that the sense of smell does affect the sense of taste.

6011**Bacteria Affected By Chemicals***Nikita Akchyan and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this experiment, bacteria were cultured and then chemicals like salt, sugar and baking soda were added to the bacterial culture. During the culture process, the bacteria were put in a box and covered with a blanket to stay warm. The warmth is supposed to help the bacterial culture. The box covered with a blanket acted as an incubator, because real incubators are expensive. After the bacteria were affected by the chemicals and observed, they were killed with bleach or an antiseptic that worked on the strains of bacteria being used. Then the Petri dishes were disposed of in the trash. The bacterial strains used are supposed to be harmless, because if harmful bacteria are cultured, it is really likely that the person culturing the bacteria can become sick. The data collections and summaries were not difficult because they did not require big numbers to be compared. The experiment was repeated nine times: three times with 5 grams of each chemical, three times with 10 grams of

each chemical, and three times with 15 grams of each chemical. The reason for the different amounts of each chemical used for the sets of trials was if, for example, 5 grams of each chemical did not show observable results, then 15 grams of each chemical might show observable results. The data is quantitative. The results showed that the sugar helped the bacterial culture, and the salt and baking soda killed off some of the bacteria. The sugar helped the bacteria because bacteria use sugar as a form of energy to multiply faster and faster. The salt harmed the bacteria by dehydrating the environment the bacteria were in. The baking soda harmed the bacteria because it is a weak disinfectant and directly harms bacteria.

6012**The Effects of Temperature on Math Abilities***Niko Bercovici and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment aimed to discover how the temperature of a room in which a simple math test is being taken affects the results of the test, namely the amount of time that is taken to complete the test and the percentage of math questions that are correctly answered. To assess math ability, six subjects took a simple math test in a 21°C environment. The subjects' results on this test then were compared to the results of a test the subjects later took in either a 6°C or 28°C environment, and the differences were interpreted as the possible effect of temperature on test-taking. The results of the study seemed to suggest that cold temperatures caused the subjects to rush through the tests, taking a shorter time to complete the tests but getting a lower percentage of the questions correct. Hot temperatures were less likely to decrease the time used by a large amount, but did lower the percentage of questions answered correctly.

6013**Which Type of Milk Curdles the Most?***Rael Avilez-Quintero and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The objective of the project was to find out which milk, out of four types, curdles the most. Lemon juice was added to the milk after it was heated to produce the curds. The milk then was strained to separate the curds from the whey, allowing them to be weighed. The whole milk seemed to usually have a high outcome of mass for each experiment. The 1% and 2% normally were very close; either 1% or 2% had slightly more in each experiment. Skim milk varied a lot, and changed significantly in every experiment.

6014

Effects of Salinity on the Surface Tension of Water*Saiprakash Paspuleti and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the effects of salinity on the surface tension of water using the capillary method. The capillary tube was dipped into water with different salinity levels for a minute at room temperature and then pulled out. The height of the water up the capillary tube was recorded. The experiment was repeated five times for each salinity level. The experiment resulted in a slight incline in the surface tension with an increase in the water's salinity levels, showing that the salinity and surface tension of water have a small positive correlation.

6015

Effects of Different Materials on the Insulation Value of a Living Roof*Sara Blumkin and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined how different types of materials on a living roof affect the quality of the insulation it provides. Five 15-inch x 17-inch boxes were constructed with one ¼-inch hole drilled in each of them, which was used to check inside temperatures and remained covered when not in use. Flats measuring 17 inches x 17 inches were placed on four of the boxes. The four flats were filled with different types of materials – soil, artificial grass, a short and tightly compacted moss-type plant, and tall and bushy plants. The fifth box, which had no plants or materials, served as the control. For three days, the temperatures in the boxes were checked and recorded every 4 hours. The evaluation process was repeated twice. The resulting data revealed very minor temperature fluctuations, but the data was easily within a margin of error, so no concrete result could be determined.

6016

Effects of Different Propeller Tips on Submarine Speed*Sarah Bonver and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

A submarine pushes itself forward in the water with its propeller. The purpose of this experiment was to find out which propeller tip shape will affect the submarine's travel time. To test this, the experiment used an empty water bottle to simulate the submarine, the cut bottom of another water bottle for the propeller, and a rubber band and paper clips for the power to spin the propeller. To conduct the experiment, the propeller was cut to vari-

ous shapes and attached to the submarine with a rubber band and paper clips; a bathtub was filled with water; and the submarine was timed to travel a certain distance. The experiment was repeated five times with each propeller tip shape: the straight shape (the control), the forked propeller shape, and the short pointed propeller shape. Collected data was analyzed to determine which propeller tip shape had an effect on the submarine. The results showed that the control reached the 30.48-cm mark in about 4.41 seconds, the forked shape got to the mark in about 4.59 seconds, and the short and pointed shape got to the mark in about 5.59 seconds.

6017

Which Truss Bridge Is the Strongest?*Sarthak Kamerkar and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was about finding which one of the three truss bridges is the strongest. The bridges under experiment were the Warren truss, the Howe truss and the Bowstring truss. These truss bridges were built with only two materials: Popsicle sticks and hot glue. Popsicle sticks are 4.5 inches long. Each bridge was five sticks long and one stick wide. The sides of the bridges were one stick tall. I connected the edges of two tables with the bridges, and 3 inches of each end of the bridges overlaid on each table. I measured the heights of the bridges from the ground with no load on each bridge. To find out how much weight each bridge could sustain, I gradually added weight on the bridges in 1-lb. (0.45-kg) increments. To find out how much the bridges bent because of the weight, I measured the heights of the bridges from the ground each time after adding weight. I added weight until the bridges started cracking and became unsafe to use. I repeated the experiment three times on all three types of bridges. The Howe Bridge, which used the most beams and pillars, bore the most weight, which proved my hypothesis.

6018

Effect of the Amount of Fungus on Rate of Spread*Shion Murakawa and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment was to determine if different amounts of *Penicillium expansum* injected inside tangerines affect its rate of spread. Three tangerine groups – 10 g, 20 g and 40 g – were injected with *Penicillium expansum* amounts of 10 mg, 20 mg and 40 mg (to create a 0.01 g to 10 g ratio between the fungus and tangerines). Each group was observed every day to see which group had taken over the tangerine surface first. Each test was repeated three times, and labeled trials A, B and C. The 40 g B and C were done in 10 days, and A was done in

11. The 20 g B was done in 11 days, A was done in 12, and C was done in 13. The 10 g A was done in 13 days, and B and C were done in 15. These results showed that larger amounts of fungi injected in tangerines have a faster rate of spread.

6019

Which Bacteriophage, T7, T4 or P1, Is Better At Killing Bacteria?

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

This experiment studied which bacteriophage strain (T4r+, T7 or P1) would lyse a larger area of various *Escherichia coli* strains. 0.25 mL of the bacterial culture was micropipetted into a vial containing 3 mL of soft agar and 0.1 mL of a dilution of a strain of bacteriophage. The mixture was distributed evenly on an agar plate and the process was repeated for all of the other combinations. This experiment was repeated five times. P1 lysed less area of the bacterial lawn than T7, but it also had a lower titer and was therefore slightly more efficient. T4r+ did far better than either of them in all of the trials. The results indicated that T4r+ would be most efficient at lysing *E. coli*.

6020

Does Amount of Sleep Affect Math Scores For Seventh-Graders?

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

This study examined the effects of sleep on seventh-graders. Each subject slept a certain number of hours, three times going from 4 hours to 8 hours, then finally to 12. There were a total of six male subjects. Results were the final percentages from the corrected tests. Twelve hours proved to be the best amount of sleep, followed by 8 hours and then 4 hours. The results showed that 12 hours is the best amount of sleep before a test compared to 4 hours and 8 hours.

6021

Finding the Strongest Combination of Sewing Stitch and Fabric Type

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

This study examined the question of which combination of sewing stitch and fabric type is the strongest. The three stitches tested were straight stitch, zigzag stitch and whipstitch. The three fabric types tested were cotton, fleece and spandex. Black thread was used for all of the stitches, and a Singer sewing machine was used

for the straight and zigzag stitches. The whipstitch was hand-sewn with a needle. Two identical 4-inch squares of fabric were sewn together in a seam in each stitch type. This was done for all three types of fabric. The strength of the sewn seams on each square was tested by ripping them apart with two hands; the ripping was timed and the observations were documented in writing. The two strongest combinations used the whipstitch technique and lasted more than 10 times as long as the weakest combination of stitch and fabric. Three of the top four results used the spandex fabric. Cotton appeared to be the weakest of the fabrics, as it was among three of the four weakest combinations. The results indicated that the whipstitch on spandex produced the strongest seam. The weakest result was the zigzag stitch on cotton.

6022

The Effects of Temperature on the Brightness of the Chemical Luminol

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

This study examined the question of the possible effects temperature can have on a chemical solution containing luminol mixture, perborate mixture and copper sulfate crystals. These materials were mixed together and different temperatures of water were added to the solution. The independent variable (the temperature of water) was changed three times, and three trials were done for each variable level. Then photos were analyzed by computer to see which water temperature produced the brightest glow. The results showed that the coldest water temperature produced the most light, although it dimmed the quickest. The results also showed that the warmest temperature created a glow that lasted significantly longer than with the other two variable levels. In the end, the study showed that temperature does indeed affect the brightness of the chemical reaction.

6023

How Does Animation Timing Affect Your Perception of Game Action?

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

This study examined how the timing of animation affects your perception of a video game. A sprite of the fighter Ryu Hoshi from Street Fighter II was put into a coding program. This fighter had three positions – windup, hit and finish – each with changeable frame rates (1 to 60 frames per second, or FPS). The default settings for the three positions, in the order listed before, were 24, 12 and 8 FPS. First, the windup was increased by 2 until 60. Then, from its original, it was decreased by 2 until 0. Each setting was rated by its smoothness, reality and

power, and given an overall score. This process was repeated with the hit and with the finish settings. Using the overall scores, the average and standard deviation were calculated for each data set. Then, with the complete data sets, line graphs were made for each of them. Using the graphs, four questions were answered to conclude the experiment. The results suggested that the best settings for a smooth punch by the fighter sprite are windup 20 FPS, hit 20 FPS and finish 16 FPS.

6024

Into the Open Air

Trevor Trinh and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The purpose of this project was to determine the different evaporation rates of different liquids. The hypothesis was, "If the substances tested are wine, tap water, Coke and a Starbucks Frappuccino®, then wine will evaporate the fastest." The experiment involved filling a cup 2 in. high (5.08 cm) with separate liquids (in this case wine, tap water, Coke and a Frappuccino). The beverages were poured inside clear plastic cups and were observed over a span of six days. During that time, the data was recorded. From the data, it was easy to conclude that wine evaporated the fastest relative to the other beverages.

6025

Effects of Salt on Copper Materials

Valerie Vallejo and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project showed that after placing three pennies in saltwater and three in freshwater, the saltwater pennies seemed to rust much faster than the freshwater pennies. When the rust was calculated, it seemed that the saltwater rust was twice as much as the freshwater rust. In the second test, the saltwater rust was, in fact, twice as much as the freshwater rust. The exact numbers were 50% in saltwater and 25% in freshwater. Either way, the end results were that saltwater makes copper rust faster than freshwater.

6026

Does the Color of Sunlight Affect the Growth of Plants?

Vedant Shah and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the effects on bean plants from being exposed to different colors of sunlight. Each pot had three seeds in it. The pots were exposed to the colors red, orange, yellow, green and blue. One plant was exposed to direct sunlight. All of the plants were given 30 mL of water every two days. Two plants from

the red pot and two plants from the control pot were the only ones that survived. The plants exposed to red light grew an average of 0.34 cm every two days, while the control group plants grew an average of 0.547 cm every two days. The results suggested that certain colors affect plants in different ways, but colored sunlight affects plants in a negative way.

6027

Does the Strength of a Magnet Vary With Temperature?

Vishwanath Durgam and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined whether the strength of a magnet varies with its temperature. A ring magnet was placed in a freezer for about 30 minutes at -20°C ; in a bowl filled with water and ice for 20 minutes at 0°C ; at room temperature; and then in boiling water at 100°C . Each experiment was recorded five times. The magnet was stronger at the freezing level. This experiment showed that a magnet is stronger when it is colder than when it is hot, at normal temperature or at an ice water level.

6028

Mathematical Patterns in Classical Music

Youbin Cho and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment answered the question, "What mathematical patterns can be found in classical music?" Songs from three composers — Bach, Mozart and Beethoven — were chosen. The length and pitch of notes were numbered with integers and observed for mathematical patterns. Three songs per composer were used, making nine trials for the whole experiment. The results suggested that there are mathematical patterns in classical music, and Mozart especially has more patterns.

6029

The Fastest Way of Running a Mile

Patrik Sargsyan and D. Shaw (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This project examined the fastest way of running a mile. There were three different people running, with each using three different tactics. The first tactic was using your strength in the beginning. The second tactic was running at a constant pace. The third tactic was using your strength at the end. Person #1 ran the mile in 8.14 minutes using the first tactic, in 7.48 minutes using the second, and in 7.15 minutes using the third. The second person ran the mile in 8.37 minutes using the first tactic, in 8.12 minutes using the second, and in 8.32 minutes using third. The third person ran the mile in 8.26

minutes using the first tactic, in 7.56 minutes using the second, and in 7.36 minutes using the third. The results showed the best tactic for the majority of people, which is running at a constant pace and speeding up at the end.

6030

Effect of Caffeine on Bell Pepper Plant Growth

Shreya Nair and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The science experiment that was performed examined the effect of caffeine on red bell pepper plants. Nine bell pepper plants were grown – six experiment bell pepper plants and three control bell pepper plants. The six experiment plants were watered with one cup of room temperature tap water that contained $\frac{1}{4}$ teaspoon (1.25 grams) of caffeine in the form of Folgers Classic Roast coffee powder. The control plants were watered with a half cup (118.294 ml) of room temperature tap water. The first week, all of the plants were given water so that both groups had an equal chance of growing. The plants' heights and progress were recorded every week for a time period of three weeks. The average of each plant group (which had three plants) was taken each week. At the end of three weeks, the final set of averages was recorded. The control plants were at 4.45 cm, the first experiment group was at 5.39 cm, and the second experiment group was at 4.02 cm. The experiment plant groups had a combined average of 4.7 cm, while the control plant growth average was 4.45 cm. The experiment plants grew the tallest in the shortest time period, proving my hypothesis correct.

6031

What Is the Best Method of Desalination?

Vishnu Murali and D. Shah (teacher)

Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study was about the efficiency of certain desalination techniques and how to better them. In the study, seawater was put through the filters – science-grade filter paper, coffee filter paper, carbon paper and cloth – and coconut oil. Coconut oil seemed to do the best job in the process. It left the least amount of salt of all of the processes. 139 mL of seawater (that was heated to 102°C) was poured through each one of the filters (science-grade filter paper, coffee filter paper, carbon paper and cloth). For the coconut oil part of the experiment, 10 mL of coconut oil was mixed into 139 mL of seawater (not boiled) for each trial. The mixture was heated to 50°C and stirred for 2 minutes (a layer of coagulation should have formed at the top of the mixture). It was then left out to cool at room temperature (about 22°C) so that the layer at the top of the mixture could solidify. The solidified layer then was broken and the

water released into another container. All of the water that was a product of the experiment was put in an oven and left to evaporate so that only salt crystals remained. The crystals' mass from each sample was collected, weighed, recorded and analyzed.

6032

When Adding Tomatoes to the Environment of Collembolans, Will the Population Increase If the Tomatoes Were Grown From Seeds Treated to a Space Environment?

Genesis Alas, Brianna Arriola, Jabez Avila, Arturo Barrera, Rose Boonpitanon, Emily Boukhanian, Ysabelle Cando, Arleen Chavez, Natalie Chavira, Samantha Corlew, Jared Cruz, Monique Escareno, Amir Filabs, Garrett Gamboa, Mia Garcia, Lizbeth Gonzalez, Sharlene Guarina, Evelyn Gutierrez, Alex Hernandez, Jeremy Hogarth, Esther Jung, Micah Kim, Ayanna Kimbro, Timothy Lim, Caterin Lopez, Diego Lozano, Elizabeth Melendez, Daniela Mendoza, Idali Molina, Layla Montero, Natalie Moreno, Samuel Mudgett, Summer Rogers, Monica Romero, Angie Solis, Ashley Trujillo, Christian Villanueva and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The objective of this experiment was to determine if a population of Collembolans would increase, decrease or remain constant when adding tomatoes to their environment grown from seeds treated to a space environment. (The seeds were placed in -80°C for 34 days by Tomatosphere.) Collembolans are tiny hexapods with a springtail used for jumping. The hypothesis by the colleagues in the class was that the population of Collembolans would remain constant to the control. Nine parts plaster of Paris and one part charcoal were mixed in a plastic container. This substance was placed in a bowl and mixed with water until it was the consistency of yogurt. It was poured in Petri dishes, which were tapped on the table to help it spread evenly, and allowed to dry for two days. The Petri dishes were labeled with blue tape for the control and beige tape for the experiment. Equal numbers of Collembolans were placed into each environment and yeast was added for the Collembolans to eat. Water was dropped into the environments using eyedroppers. In the Petri dishes for the experiment, pieces of "space tomatoes" were added; and into the Petri dishes for the control were added small pieces of the same tomato species whose seeds had not been treated to a space environment. The environments were observed and the Collembolans were counted twice a week. The numbers of Collembolans and Collembolan eggs were counted as data. A total of 1,408 Collembolans were counted: 35% in the control and 65% in the experiment. There were 903 Collembolan eggs counted on the experiment's last day, with 58% in the control and 42% in the experiment. The hypothesis was incorrect. The Collembolan population increased in the experiment.

6033

Will a Population of Collembolans Increase If Plastic Is Placed in Their Environment?

Carmen Almaguer, Alyssa Alvaran, Elizabeth Avila, Charline Bercasio, Anthony Castaneda, Eddie Castellanos, Sheyla De Leon, Breetzy Hernandez, Erin Hernandez, Carina Iraheta, Sofia Lemus, Bradley Lopez, Kathryn Lopez, Jayden Marquez, Sydney McNulty, Daphne Melgar, Elmer Merino, Cyrus Molina, Sisi Mora, Alyna Oliver, Norberto Osorio, Daniela Rico, Aracely Sanchez, Amrit Sohal, Manuel Sotero, Casey Vidales and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if Collembolans (*Onychiuridae encarpatus*) would survive and reproduce well if plastic was placed in their environment. As a class, it was agreed that the population of Collembolans would decrease if plastic was placed in their environment. First, we placed one part charcoal to nine parts plaster of Paris in a container, with the lid closed tightly, and turned it until the ingredients were completely mixed. Next, some of this mixture was placed in a bowl and water was added. It was stirred completely, until it was the consistency of pudding. It was poured into Petri dishes, which were tapped on the table to spread the mixture throughout them. The new environments were allowed to dry for a couple of days. The Petri dishes were labeled for control and experiment and then given to each group of students. Small pieces of plastic bottles were dropped into the experiment dish. Equal numbers of Collembolans were dropped into the Petri dishes. Yeast was given for the Collembolans to eat and drops of water also were added to the environments. The number of Collembolans was counted and recorded as data twice a week for six weeks. At the end of the experiment, a total of 1,420 Collembolans were counted: 51% in the experiment and 49% in the control. On the same day a total of 490 eggs were counted: 66% in the experiment and 34% in the control. The hypothesis was incorrect. The population of Collembolans and Collembolan eggs increased when plastic was added to the Collembolans' environment.

6034

Will a Population of Collembolans Increase If Centrum® Vitamins Are Placed in Their Environment?

Angelica Catalan, Emily Daniels, Anette Germirlian, Joseph Gonzalez, Steven Kim, Elizabeth Kinne, Kirsten Laquindanum, Evelin Lopez, Andy Matias, Gianni Mendoza, Diego Mercado, Gabriela Miramontes, Alliyah Montero, Manny Moran, Angela Muralles, Angeliem Nguyen, Logan Ortiz, Oscar Palafox, Samantha Palomarez, Frank Pretzantzin, Makenzie Reisgen, Aliyah Rosario, Cristina Rosas, Maya Rose, Jonathan Ruano, Leslie Solis, Joanna Tenollar, Jonah Tenollar, Bianca Torres, Jonathan Umanzor, David Vallejo, Pacey Vandebroeder and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The objective of this experiment was to determine if a population of Collembolans would increase if vitamins were added to their diet. The class hypothesis was that a population of Collembolans would increase if vitamins were placed in their environment. First, one part charcoal and nine parts plaster of Paris were placed into a container. The lid was closed and the container was turned until the ingredients were mixed. Some of this substance was placed in a bowl, water was added and it was stirred until it was mixed. It was the consistency of yogurt. The thick liquid was poured into Petri dishes, which were tapped on the table to spread the mixture throughout the Petri dishes and allowed to dry for a couple of days. Both of the Collembolans' environments were moistened with water using eyedroppers. Equal numbers of Collembolans were placed into the environments. Yeast was added for the Collembolans to eat. In half of the Petri dishes, crushed Centrum vitamins were sprinkled. The Collembolans and Collembolan eggs were observed and counted for six weeks. At the end of the experiment a total of 1,355 Collembolans were counted: 51% in the experiment and 49% in the control. On the last day of the experiment, there were 1,355 eggs counted: 65% in the experiment and 35% in the control. In conclusion, the hypothesis was correct. The Collembolan population did increase when vitamins were placed in their environment.

6035

Will a Population of Collembolans Increase If an Aluminum Gum Wrapper Is Placed in Their Environment?

Breetzy Hernandez and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of the experiment was to determine if Collembolans would survive if aluminum gum wrappers were placed in their environment. The hypothesis was that the population of Collembolans would increase if aluminum gum wrappers were placed in their environment. Collembolans are tiny creatures with six legs and a springtail used for jumping. Dissecting microscopes were used to observe them. First, one part charcoal to nine parts plaster of Paris were placed in a container. The lid was closed tightly and the container was turned until the ingredients were completely mixed. Then some of this mixture was placed in a bowl, water was added and it was stirred until it was the consistency of pudding. It was poured into two Petri dishes, which were tapped on the table to spread the mixture throughout the Petri dishes. The Collembolans' new environments were allowed to dry for a couple of days. The Petri dishes were labeled for control and experiment. Small pieces of gum wrappers were placed in the environment marked experiment. Ten Collembolans were placed into each environment. Yeast was given for the Collembolans to eat and drops of water also were added to the environments.

The number of Collembolans was counted and recorded as data twice a week for six weeks. At the end of six weeks a total of 267 Collembolans were counted: 45% in the experiment and 55% in the control. The hypothesis was incorrect because the population of Collembolans did not increase when compared the control.

6036

Will Changing Collembolans' Water Source to Red Bull Cause a Population of Collembolans to Decrease?

Daniela Rico and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose for doing this experiment was to determine if a population of Collembolans would decrease if Red Bull was added as their source of water. The hypothesis was that the population would decrease if the Collembolans were given Red Bull instead of water. First, one part charcoal to nine parts plaster of Paris were placed in a plastic container, the lid was closed tightly, and the container was turned until the ingredients were completely mixed. Then some of this powdered mixture was put into a bowl, water was added and it was stirred to make it the consistency of yogurt. The plaster of Paris mixture was placed into two Petri dishes, which were tapped on the table to make the mixture spread throughout the entire Petri dishes. They were allowed to dry for a couple of days. Once dry, one of the Collembolans' environments was moistened with water and the other with Red Bull. A few grains of yeast were added for the Collembolans to eat. Eleven Collembolans were placed in each environment. The experiment environment was watered with Red Bull twice a week and the control was watered with water twice a week. The number of Collembolans was counted and recorded as data. The final results were that there were zero eggs and zero Collembolans in the experiment. In the control, there were 47 Collembolans and eight eggs. The hypothesis was correct. The population of Collembolans decreased while receiving Red Bull as a source of water.

6037

Will a Population of Collembolans Increase If Fed Carrots and Yeast?

Elmer Merino and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The reason for doing this experiment was to consider if carrots would harm a population of Collembolans. The hypothesis was that the population of Collembolans would increase if carrots were added to their environment. Collembolans are small insect-like animals that have a springtail and are seen in many colors. First, one part charcoal to nine parts plaster of Paris were placed into a container, the lid was closed tightly, and the con-

tainer was turned until the ingredients were completely mixed. Next, some of this mixture was placed in a bowl and water was added. It was stirred completely until it was the consistency of pudding. It was poured into two Petri dishes, which were then tapped on the table to spread the mixture throughout the Petri dishes. The environments were allowed to dry for a couple of days. The Petri dishes were labeled for control and experiment. Small pieces of carrot were dropped into the experiment environment. Eleven Collembolans were dropped into the Petri dishes. Yeast was given for the Collembolans to eat and drops of water also were added to the environments. The number of Collembolans was counted and recorded as data twice a week for six weeks. The hypothesis was incorrect. At the end of the six weeks, 44% of the Collembolans were found in the experiment and 56% were found in the control.

6038

Will a Population of Collembolans Increase If Aziza Lipstick Is Added to Their Environment?

Carina Iraheta and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if Collembolans (*Onychiuridae encarpatus*) would survive if Aziza lipstick was added to their environment. The experimenter believed the population of Collembolans would decrease if Aziza lipstick was placed in their environment. Collembolans are tiny insects that have springtails, and feed on fungi, plant material, feces or algae. First, one part charcoal to nine parts plaster of Paris were placed in a container, the lid was closed tightly, and the container was turned until the ingredients were completely mixed. Then this was placed into a bowl and water was added. It was stirred until it was completely mixed and the consistency of pudding. The mixture was poured into Petri dishes, which were tapped on the table so the mixture would spread evenly throughout the Petri dishes. The environments were allowed to dry for several days. One Petri dish was marked as the control and the other was marked as the experiment. In both the control and experiment water was added, and in the experiment little pieces of Aziza lipstick were added. Ten Collembolans were dropped into each Petri dish. A few grains of yeast were added to both Petri dishes for the Collembolans to eat. Lastly, the Collembolans were watered with drops of water twice a week. The numbers of Collembolans and Collembolan eggs were counted on school days two or three times a week. At the end, there were a total of 1,556 Collembolans, with 50% in the experiment and 50% in the control. There were a total of 919 Collembolan eggs, with 45% in the experiment and 55% in the control. The experimenter's hypothesis was incorrect. The population of Collembolans remained the same and the number of Collembolan eggs increased by 5% with Aziza lipstick added into their environment.

6039

Will a Population of Collembolans Increase If Grape-Flavored Kool-Aid Is Added to Their Environment?

Daphne Melgar and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to decide if Collembolans would survive if grape-flavored Kool-Aid was added to their environment. The hypothesis was that the Collembolan population would decrease if grape-flavored Kool-Aid was added to their environment. Collembolans are tiny insect-like creatures that use a springtail for jumping. One part charcoal to nine parts plaster of Paris were placed in a container, the lid was closed tightly, and the container was turned until the ingredients were completely mixed. Next, some of this mixture was placed in a bowl and water was added. It was stirred until mixed and the consistency of pudding. It was poured into two Petri dishes, which were tapped on the table to spread the mixture throughout the Petri dishes. The environments were allowed to dry for a few days. The Petri dishes were labeled control and experiment. Nine Collembolans were placed into each Petri dish and yeast was given for the Collembolans to eat. Grape-flavored Kool-Aid was prepared according to the directions and the Petri dish marked experiment was moistened with it. Drops of Kool-Aid were added twice a week. The Petri dish marked control was moistened with water and drops of water were added twice a week. At the end of six weeks, 51% of the Collembolans were counted in the Petri dish labeled experiment and 49% of the Collembolans were counted in the Petri dish labeled control. The hypothesis was incorrect. The Collembolans' reproduction rate was slightly higher in the experiment.

6040

Will a Population of Collembolans Increase If Coppertone Sunblock Is Added to Their Environment?

Evelin Lopez and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if Collembolans (*Onychiuridae encarpatus*) would survive if spray-on sunblock (Coppertone®) was added to their environment. If the Collembolans couldn't survive with the sunblock, then it wouldn't be a good idea for people to use it often. The hypothesis was that the population of Collembolans would decrease if spray-on Coppertone sunblock was added because it has too many harmful chemicals that can kill them. First, one part charcoal and nine parts of plaster of Paris were placed into a container, the lid was closed tightly, and the container was shaken until the ingredients were mixed completely. Then it was placed into a bowl and water was added. It

was mixed until it was the consistency of yogurt. The mixture was poured into two Petri dishes, which were tapped on the table so the mixture would spread evenly throughout the Petri dishes. They were left open and allowed to dry for a couple of days. One Petri dish was marked as control and one as experiment. Coppertone sunblock was sprayed onto the Petri dish marked experiment. Eleven Collembolans were placed in both Petri dishes. A few grains of yeast were added to each Petri dish for the Collembolans to eat. Drops of water were added to the Collembolans' environments twice a week. The number of Collembolans and Collembolan eggs were counted two or three days a week. The last day the Collembolans were counted there were 369 Collembolans in the control, which was 60% of the Collembolans. In the experiment there were 242 Collembolans, which was 40%. In conclusion, my hypothesis was correct. The population of Collembolans decreased when spray-on Coppertone sunblock was added to their environment.

6041

Will the Reproduction Rate of Collembolans Increase If Beans Are Added to Their Diet?

Kirsten Laquindanum and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if adding cooked pinto beans to an environment of Collembolans would increase their population. The hypothesis was that the population of Collembolans would increase if cooked pinto beans were added to their diet of yeast. First, one part charcoal and nine parts plaster of Paris were placed into a container. The lid was closed and the container was turned until the ingredients were mixed. Some of this substance was placed in a bowl, water was added and it was stirred until it was mixed. The thick liquid was poured into two Petri dishes, which were tapped on a table to make the mixture spread throughout the Petri dishes. They were allowed to dry for a couple of days. The two Collembolan environments were moistened with water using eyedroppers. Equal numbers of Collembolans were placed into the environments. Yeast was added for the Collembolans to eat. Three half-pinto beans were added to one Petri dish. The Collembolans and Collembolan eggs were observed and counted for seven weeks. A total of 205 Collembolans were counted on the last day: 70% of them were counted in the experiment and 30% of them were counted in the control. On the last day of the experiment there were 162 eggs counted: 59% in the experiment and 41% in the control. In conclusion, the hypothesis was correct. The Collembolan population did increase when cooked pinto beans were placed in their environment.

6042

Will the Reproduction Rate of Collembolans Increase If Brownies Are Added As a Food Source?

Maya Rose and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if a population of Collembolans would increase if brownies were added to their diet. The hypothesis was that the population would increase because brownies grow mold and Collembolans eat mold. Collembolans are tiny insect-like animals that are easily seen with a hand lens or dissecting microscope. First, one part charcoal and nine parts plaster of Paris were placed into a container. The lid was secured and the container was turned until the powders were mixed. Some of this substance was placed in a bowl, water was added and it was stirred until it was mixed. It was the consistency of yogurt. The thick liquid was poured into two Petri dishes, which were tapped on the table to spread the mixture throughout the Petri dishes. They were allowed to dry for a couple of days. The two Collembolan environments were moistened with water using eyedroppers. Eleven Collembolans were dropped into each of the two environments. Yeast was added for the Collembolans to eat. Brownies also were added to the experiment environment. At the end of the experiment a total of 223 Collembolans were counted: 57% in the experiment and 43% in the control. The hypothesis was correct. The Collembolans' numbers increased when brownies were added to their diet.

6043

Will a Population of Collembolans Decrease If Ivory Soap Is Added to Their Environment?

Sofia Lemus and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if Ivory soap would harm a population of Collembolans (*Onychiuridae encarpatus*). The hypothesis was that the Collembolans' numbers would decrease if Ivory soap was added to their environment. Collembolans are tiny insect-like animals with exoskeletons and a springtail used for jumping. Blind Collembolans such as *Onychiuridae encarpatus* use their antennae to help navigate through their environment. First, one part charcoal and nine parts plaster of Paris were placed into a container, the lid was closed tightly, and the container was turned until the material was mixed. Next, some of the mixture was placed into a bowl and water was added. It was stirred until it was the consistency of pudding. It was poured into two Petri dishes, which were tapped on the table to spread the mixture throughout the Petri dishes. These new Collembolan environments were allowed to dry for a couple of days. The Petri dishes were labeled for control and experiment. Small pieces of Ivory soap

were dropped into the Petri dish marked experiment. Eleven Collembolans were dropped into the Petri dishes. Yeast was provided for the Collembolans to eat and drops of water also were added to the environments to keep the Collembolans moist. At the end of six weeks a total of 451 Collembolans were counted: 37% in the experiment and 63% in the control. The hypothesis was correct. The number of Collembolans decreased when Ivory soap was placed in their environment.

6044

Will Cinnamon Cause a Population Rate of Collembolans to Decrease?

Angela Muralles and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if the spice cinnamon would work as a natural pesticide. The hypothesis was that cinnamon would work as a natural pesticide. Collembolans are tiny insect-like creatures with a springtail and are found in many different environments. First, one part charcoal and nine parts plaster of Paris were placed into a container. The lid was closed and the container was turned until the ingredients were mixed. Some of this substance was placed into a bowl, water was added and it was stirred until it was the consistency of yogurt. The thick liquid was poured into two Petri dishes, which were tapped on the table to spread the mixture in them. The mixture was allowed to dry for a couple of days. The Collembolans' environments were moistened with water using eyedroppers. Twenty-two Collembolans were placed into each environment. Yeast was added for the Collembolans to eat. In one Petri dish cinnamon was sprinkled. The Collembolans then were observed and counted for six weeks. On the last day the Collembolans were counted, there were a total of 97 Collembolans, with 8% in the experiment and 92% in the control. On the last day the Collembolan eggs were counted, there were a total of 52 eggs, with 0% in the experiment and 100% in the control. The hypothesis was correct: The spice cinnamon did cause the population of Collembolans to decrease when added into their environment, therefore working as a natural pesticide.

6045

Do Mentos Lower the Temperature of Hot Water?

Idali Molina and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to find out if Mentos actually lower the temperature of hot water. The hypothesis was that adding Mentos to a cup of hot water would not lower the temperature. First, two cups of hot water were labeled Number 1 Experiment and Number 2 Control. Then hot water was added to both cups, and the

temperature of the water was taken with a thermometer and recorded. After, one Mentos was placed into Cup Number 1 and both cups were checked to see if there was a change in temperature. Then one more Mentos was placed into Cup Number 1 and the temperature of both cups was recorded again. Cup Number 2, the control, was the reference. Because water cools over time, it was needed to make sure that if there was any change in temperature, it was not dependent on time, but on the Mentos speeding up the cooling process. This experiment was repeated 12 more times and the results were recorded. The average temperature in the experiment was 159 degrees with two Mentos added to the cup, and the average temperature in the control was 155 degrees with no Mentos. The Mentos failed to speed up the cooling process, and the control was 4 degrees cooler than the experiment. In conclusion, the hypothesis was correct: The chemical reaction raised the temperature of the water higher than that of the control.

6046

Can a Population of Collembolans Survive With Eraser Shavings in Their Habitat?

Sophia Lozano and T. Miller (teacher)

Oliver Wendell Holmes Middle School

9351 Paso Robles Ave., Northridge, CA 91325

The purpose of the experiment was to test if eraser shavings would affect a population of Collembolans. The hypothesis was that the population of Collembolans would decrease if eraser shavings were added to their environment. To carry out this experiment, one part charcoal to nine parts plaster of Paris were placed in a plastic container. The lid was closed tightly and the container was turned until the ingredients were completely mixed. The substance was placed in a bowl and water was added. It was stirred. Next it was dropped into two Petri dishes, which were tapped on a tabletop until the mixture spread throughout the entire Petri dishes. This was allowed to dry for a couple of days. Then the Petri dishes were labeled control and experiment. These Collembolan environments were moistened with drops of water using an eyedropper. Grains of yeast were sprinkled into the environments for the Collembolans to eat. Then 10 Collembolans were added to each Petri dish. Shavings of eraser were added to the Petri dish marked experiment. After eight weeks, 117 Collembolans were counted and recorded as data. After analyzing the data, 56% of the Collembolans were found in the control environment, and 44% of the Collembolans were found in the experiment environment. After further analyzing the data, the eggs were affected as follows: All of the eggs in the control environment hatched, while in the experiment environment 12 eggs remained. The evidence suggested the eraser shavings or their ingredients (vegetable oil, pumice, sulfur and rubber) did have a slight effect on the population of the Collembolans. The hypothesis was correct because the Collembolans had a higher population in the control.

6047

Will Insecticides Affect Seed Germination?

Amrit Sohal and T. Miller (teacher)

Oliver Wendell Holmes Middle School

9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if insecticides would affect seed germination. It was hypothesized that fewer seeds would germinate if sprayed with insecticides. First, 10 rows were made in the soil in which to plant seeds. Next, 10 holes were made in each row. The seeds were placed in each hole and covered in soil. Then five Popsicle sticks were labeled experiment and five more were labeled control. The five Popsicle sticks labeled experiment were placed in the soil in front of five of the rows, and the five labeled control were placed in the soil in front of the other five rows. In total, there were 50 seeds in the experiment and 50 in the control. After the seeds were planted, the side labeled experiment was sprayed with insecticides. Both sides were watered every day and the observations were recorded every two days. At the end of 32 days, a total of 33 seeds germinated in the experiment, and 34 seeds germinated in the control. It was concluded that both groups grew at the same rate. The hypothesis was incorrect because the insecticides did not affect the rate of seed germination.

6048

Will Collembolans' Population Remain Constant When Nontoxic, Scented Crayola Marker Is Added to Their Environment?

Ashley Trujillo and T. Miller (teacher)

Oliver Wendell Holmes Middle School

9351 Paso Robles Ave., Northridge, CA 91325

The objective of this experiment was to see if Collembolans could survive with nontoxic, scented marker and have a constant number of Collembolans remain. Collembolans are tiny hexapods with a springtail used for jumping. The hypothesis was that the Collembolan population would stay constant. One part charcoal to nine parts plaster of Paris were placed in a plastic container with the lid closed tightly. The container was turned until the ingredients were completely blended. The powdered mix was put into a bowl and water was added to make it the consistency of yogurt. It was stirred until it was completely mixed. This plaster of Paris mixture was placed into the Petri dishes, which were tapped on a table to make the mixture spread throughout the entire dishes. They were allowed to dry for a couple of days. The Collembolan environments were moistened with water. A few grains of yeast were added for the Collembolans to eat. Sixteen Collembolans were placed in each environment. The numbers of Collembolans were counted and recorded as data. After 36 days, there were nine Collembolans in the experiment and seven Collembolans in the control. The Collembolan eggs also were counted. There were zero in the experiment and 13 in the control. This

data suggested the hypothesis was incorrect. The experimenter believes more tests should be performed to get more accurate results.

6049

Will a Population of Collembolans Increase If Salted Sunflower Seeds Are Added to Their Environment?

Ayanna Kimbro and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if Collembolans would thrive if salted sunflower seeds were added to their environment. Collembolans are tiny hexapods that have a springtail that is used for jumping. It was hypothesized that the Collembolan population would increase because they still would be receiving their normal food, which is yeast. Nine parts plaster of Paris, one part activated charcoal, and water were mixed together. The mixture was placed in two Petri dishes and allowed to dry for several days. One of the Petri dishes was labeled control and the other was labeled experiment. At the beginning of the experiment, 11 Collembolans were placed in each Petri dish. Salted, unshelled, crushed sunflower seeds and a couple of grains of yeast were added for the Collembolans to eat in the experiment. Yeast was placed in the Petri dish labeled control. The numbers of Collembolans were counted and recorded. After 43 days, there were 234 (79%) Collembolans in the control and 62 (21%) Collembolans in the experiment. The hypothesis was incorrect, because there were more Collembolans in the control than in the experiment.

6050

Will a Population of Collembolans Increase If Tiny Lime-Flavored Marshmallows Are Placed in Their Environment?

Katherine Lara and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if a population of Collembolans would increase if small pieces of tiny lime-flavored marshmallows were placed in their environment. The hypothesis was that a population of Collembolans would increase if small pieces of lime-flavored marshmallows were placed in their environment. Collembolans are very tiny creatures that are common in the soil. They have a jumping organ called a furca on their abdomen that is used to escape from predators. For the experiment procedures, one part charcoal and nine parts plaster of Paris were placed into an airtight container, which was turned until the ingredients were completely blended. Water was added and the mixture was stirred until it was the consistency of yogurt. The plaster of Paris mixture was poured into Petri dishes, which were tapped on the table to make the mixture spread evenly throughout the containers. This was al-

lowed to dry for a couple of days. The Collembolan environments were moistened with water and a few grains of yeast were dropped into each Petri dish for the Collembolans to eat. Small pieces of a lime-flavored marshmallow were placed in one Petri dish, which was labeled experiment. No lime-flavored marshmallows were placed in the control. Ten Collembolans were placed in each Petri dish. Due to a low number of Collembolans in the first and second trials, a third trial was done. In the third trial, a total of 276 Collembolans were counted, with 55% of them in the experiment and 45% in the control. There were 345 eggs counted on the last day of the experiment: 59% in the experiment and 41% in the control. After a few trials, the hypothesis was correct. A population of Collembolans increased when tiny lime-flavored marshmallows were placed in their environment.

6051

Will a Population of Collembolans Increase If Orange-Flavored Gelatin Is Added to Their Environment?

Natalie Chavira and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this project was to determine if a population of Collembolans would increase, remain constant or decrease if orange-flavored gelatin was added to their environment. The hypothesis was that the population of Collembolans would increase if orange-flavored gelatin was added to their environment. Collembolans are small hexapods, and one of the most abundant of all soil-dwelling arthropods. They have a springtail for jumping. Nine parts plaster of Paris and one part charcoal were placed in a plastic container with the lid closed tightly, and the container was turned until the ingredients were completely blended. This powdered mixture was placed into a bowl, water was added and it was stirred to make it the consistency of yogurt. The substance was then poured into two Petri dishes, which were tapped on a table to help the mixture spread evenly. It was then allowed to dry for two days. The Petri dishes were labeled with blue tape representing the control and beige tape representing the experiment. Equal numbers of Collembolans (18) were added to each environment and yeast was added for them to eat. Water was added to the environments as well. In the experiment, small amounts of the orange-flavored gelatin were added into the Petri dish. The environments were observed and data was totaled twice a week. The numbers of Collembolans and Collembolan eggs were recorded and after six weeks they were counted. On the last day, 175 Collembolans were counted, with 40% in the experiment and 60% in the control. There were also 35 Collembolan eggs counted, with 14% in the experiment and 86% in the control. The hypothesis was incorrect, because the population of Collembolans did not increase when gelatin was added to their environment.

6052

Will a Population of Collembolans Increase If Dial Spring Water® Antibacterial Soap Is Placed in Their Environment?

Makenzie Reising and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to see if Dial Spring Water Antibacterial Soap would cause a population of Collembolans to increase. The hypothesis was that a population of Collembolans would decrease if the soap was added to their environment. Collembolans are macroscopic and insect-like. They have a jumping organ called a furca. The springtails (the common name for Collembolans) being tested were white. First, one part charcoal and nine parts plaster of Paris were placed into a container. The lid was closed and the container was turned until the ingredients were mixed. Some of this substance was poured in a bowl, water was added and it was stirred until it was mixed. It was the consistency of yogurt. The thick liquid was poured into two Petri dishes, which were tapped on a table to spread the thick liquid throughout the Petri dishes. This was allowed to dry for a couple of days. The Collembolans' environments were moistened with water using eyedroppers. Into one Petri dish, drops of the Dial Spring Water Antibacterial Soap were added. This was the experiment. Yeast was added to each Petri dish for the Collembolans to eat. In the first trial, the Collembolans in the control and in the experiment were thriving. In the fourth week, the Collembolans in the control and in the experiment started dying. Eventually, all of the Collembolans died. In the second trial, the same procedures were followed. At the beginning of the second trial, there were 25 Collembolans in the control and 25 in the experiment. The Collembolans in the experiment started increasing, but then they started decreasing. In the third week, there were 30 Collembolans and 38 eggs in the experiment. In the control, there were 25 Collembolans and 60 eggs. In the sixth week there were eight Collembolans and zero eggs in the experiment, and 10 Collembolans and zero eggs in the control. In conclusion, the results were inconclusive and a third trial should be done.

6053

Will a Population of Collembolans Decrease If Nontoxic, Twistable Crayola-Colored Pencils Are Added to Their Environment?

Summer Rogers and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if a population of Collembolans would increase, decrease or remain constant if white nontoxic, colored pencils were added to their environment. Collembolans are tiny hexapods with a springtail used for jumping. The hypothesis

was that the population of Collembolans would decrease if nontoxic colored pencils were added to their environment. Nine parts plaster of Paris were mixed with one part charcoal in a plastic container. This substance was placed in a bowl and mixed with water until it was the consistency of yogurt. It was poured in two Petri dishes, which were tapped on a table to help the mixture spread evenly, and allowed to dry for two days. The Petri dishes were labeled with blue tape for the control, and beige tape for the experiment. Water was added to each new environment to keep the Collembolans moist. Twelve Collembolans were placed in each Petri dish. The Collembolans and Collembolan eggs were counted as data. At the end of 11 weeks, a total of 17 Collembolans were counted in the experiment, along with seven eggs. In the control, five Collembolans were found, along with four eggs. The hypothesis was incorrect. The population of Collembolans increased in the experiment. Further experimentation is needed to get additional data for more accurate results.

6054

Is 17 the Most Popular Random Number?

Ysabelle Cando and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if the number 17 would be chosen the most if 50 people were asked to choose a random number between 1 and 20. The hypothesis was that 17 would be the random number chosen the most. First, 50 subjects were asked to choose a random number between 1 and 20. The data was recorded from each of the 50 subjects as their chosen number. The percentage of the chosen numbers was then calculated. The most popular were 17 and 10, which each were chosen 16% of the time. The next most popular numbers were 15 and 7, which each were chosen 12% of the time. The next few numbers that were favored after that were 5, 6 and 13, all tied up and each chosen 6% of the time. It was believed that people tend to follow patterns or preferences when choosing random numbers and that could have been the reason for the experiment's outcomes. The hypothesis was incorrect, because the numbers 10 and 17 were chosen the same number of times.

6055

Do Blood Pressure and Pulse Rate Lower If a Person Smells the Aroma of Lavender?

Natalie Moreno and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine whether people's blood pressure and pulse rate would lower if they smell the aroma of lavender. It was performed to see if aromatherapy would relax subjects and lower

their stress, as shown by their blood pressure and pulse rate decreasing. The hypothesis was that both a person's blood pressure and pulse rate would lower after smelling lavender. A subject entered a room without the smell of lavender for at least 15 minutes. The blood pressure of the subject was taken and recorded. The test subject then entered another room as a lavender-scented candle was lit. After letting the subject stay in the room with the lavender aroma in the air for at least 15 minutes (or the same amount of time the subject was in the unscented room), the blood pressure was taken and recorded. Fifteen subjects had their blood pressure taken. The same process was continued when 15 subjects had their pulse rate taken. The results were then compared to see if the hypothesis was correct. Ten out of 15 (about 67%) of the subjects had a lower blood pressure rate, and nine out of 15 (about 60%) had a lower pulse rate. The hypothesis was correct. Both the blood pressure and pulse rate lowered when the subjects were in a room that had the scent of lavender in the air.

6056

Tomato Seeds on the International Space Station

Students in Class Periods 1, 2, 3, 4, 6 and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if tomato seeds that had been taken to the International Space Station would have the same germination rate as seeds that had never left the Earth. Tomatosphere sponsored this blind study and sent five seed packets labeled D and five seed packets labeled F to Oliver Wendell Holmes Middle School. After careful observation of the tomato seeds, the students decided by vote that the seeds in the packets marked D were less perfect in their appearance than the seeds in the packets marked F. The hypothesis was that the seeds in packets D were the seeds that had traveled to the International Space Station and would have a lower germination rate than the seeds that had never left the Earth. Peat pots were labeled D and F and filled with seed starting soil. One tomato seed was planted in each peat pot by poking a small hole in the soil, placing the tomato seed in the hole and covering the seed with the soil. Each seed was planted in the correct D or F peat pot. The peat pots were placed in trays and watered, and the number of seeds that germinated was counted three times a week. (A seed was considered germinated when two seed leaves appeared above the soil.) After four weeks, 77% of the seeds marked D had germinated and 61% of the seeds marked F had germinated. These results were submitted to Tomatosphere, which informed the experimenters that the seeds labeled D had been sent to the International Space Station for five weeks. The hypothesis was correct in that the seeds labeled D had been sent to the International Space Station, but incorrect because more of the seeds that had gone to the International Space Station germinated.

6057

Will Adding Dish Soap to Tap Water Lower the Germination Rate of Pinto Beans?

Anette Germirlian and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this experiment was to determine if adding Ajax® Super Degreaser Dish Soap would decrease the germination rate of pinto beans. The hypothesis was that adding this dish soap to the pinto beans would decrease the number of beans that germinated. Dish soap has many chemicals that will prevent the seeds from absorbing oxygen and water efficiently, and therefore will interfere with the growth of the plants. Six plastic planters were used for this experiment. One hundred pinto beans were soaked in tap water for 24 hours. Three of the planters were labeled as Control-A, Control-B and Control-C, and the other three were labeled Experiment-A, Experiment-B and Experiment-C. Soil was added into all six planters, each 10 cm high. For all of the planters, the pinto beans were planted, each 2.5 cm apart and 2.5 cm deep into the soil. After each bean was planted, it was labeled on a craft stick with a marker. The beans in Control-A were labeled C1-C17; the beans in Control-B were labeled C18-C32; and the beans in Control-C were labeled C33-C50. The beans in Experiment-A were labeled E1-E16; the beans in Experiment-B were labeled E17-E34; and the beans in Experiment-C were labeled E35-E50. 239 ml of tap water was poured into all of the planters marked Control. A teaspoon of dish soap was poured into another 239 ml of tap water, mixed with the water and poured into each planter marked Experiment. All of the planters were watered every other day and were exposed to sunlight for 2 to 4 hours every day. The plants were placed near a window when they were indoors. The growth and germination of the beans were recorded as data. For both the Control and the Experiment, 41 out of 50 beans germinated. The hypothesis was incorrect, because adding one teaspoon of dish soap to the tap water did not lower the germination rate of the beans.

6058

If Someone's Nose Is Closed When Dining, Will That Affect the Perception of Taste?

Timothy Lim and T. Miller (teacher)

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave., Northridge, CA 91325

The objective of this experiment was to determine if smell affects the perception of taste when consuming foods. Taste is really a combination of taste and smell. The reason for this is because food in the mouth gives off odor molecules in the air, which then are inhaled into the nasal cavity, where smell receptors are stimulated by the odor molecules. The hypothesis predicted that when the subjects consumed food with their nostrils closed, it

would affect their perception of taste by giving them a faint sense of taste, and would challenge them to identify the sample foods. To begin this experiment, a volunteer was blindfolded. Next, all of the sample foods were collected, and were sliced into bite-sized pieces. There were nine foods tested: honey, tangerines, lemons, cucumbers, Butterfinger chocolates, oranges, apples, mangos and pineapples. The test subjects were fed using a fork or spoon. When the test subjects ate, their noses were closed. After one sample was eaten, the subjects identified what the food was, and their answers were recorded. A total of 25 people were tested for the experiment, and these same people were tested for the control. The same procedures were followed for the control with the same foods, but when the subjects consumed a food, their noses were left alone. An average of 65.2% of the foods were identified correctly in the control, and an average of 72.4% of the foods were identified correctly in the experiment. The hypothesis was incorrect, but the results were very close, and the experimenter believes that more data should be collected.

6059
Giant Soccer Ball Heat Absorption

Bridget Smith, Sophie Smith and D. Gaughen (teacher)
 Homeschool (Third Grade)
 San Juan Bautista, CA

We received a giant (6-foot-diameter) inflatable, polyvinyl soccer ball this summer. After inflating the ball on our patio, we noticed that the black pentagram (15 inches on each side) felt much hotter than the white hexagram (22 inches on every other side). We remembered from our third-grade science class that black has no color and wants to absorb as much color as it can. White, we remembered, has all of the colors of the rainbow and cannot absorb any more color. We knew that color means energy and heat. We decided to test our observation by numbering the pentagrams and hexagrams which were next to each other and recording their temperature difference in the sun.

Sun Exposure Temperatures at 1:20 p.m.
 With Air Temperature at 95.2°F

Numbered Pentagrams (black) Temperature		Numbered Hexagrams (white) Temperature		Temperature Difference
#2	107.4°F	#2	97.5°F	9.9°F
#4	105.4°F	#4	97.3°F	8.1°F
#5	107.6°F	#5	98.5°F	9.1°F

We took two more readings to see if our theory worked in the shade.

Shade Exposure Temperatures at 5:05 p.m.
 With Air Temperature at 90.1°F

Numbered Pentagram (black) Temperature		Numbered Hexagram (white) Temperature		Temperature Difference
#6	103.0°F	#6	100.0°F	3.0°F
#7	101.4°F	#7	97.4°F	4.0°F

We used two thermometers that our mother uses with us when we are sick. We worried about the heat being reflected off of our concrete patio. Did it affect the temperature readings we took on our giant soccer ball? Our highest temperature reading of the concrete patio was 98.4°F (in the sun) and 93.6°F (in the shade). Our average temperature difference between the black pentagrams and the white hexagrams was 9.0°F above the patio reading in the sun and 3.5°F above the patio reading in the shade. We concluded that the black polyvinyl pentagram displays greater heat-absorbing powers over the adjacent white hexagrams no matter where the soccer ball is placed. This proved what we learned about heat absorption and color earlier in the year.

6060
Does Color Influence Recall?

Andrea Rubio, Linda Sandoval and S. Tanaka (teacher)
 Northridge Middle School
 17960 Chase St., Northridge, CA 91325

In our project, “Does Color Influence Recall?” we asked if different-colored paper helps people memorize things better. For example, if someone needs to study for a test, maybe studying on a specific type of colored paper will help. In our experiment we had four different colors of paper: white, green, neon pink and orange. Our hypothesis was that the neon colors would help people memorize things the best. To test our hypothesis, we had people try to memorize different words on the colored paper. The more words that were memorized, the better the score was for that paper. It turned out that the neon pink paper helped people memorize the words the best. Knowing this could help some students study more efficiently in the future.

6061
GMO Versus Non-GMO

Helena San Roque and S. Tanaka (teacher)
 Northridge Middle School
 17960 Chase St., Northridge, CA 91325

In my project I tried to discover the difference between a genetically modified organism (GMO) and an organic organism. I did this by observing how a GMO and an organic zucchini rotted. After much research I found out that most zucchinis in the grocery store are GMOs unless specifically labeled organic. This is why I chose to experiment on zucchinis. I predicted that the organic zucchini would rot the most, because it had not been

altered in any way. To conduct my experiment, I performed three trials. For each trial I got three GMO zucchinis and three organic zucchinis. I then cut each type of zucchini in half and observed what happened. After I conducted my experiment, the data showed that in two out of three trials, the organic zucchini rotted more than the GMO zucchini. This data matched my hypothesis. I believe that the GMO zucchinis have been altered to have a longer shelf life. This may be a good thing for grocery stores, but it may have unforeseen effects on the consumer.

6062

Red Light Versus Blue Light

Sebastian Altamirano, Kevin Dominguez, Renee Cedano, Andres Martinez and S. Tanaka (teacher)

Northridge Middle School
17960 Chase St., Northridge, CA 91325

Will cilantro plants grow faster and taller under red or blue light? We hypothesized that blue light would cause the plants to grow faster and taller than red light. To test this we planted cilantro seeds in two different boxes and hung lights (one red and one blue) over each box. We watered the plants every day and had the lights shine on the plants every day from 7:30 a.m. to 3:40 p.m. After three weeks, the seeds under the blue light started to grow. It took an additional three weeks for the red light plants to start growing. The blue light plants grew up to 36 cm, while the red light plants only grew up to 6.5 cm. Not only did the blue light plants start to grow first, but in the end, the blue light plants also grew the tallest. After some research, we learned that the blue light might have affected the plants more because blue light has more energy than red light. If we were to do this experiment again, we would make sure to also use a control plant, which would be grown in regular fluorescent lighting.

6063

Who Is Smarter: Boys or Girls?

Auri Brown, Cara-ann Carr and S. Tanaka (teacher)

Northridge Middle School
17960 Chase St., Northridge, CA 91325

In the teen universe, where everyone wants to be the smartest and the brightest of all, this project was designed to finally answer the question, "Who Is Smarter in a Teenage World: Boys or Girls?" Our hypothesis was that girls have better brain intelligence than boys because they mature faster. We gathered 22 students and created a five-part test to determine the brain intelligence of teenage boys and girls. We began by finding key subjects that force teens to use their brains and think. These subjects included perception/comprehension, visual memory, math/quickness of mind, conflict-

ing situations, and IQ testing. Surprisingly, boys were more successful in each and every test. Our results were the exact opposite of what our hypothesis expected. We learned that yes, teen boys can be very immature at times, but their brains are very sharp. If we did this lab again, we would really dig deep into this topic because there are so many other aspects to understanding the intelligence of each gender. We only focused on the tip of the iceberg, but now we have to dig deeper. We also would have focused on testing just one type of intelligence instead of testing so many different types.

6064

Zapping Mold With UV Light

Louise Holden, Janelle Lew and S. Tanaka (teacher)

Northridge Middle School
17960 Chase St., Northridge, CA 91325

The purpose of our science project, "Zapping Mold With UV Light," was to find out if ultraviolet (UV) light can destroy mold. Since UV light is often used as a disinfectant, we hypothesized that it should be able to get rid of common mold. For this project, we made agar, a type of gelatin, and filled Petri dishes with it. In about a week, mold grew in the agar. After the mold grew, we outlined each area of mold on the top of the Petri dish with a marker. Then we measured the diameter of each area of mold in centimeters. After that, we zapped the mold, in 15-minute intervals, for an hour with UV light. We checked the mold after every 15 minutes to see if there was a difference in diameter or color. After an hour, there were changes with the mold. Overall, the mold had lightened in color and shrunk a few centimeters in diameter. These results indicated to us that the UV light was effectively killing the mold. If given the opportunity to do this project again, we would put the mold under the UV light for a longer amount of time to see if there would be more of a change. The findings from our experiment made us realize that UV light could be a very useful way to kill not only mold, but also other types of germs and bacteria.

6065

Which Beverages Will Cause You the Most Gas?

May Lee and S. Tanaka (teacher)

Northridge Middle School
17960 Chase St., Northridge, CA 91325

Have you ever wondered which beverages will cause you the most gas? In my experiment I tested four different drinks that are very common: water, apple juice, milk and soda. I filled empty water bottles with a half cup of each liquid. I also added vinegar to each bottle to simulate stomach acid. Afterward I put the bottles over a heating pad (to start the chemical reaction) and a balloon over each bottle to capture the gas from the

reaction. My hypothesis was that the soda would produce the most gas because it is carbonated. I measured how big the balloons got to figure out if my hypothesis was true. My results showed that milk and soda had the most gas. In the future, if I were to do this experiment again, I would make sure to have more data.

6066

Tour Guide Robot

Eric Miller and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The purpose of this project was to see if I could create a tour guide robot. I bought parts to build my robot after deciding on a design. It is a car-style robot with four wheels. I programmed the robot to run on a specific track (course, pattern) and play a recording back once it came to an item of interest (i.e., a plant, painting, fossil or other museum display). I used a Raspberry Pi 2 to program the robot. The Raspberry Pi 2 contains software for writing the program. The robot was modeled for inside usage and some outside environments depending on the terrain. I was able to successfully give the robot a voice using the program eSpeak. The robot is able to run on a set course and speak at the appropriate times, but it does not have contextual awareness so it cannot tell if it is off the path or about to hit something. I am relying on distance and time calculations for it to arrive at the appropriate destinations described by the voice.

6067

What Drink Is the Worst For Your Teeth?

Jassandeep Ahdi and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The science experiment that I constructed targeted what drink is the absolute worst for your teeth. The four liquids that I used were water, Gatorade, 7UP® and vitaminwater. This project can help people know what liquids they should avoid the most and what liquids they can drink on a daily basis. To conduct this experiment I got eggshells, and after weighing them put them into these liquids. I kept the eggshells in the liquids for 24 hours, and then took them out and recorded their weight. I checked the differences between the two weights and found how much of the eggshells had dissolved. This helped me determine which liquid dissolves your teeth the fastest. After I conducted this experiment, I found out that out of the four drinks I used, the worst drink for your teeth is Gatorade. This is because when you drink Gatorade and it flows over your teeth, the layer of calcium carbonate that is on the teeth gets dissolved. This way, your teeth get weaker and you eventually will need to either put caps onto your teeth or get fake teeth. On the other hand, water is the best liquid for your teeth.

Therefore, if you ever have the option of drinking Gatorade or water, for the sake of your teeth I would recommend that you drink water.

6068

How Music Affects Focus

Dorothy Vasantachart and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The youth of this generation commonly complete studying as well as homework with music on. So, this lab's purpose was to find the best environment that helps a person focus the most. Each person took a test with five English and five math questions under different circumstances: listening to classical music, to pop music, to rock music, to a playlist of the person's preference, and lastly in a setting with complete silence. Each person had a different test assigned to a circumstance and all took the tests in the same order. The results were calculated with the averages of all of the tests' scores. In the end I concluded that rock music had the highest average and is the best music to listen to for focusing. Following the rock playlist were the person's musical choices, then the circumstance with no noise at all, then the pop playlist, and finally the classical playlist.

6069

Colors Based on Gender

Vaani Mathur and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project, I decided to see how colors appeal to male and female genders. I tested both males and females, seeing what colors they would pick depending on the object. I put "gendered" colors as certain objects. Some of the few gendered colors are blue and pink. You often hear that pink is for girls and blue is for boys. During the experiment I noticed that more than 50% of the boys chose a "girl color," while the other half chose a "neutral color." This also happened with the females I tested. To make sure my data wasn't affected by age, I did surveys on kids, teens and adults. The overall results were that many people chose the colors opposite of their gender, showing that the colors cannot be gendered.

6070

Familiarity = Preference

Nadia Sabar and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The purpose of this project was to find out if individual choices about food are influenced by familiarity with its appearance, taste, smell or the outlet where it is served. My hypothesis was that familiarity does affect food

choice. This is because when choosing a food, you tend to choose one that you have eaten before, and you like the taste, smell and/or appearance of it. For example, when choosing a soda you most likely would choose one that you have already consumed before or that is similar to your favorite type. To find my answers I conducted a survey of 10 subjects, who answered a set of 12 questions. I drafted general questions and some specific to the subject of familiarity. The respondents had to choose an answer based on a scale from 1 to 5. After the survey was concluded, I mapped the results of each question on individual pie charts and showed the information as a percentage. I observed that the majority of responses indicated that familiarity with a food item was the principal reason for the subjects' preferences. In conclusion, I believe that my hypothesis was correct in saying that familiarity does affect food choice.

6071

Which Candles Burn Faster?

Jasleen Chadha and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My topic is about burning candles. I wanted to find out which candle would burn faster. My hypothesis stated that, if I burned a colored candle along with a white candle, the colored candle would burn faster. I tested my hypothesis by burning one red candle, one green candle and one white candle. (I made sure that all three candles were the same brand and the same size.) I placed a piece of foil, got a Sharpie and separated the foil into three sections. I labeled each section using #1, #2 and #3, and placed the green candle on section #1, the white candle on section #2 and the red candle on section #3. I lit all of the candles and then started the timer, making sure to record observations before, during and after the experiment. The white candle took much longer to burn compared to the colored candles. I found out that my hypothesis turned out to be correct. I believe that the colored candles burned faster because they contain a dye in them that has more chemicals in it to heat up more quickly.

6072

The Effects of Color on Memory

Kelley Lam and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In my science project, I tried to figure out whether color affects your memory or not. I created three different types of test groups: a control, a trend and a random group. The people in the control group were given a flash card with a date and a corresponding historical event written in black ink. I did the same thing for the other groups, but the words were written in different colors. The trend group had a color that corresponded with the event (i.e., red = blood/danger), and the random group

had a random color. I gave them a few minutes to memorize the information and then recite what they knew. I asked them to recite it again a few hours later. I found out that the people in the trend group did a lot better compared to the other two groups. I think this is because the trend group had a color that corresponded with the event on the card, which allowed them to focus more when they were trying to memorize the information.

6073

Is It a Bird? Is It a Plane? It's a Magnet!

Kirsten Cha and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My project focused on the idea that magnets could levitate. We know that magnets (especially rare-earth magnets) have enough power to attract other metal items toward them. So wouldn't there be some way to get magnets to levitate? I found two magnets that repelled each other, one being a simple ferrite magnet and one being a rare-earth magnet. The rare-earth magnet was placed between two carbon graphite blocks, with the large ferrite magnet on top. The carbon graphite blocks balanced out the rare-earth magnet, while this magnet was repelling the large ferrite magnet on top, causing it to float. You could say that two opposing forces on the rare-earth magnet were causing it to float. Then I tested the farthest lengths these magnets could move apart and also saw how high the rare-earth magnet could float. My hypothesis was that as the magnets got farther away from each other, so would the height. I could say I was half right. The height of the rare-earth magnet did not change that much (maybe by 1 cm) compared to how far away the magnets were from each other. However, this project showed us how magnets truly are strong, and can levitate each other. This experiment also could help other scientists in the future by giving them knowledge of what magnets to use, even if in their case they use much larger ones. Maybe scientists can use this property for greater things later on! Lastly, I concluded from this experiment that not all magnets are alike, and that the different sides of magnets are truly amazing: where one side attracts the other, the other side repels. Now to figure out how to levitate other objects ...

6074

Night Vision

Alison Wang and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

A large number of animals (like cats, dogs, owls, etc.) have the capability to see clearly under low-light conditions, but human beings, birds and some primates cannot. In this study, it was hypothesized that human beings can retain night vision given some genetic conditions. I hypothesized that having a material function as tapetum cellulosum offers the closest possibility for the

human eye to see clearly within 50 meters of distance in the dark. After intensive research, I discovered only a specific genetic sequence can contribute to night vision. This protein is 3c9l, or the ground-state of bovine rhodopsin in a hexagonal crystal form. It contains G (guanine) protein-coupled photoreceptors, which perform the sensory perception of light. It can provide the maximal wavelength of reflected light, and it matched the material function found within the tapetum cellulosum. If 3c9l could be engineered and reconstructed as a thin layer of material like the tapetum found within some animals having night vision, humans might have a chance to obtain night vision.

6075

Does Water Distillation Affect the Purity of Water?

Rita Thomas and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In my project, I wanted to discover whether or not water distillation is able to affect the purity of water. To do this, I first had to create a system in which I would be able to distill unclean water. I decided to take a larger bowl filled with unclean water (muddy water, salty water), and then take a smaller empty bowl and place it inside. Then I placed a plastic wrap over the two bowls, and used a weight to tilt the wrap inward. After doing the experiment, I found out that water distillation is able to affect the purity of water. I determined that it is able to make the dirty water cleaner and fresher to drink. This happened because after the water evaporated, it condensed down into the smaller bowl due to the weight I used. Therefore, it is possible for water distillation to purify water.

6076

What Are We Really Touching?

Malia Young and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I did this project to discover which of three items (shoes, currency and iPhones) have the most bacteria. In this project I learned that everyday objects have more bacteria than you may think. I swabbed parts of shoes, currency and iPhones and wiped the swabs on a Petri dish. After a few days, bacteria started to grow, and I discovered that the Nike shoes had more bacteria than the phone and the currency. However, even though the shoes were the dirtiest, the currency and phones were very dirty as well. This experiment proved that shoes are extremely dirty and hopefully you won't wear your shoes in the house after looking at the experiment I conducted. This experiment on bacteria on everyday items hopefully will help you realize that the surfaces you touch every day are dirtier than you think. In conclusion, we need to

be more aware of what we touch. Even though we don't see any of the bacteria and germs on surfaces, we should know they're there.

6077

Now You See It, Now You Don't

Nishank Gite and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project I created invisible ink. Then I used the ink to find out under what type of light source it became visible and how. I took the invisible ink and wrote on something with it, and then I shined different types of light on the spot where I wrote. The types of light I tried were black, incandescent, fluorescent and ultraviolet (UV). After putting the invisible ink under these lights, I concluded that the ink only showed up with the black/UV lights. How this works is that these lights shine high-frequency light waves onto the ink. Then the ink absorbs this light and goes up the energy scale, and once it gains too much energy it has to lose it, so it begins to get molecular vibrations. This allows the ink to lose some of its unnecessary energy. This unnecessary energy is what we see when we look at the invisible ink. This is what I learned throughout the project and about how invisible ink works.

6078

Bamboo and the pH of Household Liquids

Jenny Nguyen and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In this science project, the question asked was what type of household liquid would be best for the long-term survival of a bamboo stalk. The different types of liquids were represented by the pH scale. Acidic liquids were lemon water and Coca-Cola; basic was soap water; and neutral were saltwater, sugar water and regular water. Observations of the plants' health were made over a period of 30 days. I noticed that the acidic liquids weakened the bamboo the earliest, causing thin, yellow leaves and a shriveled stem. The basic liquid (the soap water) also was not the best for the bamboo's well-being. The bamboo stalks in the neutral liquids kept the best health throughout the entire experiment, with a sturdy stem and healthy, green leaves. However, those in the saltwater, despite it being neutral, had a weak condition similar to the bamboo stalks in the acidic liquids. This is because bamboo does not tolerate salt. Therefore, one can draw the conclusion that liquids that are acidic or contain salt are the worst for the long-term health of bamboo. Basic liquids are a better choice, but not the best. Rather, it is the neutral liquids that are the best choice for bamboo.

6079

What's the Color of Work?*Halle Johnson and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In this experiment, I had five subjects who were told what they were going to do. There was a series of five short tests, each printed on a different-colored sheet of paper. There was white for control, then blue, red, yellow and green. The tests were given to the subjects facedown and one at a time. The subjects had no scratch paper, and they gave me their answers orally. I recorded each answer they gave to compare with an answer key. While they were testing, I used a stopwatch to time them. It ran from the moment they flipped the paper to when they gave their last answer. I told them their number correct, but not which ones they got wrong and what the answer was. After they finished, they moved onto the next one with the same procedure. From all of the data, it seemed that blue was the real color of work. It wasn't the fastest test, but the average number of questions right was far greater than with any other color. The control test was tied with green for the lowest score, and it had the longest average time. Yellow was a close second to blue, as it was faster, but not as accurate. Green was also fast, but had bad scores. Red was slow and inaccurate.

6080

Colors Within Colors: A Paper Chromatography Project*Jessica Chiueh and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project, I decided to create an experiment on paper chromatography. The experiment was designed to see what colors are in powder drink mixes and what colors are in markers. I chose a total of 10 different drink mixes and 10 different colors of markers. A paper towel cut into a 4-inch by 6-inch rectangle was used as the filter, while rubbing alcohol was used as the solute. I then rolled each paper towel into a cylindrical shape. Each paper towel was marked with a line 1½ inches above the end of the paper's shorter side. A drop of powdered drink mix or dot of marker was placed on the line. After placing the filters with the substance in a clear plastic cup filled with 1 inch of rubbing alcohol for 15 minutes, they were removed and I examined the results. The experiments were conducted three times each in order to obtain accurate results. I found that lighter-color drink mixes stayed closer to their original color, while the darker ones tended to vary a bit more in color. The same proved to be true of the markers, although the markers had a significantly larger variation of color from the original color. This meant that drink mixes with darker colors contain more colors than drink mixes with lighter colors. When compared to the markers, it also proves that markers have more colors than the drink mixes have.

6081

How Does Substituting Gluten-Free Flour Affect the Height of a Cupcake?*Michelle Krichevsky and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

This science experiment showed how substituting gluten-free flour affects the height of a cupcake. Knowing about this project can allow people with gluten allergies to be able to eat gluten-infused baked goods such as cupcakes and muffins by replacing all-purpose flour with gluten-free flour. I used a vanilla cupcake recipe – making a dozen gluten cupcakes with all-purpose flour and a dozen gluten-free cupcakes by replacing the all-purpose flour with gluten-free flour – but left all of the measurements the same. I allowed the cupcakes to bake in the oven for the same amount of time and proceeded to observe the cupcakes. I averaged the height of the 12 cupcakes for each batch and found out that the gluten cupcakes had an average height of 1.75 inches and the gluten-free cupcakes had an average height of 1.30 inches. After performing this experiment, I found out that substituting gluten-free flour does affect the height of a cupcake, but it is possible to do so and the outcome is still pretty tasty.

6082

How Temperature Affects Chemical Reactions*Kady Tang and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

Did you ever break a glow stick and hear the popping sound, followed by the glow that comes afterward? The stick may shine for a few hours, but will die out eventually, so there must be a solution for a longer-lasting glow stick. According to my research, the answer to that is temperature, which will affect the rate of chemical reactions in a glow stick. High temperatures will increase the kinetic energy and cause molecules in the stick to move faster. The molecules then will collide into one another, increasing the rate of chemical reactions. For my project, I put a glow stick into hot water (near boiling temperature) and recorded how long it remained glowing. This resulted in a radiant glow stick, but increasing the temperature shortened the amount of time the glow stick lasted. A second option is decreasing the temperature, which will slow down the molecules; therefore the number of collisions also will decline. This will reduce the kinetic energy and the chemical reaction rates, and the outcome will result in a dim glow stick that will last longer. To test this, I put another glow stick in icy water and recorded how long it lasted. That is how you scientifically increase the amount of time a glow stick will last – by decreasing the temperature, and this experiment proves how temperatures affect chemical reactions.

6083

The Speed of the Past, Present and Future*Sahil Kamboj and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For this project, I did different kinds of tests to find the reactions of a 7-year-old, a 13-year-old and a 35-year-old. I asked the subjects to clap when a basketball hit the floor and when a pen dropped. For sight, I used a word test and color test in which the subjects had to say the words as fast as they could. I found out that the 13-year-old had the fastest reaction time, and then the 7-year-old. The 35-year-old was in last place. The factors of stress and growth were part of this. The brains and bodies of 13-year-olds are growing and they don't have much stress. Thirty-five-year-olds have a lot of stress and aren't growing anymore. A 7-year-old just isn't old enough to have major growth impacts to have a faster reaction time.

6084

The Rise of the Cupcakes*Ivie Hoang and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I chose to conduct my science experiment on cupcakes. If you love to bake desserts, but are short on a few ingredients, this experiment will help you find out how your cupcakes will turn out if you change the amount of baking powder or baking soda you add. Throughout the project, I used the same recipe for vanilla cupcakes by Laura Vitale. I needed flour, eggs, milk, butter, sugar, salt, vanilla extract, and baking powder/baking soda. I used a standing mixer to mix the batter, and an ice cream scoop to separate the batter into a cupcake tin lined with cupcake wrappers. The cupcakes baked for about 25 minutes or until they were cooked. The first batch I made was the control batch, where I used the exact amount of baking powder the recipe calls for. Then for each cupcake batter, I substituted the baking powder for baking soda, added an extra $\frac{1}{2}$ teaspoon of baking powder/soda, or subtracted $\frac{1}{2}$ teaspoon of baking powder/soda. From this experiment, I learned that it is better to just follow the recipe and instructions you are given. When I changed the measurements, the cupcakes came out lopsided with a pale color, or flat with golden brown edges. So I highly recommend either using the exact measurements in the recipe, or using an equivalent substitution for the substance you are replacing.

6085

Eggs Versus Tea, Coffee and Cola*Emmy Khuu and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In my science experiment, I investigated whether or not tea, coffee or cola can stain your teeth. Eggshells were used as a substitute for actual teeth due to the fact that eggshells contain components extremely similar to the enamel of teeth. I began by emptying out the insides of the eggs by poking a hole on both sides of each egg to blow out the insides. After that, the eggs were soaked in coffee, tea or cola for about a week. Every day at 7 p.m., the eggs were checked to see if any changes had occurred. After the week, I concluded that the beverage that stained the darkest was tea, while coffee created the lightest stain. You can conclude from this experiment that you should always be careful after you drink one of these beverages and make sure you care for your teeth so staining doesn't occur.

6086

How Does Blue Light Affect Your Emotional State?*Clarissa Lee and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science experiment I tested the different effects blue and white light had on my two groups of 10 participants. Group A was tested with white light and Group B was tested with blue light. I then showed the participants the same clips that included a certain movie scene. These scenes were meant to generate a sad emotional response. At the end of the viewing, I asked the participants to rate their emotional response on a scale from 1-5. As I got the results from my experiment, I found out that Group B had a decreased emotional response. When graphed out, Group B had a lower average than Group A. This means that there are certain properties in blue light that can be used to stabilize your emotions. The results of this experiment could be used in real-life situations on a larger scale. For example, now that blue light properties have been proven to stabilize emotions, this could be used with any patient struggling with depression. There could possibly be more experiments and tests that could be done with blue light to maximize this useful property.

6087

The Effects of Hobbies on Typing*Myanno Miller and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

This science experiment focused on typing speed and accuracy, and how different people's hobbies can affect how they type. There were three different groups: those

who regularly play piano, those who regularly play video games, and those who do neither. I told the subjects from each group to use a typing program to type different prompts on three different days in under a minute. The typing program measured their speed and accuracy. I asked them to send me a screenshot of their results. After the groups took their tests on the three days, I took the averages of each group and formed a conclusion. Originally, my hypothesis was that the gamers would have the highest typing speed and the pianists would have the highest accuracy, with the neither group scoring the lowest on both scales. However, while the last part of my hypothesis was correct, it was the gamers who had the highest accuracy and the pianists who had the highest speed.

6088

How Does Citric Acid Affect Calcium?

Marlee Kitchen and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

This study tested what effects citric acid has on calcium. This experiment can help people understand what the harmful chemicals in foods nowadays are doing to their bones. For this project I used vinegar, because it is on the acidic end of the pH scale. I also made use of chicken bones because they are similar to human bones and they contain calcium. I placed one bone into the vinegar and a separate bone into water. I let them sit there for a total of 18 days and observed them every other day to see their progress. At the end of the 18 days, I took them out of their bowls of liquids for a final observation to conclude my experiment. I noticed that the bone soaked in the vinegar was significantly smaller than the bone inside the water. That bone hadn't changed at all. This is because the extra hydrogen atoms inside the vinegar attached to the tissue on the bone and deteriorated it.

6089

Sound of Silence

Christopher Alvord and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The purpose of this project was to find out which material absorbs sound the best. I used foam, carpet and sheet metal to try to dampen sound. Each item was secured in a box, which was then flipped upside down on top of a speaker. I played the same song for each test, using a decibel meter to measure the maximum number of decibels generated by the song. The decibel meter was placed at a set distance outside of the box. I played the song in the box without any additional damping materials to get a control decibel level. I was able to refer to the control level to find out which material absorbed the most sound. The change in the decibel level from the control reading to the carpet reading was the greatest, meaning

that the carpet absorbed the most sound. The thickness of the material, as well as the coverage of the material in the box, may have been factors that played a part in the outcome of the project. This project is important because occupational hazards occur daily, and I believe that we can help prevent them. By using sound-damping materials, we can lower the number of injuries, including loss of hearing or possibly even deafness.

6090

Effects of Density on Evaporation

Ved Kulkarni and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My project explains how the density of different liquids affects their evaporation rates. This would explain why different liquids don't all evaporate at the same rate. For my liquids, I used 50 ml of Coca-Cola, apple juice, isopropyl alcohol, water, coconut water and nail polish remover. To test the evaporation rates, I left them all in the same room with the same lighting for one week, and recorded the amount of liquid left in the beakers every day. I took this data to determine an evaporation average rate for each liquid. I also made a graph to see how fast each liquid was evaporating, and to compare the evaporation rates of the different liquids. My hypothesis was true, with the liquids with the lowest densities evaporating the fastest. This resulted in the nail polish remover being the quickest to evaporate, at a density of 1.44 g/ml, and apple juice being the slowest to evaporate, at a density of 1.74 g/ml. This was the result of how tightly packed the molecules in these liquids are. For a molecule in a liquid to evaporate, it needs to gain enough energy to break free of the bond. This is much rarer in higher-density liquids, as they require more energy to break free of the bond than lower-density liquids.

6091

How Does Temperature Affect the Growth Rate of Crystals?

Gabby Sigal and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science experiment, I chose to explore how temperature affects the growth rate of crystals. To do this, I needed alum spice to create the crystals, a pan to dissolve the alum into water, three Popsicle sticks (one for each temperature level), three paper clips, three pieces of thread and three cups. I dipped each paper clip into the alum spice, tied it onto a piece of thread and then a Popsicle stick, and laid one Popsicle stick on top of each cup. I then put one cup into the refrigerator to test cold temperature, one in a regular room with no additional sunlight to test room temperature, and one on top of a heating pad to test a hot temperature. After

many days of observing, I saw that heat had the best effect on the growth of crystals (both in size and number), the cold temperature had the second best, and the room temperature had the worst. My original hypothesis was that the cold temperature would have the best effect on the crystals, and even though my hypothesis was incorrect, I am still extremely happy with how the experiment turned out.

6092

How Does Sight Affect Taste?

Sami Fong and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my project, I did several experiments regarding food and sight. Inspired by fancy restaurants where customers consume food in the dark, which may enhance their taste buds, I blindfolded several family members (ages ranging from 12 to 73) and served them simple foods, all of which they're familiar with (such as cereal, granola bars, etc.). From my experiment, I found that my family members were not affected, as they easily guessed correctly each food that was given. Although my hypothesis was proved incorrect, overall this project was a great learning experience.

6093

How Do Different Types of Water Affect Plant Growth?

Jayden Davila and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

This experiment's main objective was to determine if different types of water have an effect on plant growth. I predicted that the type of water does affect plant growth. I thought that the plants in Condition 1 would grow the most successfully, because they received just plain tap water with nothing else added to it that could possibly stunt the plant growth. I thought that the plants in Condition 2 probably would stay alive, but that the extra ingredients in the recycled water would make them grow more slowly or stop them from growing. Finally, I thought that the plants in Condition 3 probably would die first or never even grow because the salt in the water would build up on the soil and block the plants from growing through the soil. Overall, my hypothesis was correct. So, if you are ever watering plants in your own garden, I recommend that you use recycled water. Not only does it get the job done, but it also saves money and conserves water.

6094

Effects of Word Color on Reading Speed

Christine King and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In this science experiment, the purpose was to discover the effects of word color on reading speed. To find these effects, I used three pieces of paper with 15 words written on each of them. Each word was the name of a color, but one paper had the words all in black, while the second paper had the colors of the words correspond to the meanings of the words, and the third paper didn't have the colors of the words correspond to the meanings of the words. I asked 10 people to read the three sheets as quickly as they could, and then recorded the times. The results showed that the sheet with the colors that corresponded to the meanings of the words had the fastest average time at 5.042 seconds, while the sheet with non-corresponding colors to the words had the slowest time at 5.742 seconds. The sheet of paper that had the words in black got the middle time of 5.552 seconds. Therefore, reading speed is increased by having word meanings correspond to color, while it is decreased by having word meanings not correspond to color.

6095

Calories: The Struggles of Obesity

Jennifer Nguyen and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My science project was about the most common unhealthy foods consumed by people living in the United States and how fattening these foods can be for you. I split the project into two parts: One was a survey where I asked people what they ate the most out of the five categories that I researched to be the unhealthiest (potato chips, pizza, burgers, ice cream and chocolate); and in the other I burned the foods I had using a calorimeter to figure out which one included the most calories. I found out that the most commonly consumed unhealthy foods were LAY'S® original chips, cheese pizza, Big Macs®, vanilla-flavored ice cream and KIT KATS®. From here, I took the serving sizes labeled on the packages to figure out how much of the foods I needed to burn. I used a small calorimeter I had at home, and from that I used the starting and ending temperatures – after the foods had been completely burned – from the thermometer part of the calorimeter and inserted them into a formula to convert them into calorie measurements. (I put the burning food on a pedestal and placed it under the calorimeter. The calorimeter reacted by raising its temperature, and from the formula I calculated the calories.) I found out from this experiment that the unhealthiest food was a hamburger, since it had the most calories and that most of those calories came from fat. Fat is the leading cause of obesity, and obesity is the second-leading cause of death in the United States, the first being heart disease, which also

can be connected to obesity in a way. I wanted to use my project as a way to promote awareness of how bad these unhealthy foods can be, hoping that people now will think twice before they put that giant Big Mac into their mouth. It may seem like the world to them as they take that first bite, but I promise it won't be worthwhile in the long run, as you can tell from this experiment.

6096

At What Rate Do Different Liquids Evaporate?

Diksha Dahal and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my project, I used three liquids: mustard oil, water and apple juice. I put 8 ml of each liquid into three Styrofoam cups and put them under a lamp for 10 hours a day for five days. I noticed the differences in the evaporation rates, but there were many other changes too. I expected the water to evaporate the most. It did, and after that came the apple juice. The mustard oil didn't evaporate much. Also, the apple juice started growing mold very rapidly, and the mustard oil had condensation around the glass. I didn't think of such consequences from these liquids under light other than evaporation. I definitely learned new information and I am now more open to where science can take you.

6097

In Which Liquids Do Seeds Grow Best?

Karen Lam and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I got some seeds, put them in soil and watered them with different types of liquids every day to see how this would affect the growth of the plants as well as their germination. The liquids I used were regular water, sugar water, saltwater, iced tea, soda and vinegar. For me, the plant with the sugar water grew the best. It was a better liquid than the regular water because it had sugar in it, which helped boost the growth of the seeds and gave them more energy so they could grow. The regular water did help the seeds grow because water is what's usually used for plants. The seeds with the saltwater did not grow, and neither did the ones with vinegar. The seeds with the soda actually grew. This is because the soda released a lot of carbon in the soil, which plants require to grow and function. The sugars in the soda also helped the growing process. The seeds that were watered with iced tea did not grow. This is because there are sometimes chemicals in tea that might harm plants and the germination process. So, what I found out in the end was that sugar water helped the seeds grow the best compared to the other liquids I used to water the plants. Water still works well, though, just not as well because it doesn't have any sugar. But the plants still will grow

normally since water is really what everyone uses. Vinegar, saltwater and iced tea do not work well with plants and won't really help them grow.

6098

Can We Match Voices to the Faces of Strangers?

Casey Kim and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

To answer the thesis question of whether we can match voices to the faces of strangers, I took pictures of 10 volunteers. I labeled the pictures A to J and had each volunteer say, "Hi, it's nice to meet you" into a voice recorder, and made a key with the correct corresponding answers. I had the test subjects (who did not know the 10 volunteers) try to match each voice to a picture, and I recorded the answers on my data table. I found out that all of the test subjects were able to tell the difference between the male and female voices, most likely due to the differences in tone and pitch. In addition, the picture of each person revealed a small measure of how approachable the person seemed to be. A person with a bright smile would be correlated with a brighter, happier voice, while a person with less of a smile would be correlated with a smaller and shyer voice. In conclusion, there are many factors that affect the human brain in deciding how to match voices to the faces of strangers.

6099

Race to Break Tension

Cynthia He and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My science experiment tested whether or not water temperature affects how fast water tension breaks. This would most likely impact how people use water, as it could help people conserve water because breaking surface tension is important to be able to wash clothing. This project required cold and hot water, scissors, a metal pan, toothpicks, markers, foam boats and a stopwatch. By using all of these items, I was able to figure out the time difference among all of the boats. To prepare, I used a marker to draw ticks on the metal pan to show measurements. This was used to create data for the time it took each boat to cross each line. I put a drop of soap in each boat, and they propelled themselves forward. After each boat passed a mark, I wrote down the time. As a result of the experiment, I concluded that water temperature does affect the speed at which soap breaks surface tension, because the warm water broke the water tension faster. After doing some research, I discovered that soap is able to break surface tension because soap molecules push water molecules out of the way. This forces the hydrophobic end of the molecule out of the water, causing the surface tension to break.

6100

Effect of Gender on Short-Term Memory*Chaerin Sung and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project, my purpose was to see how gender affects short-term memory. I decided on this topic because I wanted to know if there actually is a memory difference between boys and girls. This topic could have an effect in the world because it could help each gender find a way to memorize to a greater extent, which could lead to higher scores on tests. I first found 20 words (easy, medium and hard), six male volunteers who are the same age, and six female volunteers who are the same age. I told the first volunteer that I would show him/her a list of 20 words and that he/she should memorize as many of the words as possible in 1 minute. After that, I showed the word list to the first volunteer for exactly 1 minute, and then turned the list over. Then I had the volunteer write down as many words as he/she remembered in 45 seconds, and recorded the number. I repeated this process for the rest of my volunteers, found the average number of correctly recalled words for the males and females, and compared them. I observed that the average for females was 6.25, or 31.25%, and the average for males was 5.375, or 26.875%. Females had a higher average than males. So, in conclusion, females have a better short-term memory than males.

6101

What Is Bacteria's Favorite Type of Music?*Rahul Sathish and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I wanted to find out if music could affect the growth of bacteria, and what type of music would work best. I thought that music might affect the growth of bacteria because of an experiment that was run in a sewage plant in Treuenbrietzen, Germany. This experiment proved that the sewage-cleaning microorganisms “work harder” when listening to Mozart music. For my experiment, I swabbed for bacteria in my bathroom and I rubbed some bacteria on each of four agar plates. I used three pairs of headphones and MP3 players to play the different genres of music, which were pop/dance, heavy rock and classical. I used the last agar plate as a control, for which no music was played. I placed all of the agar plates in an incubator that I made using a box and desk light. After I set up the experiment, I took pictures and examined how each sample grew over the course of seven days. I discovered that the pop/dance music and the classical music influenced the bacteria to grow faster. Both of these samples had one larger colony along with a few smaller colonies. The heavy rock bacteria sample had no large colonies and a few small colonies. The control sample had one medium-sized colony and several smaller colonies. Us-

ing this data, I can conclude that pop/dance and classical music are better suited to increase the growth rate of bacteria. I also can conclude that heavy rock music should not be used, because it showed worse results than the control sample. Overall, I learned a lot about factors in the growth of bacteria, and I feel this could be useful for tasks that involve using bacteria and microorganisms to benefit humanity.

6102

How Does Smell Affect the Way Our Food Tastes?*Alex Rhee and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

Our sense of smell plays a big role in the way we taste our food. Without our sense of smell, some foods may be tasteless or taste very bland. About 80% of how our food tastes is because of the delicious smell. We inhale the steam that is in the air from the food and instantly we know how the item should taste. So what happens if we take the sense of smell away? My hypothesis was that the items I selected would not be easily identified without the sense of smell. I believe age plays a role in this too. The younger you are, the more taste buds you have, so you should be more accurate in knowing what you taste. The older you are, the fewer taste buds you have, so you should be less accurate when trying to identify what you taste. You have a certain number of taste buds when you are born, and as you age you lose some or burn some off, etc. That said, older people do not taste as well compared to persons in their youth. The older you are, you might not even be able to know what you taste without your sense of smell. To conduct the experiment, I gathered a group of people and had them taste five to six spices while blindfolded. They tasted each spice twice: once with only taste, and the other with both smell and taste. I recorded their response for both tests. The results of the experiment were that younger people had more accuracy when tasting the spices and identifying them. In the test where the participants could only taste the spice, the younger people were far more accurate than the older people. Some younger people identified the correct spice on both tests, but the adults could not get both of their guesses correct. In conclusion, my hypothesis was correct. Smell affects taste greatly, as the adults sometimes did not even know what spice they tasted without smelling it first. In both age groups, everyone was more accurate on the test with both smelling and tasting incorporated. So how does smell affect taste? As you can see, many people were not able to correctly identify the spice on the first test, but were able to on the second. Smell accounts for 80% of how you taste food – so next time thank your nose for how your food tastes.

6103

To Grow or Not to Grow*Isabel Cerna and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In my project, I tested growth formula for humans on plants. I grew two plants of parsley, one treated with the formula and the other with water. Each plant was fed a cup of the liquids twice a day. I logged my observations and the measurements of both plants. Though there are many similarities in the composition of plants and humans, the formula did not improve the growth of the plant. However, I created a theory based on the results. If I were to feed the plants with a nondairy growth formula, the plants possibly would grow more efficiently than with water. Taking out the ingredient of milk would prevent the plant from molding and possibly still provide nutrients to improve growth.

6104

Gravity, Why You Pullin' Down?*Hannah Howell and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project, I decided to see how seedlings react to being turned upside down in the process of plant growth. I constructed a contraption called a seed germinator, and placed 10 seedlings inside it. I provided them with a good supply of water and light, and observed and recorded their daily changes. After about six days, the stems of the seeds grew long enough for me to turn half of them upside down. I only turned half of them upside down to see the comparison between the ones growing normally and the ones growing the other way. After another couple of days, the upside-down seedlings ended up curving and growing upward. From this experiment and extra research, I learned that seedlings naturally grow vertically. Plants do this because they can detect gravity through an ability called gravitropism. Without this, seeds moved upside down wouldn't be able to grow.

6105

Cell Phone Spectrophotometer*Verleen Bilg and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The purpose of this experiment was to investigate the absorption of visible lights in different-colored solutions. One of my hypotheses was that the intensity of a colored solution might affect the amount of absorption. Therefore, the darker the solution, the higher the absorption would be. The darkest primary color used was blue dye, and the lightest-colored solution was yellow. The other color used was red, and the reference sample was water. Using a homemade spectrophotometer, we can see a

solution absorb visible light. This experiment involved placing a cell phone in front of a visible light diffraction grating, which was at least 30 cm away from the colored solutions so I could get the most accurate results. The solution was placed on top of a wooden base so it would be elevated above the flat surface. A white light-emitting diode (LED) light source was positioned on top of the wooden base so that it would come in contact with the colored solution. After I set up the equipment in a dark room, I used my cell phone camera to take pictures of the spectrum through the diffraction grating. I uploaded these pictures to a cell phone spectrophotometer software program that graphed the spectrum. I then defined the highest peak in absorption for each solution to see which one had the maximum absorbance. My results proved my hypothesis that the darker the solution, the higher the absorption will be. I know this because the blue-colored solution had the highest peak in wavelengths compared to the other primary colors tested.

6106

Is Bigger Better?*Daniel Klosterman and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My science experiment was based on testing if the length of a paper helicopter blade would affect how fast it falls, and if the stiffness of the paper used would affect it as well. I first put together three helicopters with different-sized blades: 5 cm, 10 cm and 15 cm. I dropped all three helicopters three times from 8 feet to get more accurate times for each one. After testing all of the helicopters, I saw that the blades on the largest helicopter were folding up. So I decided to make another three helicopters, with the same dimensions, but out of cardstock. At the end I found that the longer-bladed helicopters fell more slowly than the ones with the shorter blades, but the heavier paper caused the helicopters to become unbalanced while falling.

6107

How Do Different Music Genres Affect the Brain?*Kaitlyn Hang and G. Zem (teacher)*Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my project I took a group of 12 different people, put them into four separate music categories and tested them with a very basic multiplication sheet. The music genres were pop, rock and classical, and the control group was no music. I tested the subjects on their test accuracy level, which was indicated in percentages, and their time, which always was shown in seconds. Since the worksheet was very simple, no one took more than 60 seconds. I found out that participants in the rock category scored the highest and had one of the lowest completion times. It wasn't very far ahead, but it was the best. But, the

pencil that I gave to each tester broke in every category except for rock. The pencil could have affected my data. The four music genres were all really close to each other, so I don't think there is any one specific genre that helps the brain.

6108

How Do Tire Pressure and Gear Ratio Affect a Bike Ride?

Jennifer Huynh and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

In my science experiment, I wanted to investigate how different levels of psi (pounds per square inch) in a bike tire, as well as the gear ratio for a bike, can affect the distance a bike travels. I chose a variety of psi levels to test, ranging from 5 psi to 40 psi. For the gear ratio I started out with testing from a 1:1 ratio, then 1:7, 2:1, 2:7, 3:1 and finally 3:7. To test whether these variables had an effect on a bike ride, I measured and adjusted the different levels of psi and gear ratios, then for each I rode the bike across a 10-meter distance and observed if anything changed when riding the bike. I repeated this three times with each psi level and gear ratio to make sure I had accurate results. I discovered that the higher the air pressure and the greater the gear ratio were, the speed increased when riding the bike. For future reference, this experiment can be applied more broadly in daily life, like for a car or a truck. This experiment may be used to see the range of air pressure levels needed in a tire for the best possible use. In addition, many vehicles involve shifting gears for a safer, faster and more efficient way to get somewhere. The results of this experiment can be taken into a larger perspective and used to make life easier.

6109

Do All Liquids Evaporate At the Same Rate?

Mayam Timbol and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I did my project on whether or not all liquids evaporate at the same rate. For my experiment, I used four different liquids: water (which was my control liquid), wine, juice and nail polish remover. Before I began my experiment, I developed a hypothesis on which liquid I believed would evaporate the fastest, or what I thought would happen to the liquids. I believed that the nail polish remover would evaporate first, based on the times when I spilled nail polish remover on my fingers when I painted my nails, and it just seemed as if the nail polish remover "disappeared" off of my fingers. To start the actual experiment, I placed equal amounts (one cup) of all of these liquids into jars, and placed them next to each other in one area. I then took the starting height of all of the liquids using a ruler, and the starting height was 4 centimeters. For

the next five days, I continued to measure the heights of all of the liquids, and recorded them on paper. After the five days, I found out that my hypothesis was correct, and that the nail polish remover does evaporate the fastest out of the liquids I tested. As I did more research, I found out that the boiling point of a liquid has much to do with the rate at which a liquid evaporates. The lower the boiling point of a liquid, the more likely the liquid is to evaporate faster. The main component in nail polish remover, which is acetone, has a boiling point of 133°F. Compared to the other liquids I tested, the nail polish remover has the lowest boiling point, which adds to the conclusion of why the nail polish remover evaporated the fastest.

6110

Does Hair Color Affect Perception of Intelligence?

Abbey Lee and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

My science fair project was titled, "Does Hair Color Affect Perception of Intelligence?" I chose to do this project because in my everyday life, I experience stereotypes based on hair color, and I was interested if other people are judged on the same basis. For this project, I first found four random head shots of the same person online. I used a photo editing program to change the hair color on three of the pictures so they had red hair, blonde hair, dark brown hair, and light, golden hair. I created a table with all of the pictures and asked my chosen test subjects which pictured individual appeared the smartest. I created a graph that showed the number of people who chose each different hair color. I proved my hypothesis right and discovered that the majority of people perceived the person with the darkest hair color to be the most intelligent. This project was especially interesting for me because as a person with lighter hair, I sometimes feel that people assume I'm not as smart as others. I'm glad I chose this subject because I found it interesting to look at other people's points of view on very real topics.

6111

Does Aspirin Help Plants Grow?

Aritree Bal and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

This science experiment was done to see and understand if and how aspirin helps plants grow compared to the use of normal water. Aspirin, or acetylsalicylic acid, is a synthetic compound used to medically relieve mild to chronic pain and reduce fever and inflammation. The first thing that I had to do was to label two cups as aspirin water and plain water. Next I took two tablets of pure aspirin (which can be found over the counter) and put them into warm/hot water. This was the aspirin water, because

this technique made the aspirin tablets melt into the water. Then every day I watered the plants with their designated type of water, either regular water or aspirin water. The final results that I got from this project were that aspirin does help plants grow compared to normal water. With some research I realized that the calcium in the aspirin is what helps the plants grow.

6112

Ultrasonic Proximity

Darpan Baderia and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I designed a robot that can “see” and react. The robot was built out of the LEGO® Mindstorms NXT 2.0, a creative machine-building item that you can make into whatever you want. I made a three-wheeled robot with two active motors and a dormant wheel behind for stability. In addition to the motors and wheel, I added an ultrasonic sensor that emits ultrasonic waves and receives them, much like echolocation. I used programming software provided by LEGOs to create a program that allowed the robot to see its surroundings and react by stopping, making sounds and displays on its screen, and then turn around to repeat the process. It does this indefinitely (or until you power down the program). I learned a lot from this project because of its advanced schematics. I learned some basic programming. I also learned how the robot interacts with its external sensors and motors through commands that you can change on the computer. In addition, I learned how ultrasonic sensors work because I looked up information to understand them better. They work like echolocation, but robotically. The sensors produce high-frequency sound waves that bounce off of objects/obstacles right in front of them.

6113

Can You Feel the Beat?

Kanan Wysong and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I speak for a lot of us when I say that music plays a major role in how we go about our days and how we feel at different times. Studies prove that music helps to lower blood pressure. So I wondered if the tempo of music might affect the beating pattern of the heart. A good friend of mine volunteered to be my test subject. For this experiment, I made sure that he was rested and took his pulse at intervals of 10 seconds while listening to the song *Flight* by Tristram & Braken. I put all of these data points on a graph with seconds on the x-axis and pulse on the y-axis. I then used a music app to take the decibel measurements at the same time that I took the pulse. I gathered all of these data points and put them on the same graph. After doing this experiment I learned that

the heart’s pulse will actually mimic the beat of the music. I found this to be rather surprising, but also a confirmation of how music can affect us.

6114

How Long Is Your Memory Lane?

Sarah Daniel and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science fair project, I decided to test what factors affect short-term memory. The type of short-term memory I tested is called working memory, and is used for remembering things like page numbers, or other things that only need to be remembered for a few minutes. To do this, I set up a poster board with a cover that had pictures of different items, some of which were things that men or women are supposed to like. This was done to see if gender stereotypes affect memory. I sat one person at a time down in front of the board with the cover closed. I then lifted the cover and gave each person 15 seconds to look at the board covered in pictures. After that, I closed the cover and asked them to list as many images as they remembered. In the end, I found out that things people are around are the things they are more likely to remember. However, I also found out something that I did not expect to find out. I learned that people are more likely to remember images that are on the top and middle of a board, and are less likely to remember images anywhere else on a board. In addition, I learned that people remember objects that their parents or siblings are often around. For example, one of the subjects has a sister, so he remembered things like the image of a dress. Overall, this was a very interesting project, and I learned much more than I expected.

6115

How Much Can Mung Beans Lift?

Ethan Chen and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science project, I investigated the simple idea of how much mung beans can lift. I decided to do this because in Taiwan, weights are put on mung beans to make the stems thicker. Doing this experiment allowed me to find out the correct amount of weight to put on the beans. I started with six plastic containers that were the same size and filled them $\frac{3}{4}$ full. After that, I put 3 tsp. of mung beans in each container. The weights were simply bags filled with water: six bags filled with intervals of $\frac{1}{2}$ pound. The process took about a month or less. I had to water the beans constantly and make sure I did not drown them. Also, I had to ensure the beans got plenty of sunlight. The first week most likely would tip the first weight. I found that at the end, the 3-pound weight was the best. The 3-pound weight was

not lifted completely, meaning that the weight was not too light and was not too heavy. I also found that this weight made the stem the thickest. The rest of the stems with other weights were thinner than with the 3-pound weight. Overall, this was unexpected because I did not believe that the mung beans could lift that much. I guess that all of the plants combined provided a huge upward force. At the end of this experiment I found out how much mung beans can lift.

6116

Kinetic Sand Reacting to Water

Brianna Alviz and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet

10100 Variel Ave., Chatsworth, CA 91311

My project was based on Kinetic Sand. For this experiment, I wanted to know how it reacts with water. I took two cups, two spoons, and Kinetic Sand and normal sand. I filled the two cups with water, and then drizzled Kinetic Sand in one cup and normal sand in the other. From this experiment, I learned that Kinetic Sand does not completely sink to the bottom the same way normal sand does. I found out that Kinetic Sand is very different in texture, the way it reacts to water, the way it can easily come apart and how it clumps. I also learned that it does react similarly to what I've seen online, and that it all sinks but doesn't all clump together. Kinetic Sand expands in the water, forms clumps in the water and sinks.

6117

Can Exercise Affect Blood Pressure and Pulse Rate?

Ugochukwu Akpati and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet

10100 Variel Ave., Chatsworth, CA 91311

In my project, I answered the question, "Can Exercise Affect Blood Pressure and Pulse Rate?" It is most likely that we all know the answer: When we exercise, our blood pressure and pulse rate both increase greatly. However, how much do the blood pressure and the pulse rate increase by? To answer that question, I took 12 participants' blood pressure and pulse rate before they began exercising. The equipment that the participants used to exercise was the treadmill for 10 minutes. I then took the blood pressure and pulse rate of each participant right after they stopped exercising. I then began to take each participant's blood pressure and pulse rate every 5 minutes until it was 30 minutes after they stopped exercising. From my results, I was able to calculate how much the blood pressure and pulse rate increased by using graphs and tables to record the data for each participant. The systolic blood pressure increased by 20% and decreased by 2-3 points. The diastolic blood pressure increased by 2-3 points and decreased by 2-3 points. The pulse rate (beats per minute) increased by 34-37 points and decreased by 2-3 points.

6118

The Effects of Music on Heart Rate

Chance Castle and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet

10100 Variel Ave., Chatsworth, CA 91311

This experiment tested whether music can affect people on a physical level, and the amount of the change. Before starting the experiment, I hypothesized that music can change the base heart rate of an individual depending on the genre of the song, and that slow music will lower the heart rate, while music with a faster beat will increase the heart's beats per minute (BPM). I tested five genres of music: classical, pop, speed metal, electronic dance music (EDM) and opera. Each genre was played for 3 minutes, and the heart rate was recorded directly after each test. Between each genre of music played, a 10-minute break was taken to completely reset the base heart rate. This information may have a beneficial effect on a patient's state of being, and can be valuable as a remedy for lowering heart rate and other characteristics of the human body.

6119

How Does Smell Affect Taste?

Lamia Siddiqui and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet

10100 Variel Ave., Chatsworth, CA 91311

Did you ever wonder why your mouth starts to water when you smell your favorite pizza? Have you ever really wanted to eat your favorite food, but could not enjoy it due to sinus congestion or a runny nose? Smell brings the taste of food to a different level. This is because you already are tasting food by inhaling it. That sounds strange, right? This is what I discovered through my experiment. I started by asking six volunteers to taste different fruit items. They were given five of them to taste. My experiment was broken down into a control and an experimental group. The control group of my experiment ate with "eyes closed, nose opened," and the experimental group did so with "eyes closed, nose closed." I gave each participant time to close their eyes and covered their eyes with a blindfold before they tried to taste any fruit. Each time a participant received a fruit, they were asked to guess what fruit was given to them based on texture, smell or the taste of it. Some participants said they did not smell the fruits while tasting them; others smelled the fruits and used texture to determine what they were; and others only used texture to determine what they were. In the second trial, the participants had to plug their noses as well as close their eyes. I conducted two trials for each participant. I found that smell almost always directly correlates to texture or taste. There were some volunteers who were ill and could not smell or taste the fruits given to them for either the control or experimental groups. I took this factor into consideration while working on this project. My results showed that when my volunteers were in the

trial for the control group, they guessed the fruits the most incorrectly, and in the experimental group, they guessed the most correctly. With that being said, it was easier for them to guess the fruits when not more than one of their senses was blocked.

6120

Soda Destruction

Ethan Gutterman and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

The science experiment I chose showed the effect of different drinks, which are U.S. Food and Drug Administration (FDA)-approved, on copper pennies. I chose to do this because it's common knowledge that soda is harmful to your body. I wanted to see these changes firsthand through the pennies. The results I found were inconclusive. This was mainly because some things changed that I didn't expect would — for example, how the markings on the pennies diminished. I wouldn't have thought a soda would ever be able to do that. But that was really it for conclusions. That was the only thing I didn't get: How does that happen? I am hypothesizing that it might be the acidity in the soda that causes the metal to be eaten away. The main sodas that I observed this change in were Coca-Cola and Pepsi. This was due, I believe, to their sugar and high acidity.

6121

That Is One Smart Cookie!

Farah Karim and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

I tested to see if the placebo effect has less impact on people depending on their age. My hypothesis was that it does have less of an influence as you get older, because as you get older you are more aware that there really is no magic cure for anything. I tested this by giving different age groups a cookie that supposedly includes special vitamins to help you think better. I gave them one test before the cookie was eaten and one test after the cookie was eaten. The different age groups I tested were children in elementary school, children in middle school, and adults. Once I collected all of the data, I averaged the scores and the time taken to complete the test by each age level. The adults had an average score of 95% on the first and second tests. The average time for the first test was 83.2 seconds and for the second test was 85.03 seconds. The average score for middle school students was 86% for both tests one and two, and the average time was 83.2 seconds for the first test and 85.03 on the second test. The average score for elementary school students was 36% on the first test and 43% on the second test. The average times were 126.68 seconds on the first test and 175.22 seconds on the second test. Because the change in score of the elementary school

children was the largest positive change compared to the other groups' tests, my hypothesis was correct that the placebo effect does have impact as you get older — just as you don't believe in the tooth fairy as you get older because you begin to believe less and less about things that seem very unlikely.

6122

The Factors of Aerodynamics

Sarthak Kamboj and G. Zem (teacher)

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave., Chatsworth, CA 91311

For my science experiment, I created different types of paper airplanes after researching the various factors of paper airplanes' flights. I charted the paper airplanes' flights and compared them with each other, testing which factors affected what parts of the flights over an average flight basis. To do this experiment, you simply need multiple pieces of paper to create different modifications for the various types of paper airplanes that you use. You can use tape measures and timers to calculate where the paper airplanes are in their path of flight and how long they are in the air. By doing this project, I maybe can teach other people the different factors that go into a paper airplane's flight, except for wind. This can help people create paper airplanes that go farther, or maybe even use the information to create better real-life airplanes. You never know how far research can go. I learned wind, weight, texture and folds, just to name a few, can affect the flight of a paper airplane. By using these different factors, you can create airplanes that model real-life airplanes. After all, the aerodynamics of a paper airplane and a real-life airplane are exactly the same. The only difference is that a real-life airplane uses machines to help it stay up in the air for several hours.

6123

Parallel and Series Circuits

Matthew Torus and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to find out how many types of circuits there are, how they work and which type of circuit is the most efficient. I found out there are two types: parallel circuits and series circuits. In my research, I learned that an electrical circuit is a path through which electricity passes to supply power and perform a task, such as run a vacuum or power a lamp. It is a closed loop formed with wires, a fuse, a load and a switch. Electricity flows through the circuit and is delivered to the electrical devices. A series circuit has more than one resistor, and gets its name from only having one path. If one of the wires in the circuit is broken, then no electricity will move through the circuit. A parallel

circuit has more than one resistor, but it also has more paths on the panel. The wires are parallel, so if there is one broken wire, electricity will be supplied to the rest of the paths. My hypothesis was that the parallel circuit would be more efficient than the series circuit. I built and tested both types of circuits and my hypothesis was proven right, because when one wire in the parallel circuit was disconnected, the rest of the lights connected to the circuit were still powered. In the series, none of them worked when one was disconnected. Therefore, parallel circuits are more efficient and useful.

6124

Can You Cook Food Using Only Sunlight?

Nicholas Hovnanian, Alex Garibkhanyan and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to find out if we can cook food using only sunlight. According to our research, this can happen if the food reaches certain temperatures. Our hypothesis was that the food would not cook properly and that water would not boil. We tested our hypothesis by trying to cook a hot dog and an egg, and boiled water by reaching 80°F, 70°F and 60°F. Our results were that the egg cooked a little bit. The hot dog cooked even less, and the water did not get to boiling. Our hypothesis was correct. We were not able to cook the food or to boil the water.

6125

How Does Temperature Affect a Tennis Ball's Bounce?

Oscar Silva and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to find out if temperature affects a tennis ball's bounce. I put one tennis ball in the freezer, one in a heated pot to keep the ball warm, and one at room temperature. After leaving the tennis balls in the different temperatures for 2 hours, I took them out and dropped them from 57 cm. My hypothesis was that the heated ball would bounce the highest. My results agreed with my hypothesis. The heated ball bounced the highest, then the frozen one, and last the one at room temperature. This means that temperature does affect a tennis ball's bounce.

6126

Which Liquid Makes a Cut Flower Last the Longest?

Megan Kang and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

My experiment was to find out which liquid out of six would make a cut flower last the longest. I got 24 of the

same cut flowers and put four flowers in each cup. The first cup had plain water (which was the control); the second cup had a copper penny and water; the third had Sprite® and water; the fourth had aspirin and water; the fifth had Vaseline® and water; and the sixth had vinegar plus sugar and water. I chose these liquids because according to my research, these were the top recommendations on how to keep a cut flower alive longer. The penny was one of the recommendations because a penny can act as a natural antibacterial agent. My results were that the flowers in the water by itself lasted the longest, which was 11 days. Then came the penny and water flowers, which lasted 10 days; then the Vaseline and water flowers, which lasted nine days; then the Sprite and water flowers, which lasted eight days; and then the vinegar plus sugar and water flowers, which lasted seven days. The aspirin and water flowers lasted the least amount of time, six days. My hypothesis was that the flowers in the water with the penny would last the longest, but it was not supported by my results.

6127

Which Types of Fabrics Provide the Most Warmth?

Quinn Garity and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to find out which type of fabric provides the most warmth. This can help people decide which material to buy when looking for warm clothes. I wrapped plastic cups full of 24°F water in three different types of fabrics, and one with nothing. I used Sherpa fleece, Sherpa fleece with wool blend, and cotton blend. I put the cups in the freezer and checked the temperature every 15 minutes for 2 hours. My hypothesis was that the Sherpa fleece and wool blend would be the warmest. According to my results, the Sherpa fleece by itself was the warmest, which proved my hypothesis wrong.

6128

Building a Foxhole Radio

Tiana Gregoryona and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to build a type of efficient AM radio receiver called a "foxhole radio" with good quality sound. I chose to build a radio because my own radio receiver recently had stopped working. Two main components of a radio receiver are an antenna and a ground. Having an antenna connected to a radio is the key, as the antenna is the part that allows the radio to pick up radio waves. An electrical ground is used as a reference point in electrical circuits, allowing excess currents to be safely converted away from the receiver. My hypothesis was that the radio would sound best with an antenna, and that connecting or disconnecting

a ground to the radio would make no difference in its sound performance. I built a radio and tested its sound quality without an antenna or ground; with an antenna; with a ground; and with both an antenna and a ground. I found in my experiment that without an antenna or a ground, or with an antenna or a ground alone, the only sound was white noise and the sound quality was overall very poor. The only way the radio could receive any kind of signal was with an antenna and a ground, resulting in the least amount of static, and disproving my hypothesis.

6129

What Is the Average Speed of a Turtle?

Vanitie Flores and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to find the average speed of a turtle, because most people think that turtles are very slow. I measured a distance of 15 inches, placed turtle food at the end and placed the turtle at the starting point. I tested two different turtles for 10 days and calculated the average speed of both. I noticed that the turtles got distracted easily when they were walking to their destination, and that contributed to reaching it very late. My results were that the turtles walked an average of 15 inches in around 2-3 minutes, which made their speed about 6 inches per minute.

6130

Comparing Thermal Insulators

Viviana Cervantes and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to find out which material makes the best insulator. I covered two conical flasks full of hot water: one with sand and the other with Styrofoam. A third conical flask was kept uncovered as the control. I placed the boxes at room temperature and recorded the temperature in Celsius every 15 minutes for 5 hours. My hypothesis was that Styrofoam would keep the water hot the longest because sand is more porous. I was correct. The Styrofoam did make the best insulation material when compared to sand and air. In conclusion, if you would like to keep something at a certain temperature, Styrofoam would be your best choice.

6131

Who Will Finish the Maze First?

Amaris Sanchez, Emma Trujillo and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to find out if male or female mice would run through a maze first. We built a

maze and tested the mice twice each day for 10 days. We put food at the end of the maze to attract them and used a stopwatch to accurately record their times. We found out that the female mice were a lot faster than the male mice, which proved our hypothesis right. The female mice finished the maze first every time. The male mice spent time smelling and observing their environment more, which resulted in them running through the maze at a slower speed.

6132

Pendulum in Motion

Gabriella Garber and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

My project was about pendulums. I wanted to find out what affects the period of oscillation, or in other words, the time it takes for each swing. Is it the mass of the pendulum or the length of the string that affects the period of isolation? I performed three sets of experiments. In the first, I tested different amplitudes. In the second, I tested different masses by adding more yo-yos, and in the third, different rope lengths. I observed that the amplitude did not affect the period of oscillation and neither did the increase in mass. However, the rope length did have an impact. The shorter the rope, the faster the pendulum swung, regardless of how high or low I released the yo-yo. In conclusion, the data analysis showed that my first hypothesis was correct: The length of the rope affects the period of time the pendulum swings, while the amplitude does not. My other hypothesis was incorrect because the mass of the pendulum did not affect the period of oscillation, or how fast it swung.

6133

Which Fruit/Vegetable Has the Most Vitamin C?

Soriya Singhakul, Grace Elias and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

In our experiment, we tested different fruits and vegetables to find out which has the most Vitamin C. The fruits and vegetables we chose were oranges, lemons, kiwis, apples, lemons and carrots. Our hypothesis was that oranges and lemons would have the most, since oranges are very well known for having a large amount of Vitamin C and lemons are very acidic. Our control was a 500-mg Vitamin C tablet. We poured 4 tsp. of each juice into clear plastic cups and mixed each with half a glass of water. After making a starch solution, we added one teaspoon of this solution into each cup so that the iodine would react and bring out the Vitamin C. The more drops needed to have the liquid stay a solid dark blue, the more Vitamin C the liquid has. We used the following formula: number of drops in the Vitamin C/number of drops in the juices. At the end, we found out that kiwi had the most Vitamin C with 0.66 mg/ml. Lemons were

second with 0.638 mg/ml, oranges were third with 0.583 mg/ml, and in last place were carrots and apples with 0.138 mg/ml.

6134

What Is the Most Common Phobia in Eighth Grade?

Greg Khrom and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my survey was to identify the most common phobia in eighth grade. I hypothesized that the most common would be social phobias due to many cases of anxiety and social anxiety starting in childhood and early teen years. I had a list of common phobias: arachnophobia, thanatophobia, ophidiophobia, acrophobia, agoraphobia, gynophobia, astraphobia, trypanophobia, social phobias, pteromerhanophobia and mysophobia. According to my results, the most common phobia among eighth-grade students was thanatophobia (fear of death), with a response of 30%. Second was agoraphobia (fear of crowds) at 25%; third was acrophobia (fear of heights) at 15%; fourth was arachnophobia (fear of spiders) at 10%; and fifth was mysophobia (fear of germs), with a 5% response. I can conclude that my hypothesis was incorrect and the most common phobia in eighth grade is thanatophobia. If I could do this experiment again, I would widen the age group and take a larger sample of students.

6135

Do People's Fears Differ By Age?

Julia Gomez, Caren Hines and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to find out what kinds of fears people in our community experience in their daily lives, and if the fears are the same in different age groups. We surveyed children, teenagers, adults and elders. The results of our survey showed that all ages were afraid of death. Forty percent were afraid of dying; 20% were afraid of losing someone in their family; 10% of the adults were afraid of losing their jobs; 10% were afraid of spiders (mostly kids); 15% were afraid of failing in life (this was mostly among younger people); and 5% were afraid of public speaking. Our conclusion was that more than 50% of all ages were afraid of death. The rest of them had fears about normal things that occur in our daily lives. There were not many subjects who had irrational fears. It seems to us that modern man has common fears like our ancestors did about the uncertainties of death.

6136

Which Cut Flower Lasts the Longest?

Kaitlyn Manuel and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to find out which cut flower would last the longest. I read how to clean a vase correctly before putting in the flower so no bacteria went in, how to properly cut the flower, and how to care for it. I used four different flowers: a chrysanthemum, rose, carnation and lily. Because of personal experience, my hypothesis was that the chrysanthemum would last the longest and the rose would die first. I changed the water in the flowers every two days and my results agreed with my hypothesis. The chrysanthemum lasted for 20 days, while the other flowers lasted a week.

6137

What Is the Best Way to Whiten Teeth Without Using Whitening Strips?

Lana Darbinyan and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

My experiment was to find out what teeth whitening method works best without using commercial whitening toothpaste or strips. I wanted to do this because some people may not want to use chemicals since they can damage teeth and also because of the cost. I used eggshells to represent teeth and soaked them in black tea for 5 hours to stain them. I used four different methods to whiten the teeth: baking soda and lemon juice paste; strawberry and salt scrub; hydrogen peroxide; and whitening toothpaste. My hypothesis was that the baking soda and lemon juice paste would work the best. My results supported my hypothesis. The second best was the strawberry and salt scrub. The toothpaste cleaned about half of the stain and the hydrogen peroxide did not work at all.

6138

Does the Shape of an Ice Cube Affect How Quickly It Melts?

Lexy Angulo and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to find out how long different shapes of ice cubes take to melt. According to my research, the more surface area an ice cube has, the faster it will melt due to the greater amount of surface area exposed to heat. My hypothesis was that an ice cube with more surface area would melt the fastest. I tested three different shapes of ice cubes: a crescent shape, a rectangular shape and a triangular shape. I set each one out individually and let them melt at room

temperature. My results were that the crescent-shaped ice cube took 14 minutes and 31 seconds to melt. The rectangular-shaped ice cube took 19 minutes and 17 seconds to melt. The triangular-shaped ice cube took the least amount of time to melt, which was 9 minutes and 47 seconds. According to my results, the shape of an ice cube does affect how quickly it melts because of the size of each shape's surface area. The rectangular-shaped ice cube had the biggest surface area and was the last one to melt. My hypothesis was incorrect.

6139

What Climate Promotes Bacterial Growth Best?

Mathew Aparicio and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91311

My project was on what temperatures or climates bacteria grow best in. I placed agar dishes with bacteria in the refrigerator (for a cold environment), at room temperature, and in a warm area heated by a lamp. According to my research, bacteria grow best in warm areas, but my hypothesis was that the colder the conditions, the better the bacteria would grow since we usually get sick in the cold. My results were that the bacteria grew better in the warmer environment. There were more colonies growing in the agar plate under the lamp, and next came those at room temperature. In the refrigerator, there was no growth at all. My hypothesis did not support my results, and I can conclude that higher temperatures are better for bacterial growth.

6140

What Is the Effect of Different Liquids on Plants?

Aileen Genzer, Andrea Castro and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to see how different liquids affect plants. We tested three of the same types of plants by watering them with Coke, club soda and Tropicana orange juice. Our research indicated that Coke would make a plant die faster than the other liquids would because it has a lot of sugar and sodium, so that was our hypothesis. The results of our experiment proved our hypothesis right. The Coke plant died on the third day, the club soda plant died on the fifth day, and the orange juice plant died on the seventh day. Our conclusion was that our hypothesis was correct and that liquids with a lot of sugar have a negative effect on plants.

6141

Which Kind of Detergent Cleans the Best?

Alyssa Vidal, Valerie Dominguez and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to find out which kind of detergent cleans the best. We tested detergents such as Tide, Wisk, Persil® and Sun® to clean stains such as mustard, wine, grease and chocolate. Based on our research, our hypothesis was that Tide would work the best. To test our hypothesis, we stained shirts and washed each with a different detergent in the washing machine. We repeated the experiment three times. We found out that Tide worked the best overall. Persil came in second, then Sun, and lastly Wisk. Tide and Persil cleaned the chocolate the best. Tide cleaned the grease and mustard the best. Persil cleaned the wine the best. We also found that wine was the hardest stain to remove. With this data, we concluded that Tide is the best for daily use, but Persil is great for deep cleaning, especially for wine stains.

6142

How Strong Are Plastic Wraps?

Andrea Luna, Joselynn Carmon and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to find out which plastic wrap seals the best. We filled three cups with water and sealed them with three different brands of plastic wrap: Cling Classic, Kirkland and Wrap It. Then we flipped the cups over to see if the water would spill. The Wrap It plastic wrap did not work at all because it would not seal well and the water spilled. The Cling Classic and Kirkland worked the best because they kept the cups sealed in the microwave, in the refrigerator and when we flipped the cups upside down. Our results agreed with our hypothesis and we concluded to never buy Wrap It plastic wrap because it does not work, but Cling Classic and Kirkland work the best.

6143

Which Power Source Is Most Efficient to Power a Toy Car: Solar Power or Battery Power?

Aram Alajajian, Nicholas Nicola and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to determine which power source is most efficient to power a toy car. Our hypothesis was that a battery-powered car probably would be more efficient and would win in most of the categories against a solar-powered car. We built two cars and tested their efficiency with batteries and solar panels. We tested the cars in four different categories: speed, durability, strength and life span. Our results supported

our hypothesis that the batteries would be more efficient to power a toy car. The solar-powered car did better in the life span category because it could run continuously as long as there was constant sunlight, while with the battery-powered car the batteries eventually needed to be changed. In conclusion, battery-powered toy cars are more efficient.

6144

What Materials Produce Different-Colored Flames?

Arti Jain and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to observe fire burning in different colors and find out which materials produce flames of what colors. I have noticed that different fuel sources can lead to different-colored flames. According to my research, many times different parts of a flame are different colors, such as in a candle or a wood fire. My hypothesis was that different compounds would produce different-colored flames, so I used different compounds as the fuel source in my experiment. I had three different mixtures, and therefore three trials. One mixture was composed of methanol and magnesium sulfate; one had methanol and potassium chloride; and one was made of methanol and boric acid. I lit each mixture with a lighter torch and observed the color of the flame. The first mixture, which was methanol and magnesium sulfate, created a light blue flame. The second one, which was made of methanol and potassium chloride, resulted in a blue-violet flame that initially had streaks of orange but toward the end changed mostly to orange. The third and last mixture, composed of methanol and boric acid, produced a bold green flame. This showed that different compounds do produce different-colored flames, proving my hypothesis to be correct.

6145

What Chemicals Change the Color and Temperature of Fire?

Christopher Bogart, Leah Meza and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to see what chemicals change the color and/or temperature of fire and why. When different substances or chemicals burn, different-colored flames are produced. According to our research, when you add fire to an element, you are adding energy. This causes an increase in temperature. When energy is added, photons are released, thus changing the color of the flames. Adding energy to elements/chemicals such as a candle flame can change the temperature too, even if it is a very small amount. In our experiment, we tested potassium chloride, methanol, sodium chloride and boric acid. These chemicals changed the colors of the flames to

purple (potassium chloride), blue (methanol), green (boric acid) and yellow (sodium chloride). It took maybe 20 seconds for the flames to change color, but some burned out faster than others even if we used the same proportions for all of the ingredients. We then took a thermometer and tested the temperatures of the flames. All of the temperatures were within the same range of each other. We wondered if such a small difference was due to the chemicals or just the flames themselves. But we did many temperature tests and sometimes the temperatures changed up to 4 degrees, so we think it was the chemicals that altered the temperatures. In the end, our hypothesis was correct. Different chemicals change the color of flames as well as the temperature.

6146

What Cleans Permanent Marker From Different Surfaces the Best?

David Jingoian, Alejandro Rubalcava and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to figure out what cleans permanent markers from different surfaces the best. Our solutions were nail polish remover, rubbing alcohol and hand sanitizer. The surfaces we used were granite, glass and treated wood. Our hypothesis was that nail polish remover would clean the permanent marker the best on each surface. We made marks on the surfaces with the markers and let them dry for a few minutes before we cleaned them with the different solutions. We found out that our hypothesis was correct: The nail polish remover cleaned the best on all of the surfaces.

6147

Which Solution Works Best in Cleaning Tarnished or Oxidized Coins?

Emily Navasardyan, Sophia Ohanian and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of our experiment was to find out which solution works best for cleaning tarnished and oxidized coins. We researched to learn what is inside of each solution that could clean the coins. Our solutions were lemon juice, orange juice, dish liquid, Coca-Cola, water, and baking soda paste. Our hypothesis was that lemon juice would clean the coins the best, because in our research we found out that the more acidic a substance is, the more effectively it will clean the coins. We put five different types of coins into each solution and let them sit at room temperature overnight. We had four sets of each for more accuracy. After we brushed and rinsed off the coins, we found out that the coins in the lemon juice had cleaned the best. Our hypothesis was correct.

6148

Which Power Source Is Best For Lighting Up a 1.8V Light Bulb and a Christmas Light?

Olivia Ochoa and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of this experiment was to see which power source is best for lighting up a 1.8V light bulb and a Christmas light bulb. I first connected the wires from the light bulbs to the power source (computer fan, batteries). Then I attached magnets to the top of the fan and used another magnet to try to spin the fan to see if the bulbs would light up. I also tested the fan with wind at different speeds to see which speed would light the bulbs up. In addition, I connected the bulbs to various batteries: two AA batteries, two AAA batteries and one 9V alkaline battery. My hypothesis was that the magnets with the computer fan would be able to create enough energy to light up the bulbs. I found that the 9V battery had too much power and blew out the bulbs almost immediately. I also found that the two AAA batteries had the perfect amount of power to power both bulbs. The two AA batteries had enough power to light up the 1.8V bulb, but had too much power to light up the Christmas light, and burned it immediately. The computer fan with the wind did not provide enough energy to power either bulb. The computer fan with the magnets also had no effect on lighting up the bulbs. The fan was only taking in energy and had no output. I know this because I used a multimeter, which showed how much power was being produced. According to my results, the two AAA batteries supplied the right amount of energy to light up the light bulbs. These results did not support my hypothesis.

6149

Do All Liquids Evaporate At the Same Rate?

Diana Aramyan, Angelina Piskouljian and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

Our experiment was to see if different liquids evaporate at the same rate and, if not, which evaporate the fastest. We used water, saltwater, orange juice, rubbing alcohol, vinegar, nail polish remover, six plastic cups and a graduated cylinder. The pure water was our control and the other liquids were the variables. We poured 59 ml of each liquid into separate cups and let them sit at room temperature for one week. Our hypothesis was that all liquids do not evaporate at the same rate because of their different chemical properties and densities. We also thought that the pure water would evaporate the most by the end of the week because its density is the least compared to the other liquids and because the hydrogen bonds are very weak. Within just 2 hours of pouring our liquids into the cups, the nail polish remover had completely dissolved the bottom of its cup, leaving

us with no clear result of its evaporation rate. At the end of the week we measured the remainder of the liquids: water, 35.3 ml; saltwater, 42.9 ml; orange juice, 36.1 ml; vinegar, 36.2 ml; and rubbing alcohol, 33.3 ml. The rubbing alcohol had evaporated the most and the saltwater had evaporated the least. In conclusion, our hypothesis was proven right that all liquids don't evaporate at the same rate, but we were wrong about which liquid evaporates the fastest.

6150

Middle School Students' Favorite Foods

Gary Harutyunyan, Jack Harutyunyan and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

We wanted to find out what is the favorite food among middle school students. Our hypothesis was that middle school students like pizza the most. In our survey, we found out that most students picked foods from restaurants and very few chose healthy foods like chicken or salmon. Out of 150 kids we surveyed, 42 (28%) chose pizza, which was the most popular. The second-highest was sushi, with 21 out of 150, or 14%. The third-best was steak, with 17 out of 150, or 11.33%. Our conclusion for this project was that middle school students' favorite food is pizza, which agrees with our hypothesis.

6151

Does a Solar-Powered Charger Charge As Efficiently As an Electrical Charger?

Alexis Villadelgado and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

Solar technology would be a quintessential advancement, with the world's nonrenewable energy resources already in a great decline. The future of solar devices relies on studies that involve reviewing present solar technologies. The purpose of this experiment was to examine if a single solar charger could charge a phone as efficiently as an electric charger, because this would determine which areas of solar technology need improvement. Researchers assume that a solar-powered charger will be as efficient as an electric charger if its efficiency percentage falls within the range of 5%. My hypothesis was that the solar-powered phone charger would be as efficient as the electric charger. With an electric charger with 70% efficiency, the solar charger's efficiency percentage would fall within the range of 67% to 74%. I also hypothesized that the electric charger would take up to 2 hours to fully charge, whereas the solar charger might take up to 2½ hours. In all sciences, efficiency is defined as output over input. Each battery has a rating that refers to how much charge that particular battery can hold. Computing the complete charging time was done using the formula of hours = battery rating/

continuous current. Continuous current refers to the current running in a single direction of the battery. This experiment was split into two parts. The first section of the procedure included the efficiency test and moved onto its computation. I conducted the test at 10 a.m. and at 1 p.m. and 4 p.m. for two days for each charger. The calculation of the time for fully charging the 1220 milliampere-hour (mAh) battery was done after the efficiency test using the given formula. The solar charger used was a homemade one, while the electrical charger was a box-type Apple adapter charger. Both chargers used the same setup. For the solar charger, I did the experiment outdoors with a temperature of 73°F, or 23°C. The input current for the solar charger was set at 1000 milliamperes, whereas its input voltage was at 3 volts due to its product specification. The electric charger's power, on the other hand, was at 6 watts. The next step was finding the output power. I used a multimeter, where the current and voltage were measured in output terminals of the chargers. A simple calculation was conducted to determine their efficiency. The output power for both was divided by the input power for both. The quotient was multiplied by 100 to get the efficiency percentage. With the results obtained from this experiment, the solar-powered charger that has 74% efficiency is close to the electric charger that has 77% efficiency. The results indicated that the solar charger charges as efficiently as the electric charger. I used a 1220 mAh battery to determine the time taken to fully charge both chargers. The results showed that it took 2 hours and 35 minutes to charge the battery, which was much longer compared to the 1 hour and 45 minutes recorded for the electric charger. The experiment showed that the world is now a bit closer to the perfection of solar technology. My results supported my hypothesis with some caveats. The predicted efficiency percentage range of 67% to 74% was 73% to 80% instead, since the electric charger's efficiency was about 77%. The time required to completely charge the 1220 mAh battery with a solar charger was 2 hours and 35 minutes rather than the hypothesized 2 hours and 30 minutes, whereas the electric charger took up to 1 hour and 45 minutes instead of the predicted 2 hours. In the end, I concluded that the solar charger does charge as efficiently as the electric charger with a small marginal difference.

6152

Can a Soda Bottle and Mints Be Used to Power a Generator?

Brandon Colechio and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to build a machine that is able to generate electricity through the nucleation of Coke Zero and Mentos. I came up with this idea because I have noticed how waterwheels utilize the flow of water to create power, and I figured I could make a

more efficient version using pressure from Coke Zero and Mentos to aid in the power generation. I built the machine with PVC pipe, floodgates and valves; a voltage meter; and a hydroelectric generator. To test the efficiency of the machine, I used water and Coke Zero and Mentos separately in an attempt to power it. When I tried water, it did not power the generator at all. Next I tried the soda. The first trial did not work. The soda shot into the air without even going into the machine. Due to this result, I created a Mentos slide so I could get the Mentos into the soda without it shooting before it was attached to the machine. After that machine edit, I tested it twice more and it worked! The first time it generated 9 volts in the beginning, and slowly decreased to 4 volts over a period of 30 seconds. The second trial generated 9.2 volts and decreased to 4 volts over 35 seconds, which proved that the design of my machine (The SPG Mark 1) worked with nucleation from Coke Zero and Mentos to power a hydroelectric generator.

6153

How Are Icebergs Dangerous to Ships?

Christian Hawatmeh and A. Antoniou (teacher)

Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

The purpose of my experiment was to measure the length of an iceberg above sea level and under sea level to determine how they are dangerous to ships. Icebergs are very heavy depending on how deep they go and they are very hard to move. So when a ship makes contact with one, the ship will have a hard time moving the iceberg out of the way and will get damaged by the iceberg. They have damaged many ships in the past and still do if the ship's radar or crew cannot detect one coming up in their direction. My hypothesis was that the longer and wider icebergs are underwater, the harder they will be to move and the more dangerous they will be to ships. I broke up a few big pieces of ice and placed them in water to represent icebergs. I measured them above water level and then from under the surface of the water. One block of ice was more than 3 inches deep underwater. Another was 1.5 inches. The third was 4 inches deep, and the last was 3.5 inches deep. I observed that the deeper and wider pieces of ice were harder to flip. Now imagine an iceberg the size of a house or an apartment building. They get as big as 200 feet tall and 500 feet wide. A ship will have a hard time surviving a bang from something that big. My hypothesis was correct.

6154

Which Battery Lasts Longer?*Trinity Grijalva, Emily Venegas and A. Antoniou (teacher)*Robert Frost Middle School
12314 Bradford Pl., Granada Hills, CA 91344

Our experiment was to find out which brand of battery would last the longest. We tested Rayovac, EVEREADY®, Panasonic and Sony. We found out that Rayovac lasted the longest. Our results proved our hypothesis wrong: We thought EVEREADY would last longer.

6155

Potatoes Producing Energy*Alexei Lupu and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study was done to see if zinc and copper can interact with phosphoric acid in potatoes to generate power. Zinc and copper were put inside a potato. Then the copper and zinc strips were connected to alligator leads. The other end was connected to a multimeter, buzzer or light-emitting diode (LED) light. Each test was repeated three times. For one potato, the multimeter measured 1.4 volts. The buzzer made a buzz, but the LED did not light up. For two potatoes, the multimeter measured 3 volts. The buzzer made a buzz and the LED lit up. For three potatoes, the measurement was 5.1 volts. The buzzer buzzed and the LED lit up even more. So the results suggested that every potato holds enough phosphoric acid to generate about 1.3 volts on average. Two potatoes hold enough to double the number of volts generated by one potato, and three hold enough to double the number of volts generated by two potatoes.

6156

Time of Alcoholic Beverages' Fermentation to Vinegar*Andee Koo and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined the time spent for these alcoholic beverages – beer, vodka, turbid rice wine, red wine, white wine, soju (native to South Korea) and champagne – to be fermented into vinegar. The purpose was to find which took the most time and which took the least. Each was fermented in a container and left in a dark room at room temperature. They were recorded every 10 days, with eight experiments and three trials each. The beer's pH recorded 4.0 to 4.1, but the alcohol percentage could not be measured with a hydrometer. The vodka's pH recorded 6.6 to 4.4; the initial alcohol percentage measured 37, but the end percentage could not be measured due to evaporation. The turbid rice wine's pH recorded 3.7 to 3.8, and the alcohol percentage recorded 5 to 0. The red wine's pH recorded 3.5 to 3.3, and the alcohol

percentage recorded 7 to 0. The white wine's pH recorded 3.3 to 3.4, and the alcohol percentage recorded 7 to 0. Soju's pH recorded 7.5 to 4.8; the initial alcohol percentage recorded 18, but the end percentage could not be measured due to evaporation. The results showed that the champagne took the least amount of time to ferment and the vodka took the most.

6157

Effects of Certain Colors of the Wavelength on Plants*Adrian Wei and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

My experiment examined whether different colors of the wavelength are possible factors in plant health. A tomato plant was used and had leaves covered by red, blue, yellow and clear film, along with black construction paper. Each color of film or paper covered three or more leaves for multiple trials. The plant was watered daily with half a cup of water and left at a sunny window for 10 days. On the morning of the 11th day, the film and construction paper were removed, and visual results were recorded. The results showed that with the red film, leaf 1 became 15% lighter in terms of green; leaf 2 did not have a visible change in color; and leaf 3 became 20% lighter in terms of green. With the blue film, leaf 1 became 10% lighter, leaf 2 became 5% lighter, and leaf 3 did not have a visible change in terms of green. Next, the results for the yellow film were that all of the leaves had no obvious changes and no lighter/darker increases. The results for the clear film were the same as for yellow, with no obvious changes or differences in color. Finally, with the black construction paper, leaf 1 became 50% lighter and grew a big dark spot on it; leaf 2 became 35% lighter; and leaf 3 was 15% lighter in terms of green. The results concluded that without all colors of the wavelength, plants become a lighter color. However, the results were inconclusive and cannot be relied on due to the short experiment time and lack of more trials with different type of plants.

6158

Blueberries or Coffee: Which Makes You Smarter?*Daniel Yoon and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined if blueberries or coffee make you smarter. There were two subjects who had either blueberries or coffee. Each experiment was repeated three times. Each experiment took three days to complete. At the end of the three-day experiment, I questioned the subjects and recorded the time. The results suggested that blueberries were the most effective.

6159

If Plants Can Stop Erosion*Joe Takahashi and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined if plants can stop or at least minimize the effects of erosion. Each container had the same amount of soil and plants and was angled at 35 degrees. After the setup was finished, each container with the plants and soil had added to it an equal amount of water and was left outside for 3 hours. The results showed that the plants had no effect on stopping erosion or at least too little to benefit from.

6160

Testing the Effectiveness of Color-Coding on How Well You Memorize Your Material*Luca Lin and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

I first started the timer for 1 minute for each subject to memorize a list of words. Then I stopped it and started the timer for 30 seconds for the subjects to write down as many of the words as they could remember. Subject #1 had six on the first test, five on the second and eight on the third. That means he had a 6.3, or a 42% average. Subject #2 had four on the first test, six on the second and three on the third. That means he had a 4.3, or a 29% average. Subject #3 had six on the first test, seven on the second and nine on the third. That means he had a 7.3, or a 49% average. Subject #4 had two on the first test, four on the second and two on the third. That means he had a 2.6, or a 17% average. Subject #5 had eight on the first test, seven on the second and 10 on the third. That means he had an 8.3, or a 55% average. The total average of all of the tests was 5.76, or 38% accuracy for the non-color-coded results. Subject #1 had nine on the first test, 11 on the second and 10 on the third. That means he had a 10.0, or a 67% average. Subject #2 had seven on the first test, nine on the second and six on the third. That means he had a 7.3, or a 49% average. Subject #3 had 12 on the first test, 14 on the second and 14 on the third. That means he had a 13.3, or an 89% average. Subject #4 had 13 on the first test, 11 on the second and 12 on the third. That means he had a 12.0, or an 80% average. Subject #5 had 12 on the first test, 10 on the second and 15 on the third. That means he had a 12.3, or an 82% average. The total average of all of the tests was 10.98, or 73% accuracy for the color-coded results.

6161

The Comparison Between the Growth of Ripple Jade Plants Fed With Plant Food and With Only Water*Matthew Whitworth and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

The Ripple Jade plant is part cactus and part succulent. If it is watered like other plants, it will die. The plant also has limits with plant food: too much plant food and the Ripple Jade will die. Both of these limitations were understood and established before the experiment took place. The experiment was designed to test which variable of plant food would make a Ripple Jade plant grow faster compared to growth with only plain water. The method was to have the measured amount of plant food used on half of the plants for three weeks, while the other half were only fed water. All other variables were the same. At the end of every week, the plants were measured with a ruler for their height in centimeters. In the end, every plant survived each of the variables and showed a measurable conclusion to my hypothesis and experiment.

6162

Effects of Video Games on People's Heart Rates*Samuel Spann and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined if and how different kinds of video games can produce different heart rates in people. Three test subjects of the ages 9, 11 and 12 put on a heart rate monitor and showed resting heart rates of 91, 80 and 75 BPM (beats per minute), respectively. The test subjects played three different kinds of video games each – Minecraft, a survival casual game; Team Fortress 2, a first-person shooter action game; and Slender, a psychological horror game. Each experiment was repeated for 30 minutes for three days each. The highest heart rates Minecraft resulted in were 107, 114 and 88 BPM for the 9-, 11- and 12-year-old subjects, respectively. Team Fortress 2 raised the heart rates to 107, 97 and 92 BPM. Slender raised the heart rates to 128, 104 and 100 BPM. A horror game raised the heartbeats by about 40% to 60%. A calm, casual game like Minecraft didn't cause much of an increase, but the test subjects experienced some adrenaline rushes while playing for obvious reasons (fighting, ambiance, etc.). Fast-paced, adrenaline-rush games such as Team Fortress 2 probably would have raised the heart rates to 120 BPM, but the test subjects' heart rates didn't go higher than 114 BPM. The results suggested that with a scarier or more fast-paced game, the heart rate will go up if the subject is afraid or stressed.

6163

Effects of pH on Anthocyanin and Betalain Pigments*Seoyoon Hong and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study was based on the question of how different levels of pH would affect anthocyanin and betalain pigments. Cotton strips were dyed with the juices of five different fruits and vegetables, two of which contained betalain pigments and the rest of which contained anthocyanin pigments. The cotton strips were then washed with tap water, Tide laundry detergent, and OxiClean® (stain remover). They then were compared with each other based on their color changes. The results suggested that anthocyanin pigments are more sensitive to color change than betalain pigments.

6164

The Effects of Different Stimuli on Human Reaction Time*Joseph Gonsalves and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This study examined how humans' reaction time is affected after they are subjected to different stimuli. Ten male and 10 female subjects had to take a baseline test first, and then were subjected to the stimuli – Smash Bros. for Wii U, Solitaire Chess®, and exercise on a treadmill for 12 minutes. After each, their reaction times were measured. Overall, the treadmill improved times by 0.013559 seconds, Solitaire Chess improved them by 0.013358 seconds, and Smash Bros. improved them by 0.012744 seconds. For the males, the treadmill increased times by 0.002612 seconds, Solitaire Chess improved them by 0.002998 seconds, and Smash Bros. improved them by 0.001152 seconds. For the females, the treadmill improved times by 0.024506 seconds, Solitaire Chess by 0.023718 seconds, and Smash Bros. by 0.024336 seconds. The results suggested an inconclusive test, as the differences were so minimal.

6165

Can Cars Generate Wind Power?*Laz Meiman and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

In this experiment, an anemometer was used in three locations – a highway, a surface street and a parking lot – to get an unaltered wind speed. The data collected was then converted from MPS to kilowatt-hours (kWh) using an online calculator. The overall result was that cars can generate 790 kWh of wind power on an average freeway.

6166

Does Chewing Gum Affect Reaction Times?*Liam Hatzler and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

My project was done to see if chewing gum would improve reaction times. Subjects had to take a reaction time test four times, with twice as practice and to get used to the site. Then they did the test without chewing gum and another time while chewing sugar-free gum. I recorded the average reaction times in seconds. I did the experiment on 24 subjects. The average reaction times of most people were 0.2 seconds to 0.4 seconds. The results showed that chewing gum most likely does not improve reaction times, because only 14 out of 24 (about 58%) of the subjects improved their times with the gum.

6167

How Shape Differences Among Wings Affect Flight*Andre Davancens and D. Shah (teacher)*Portola Highly Gifted Magnet Center
18720 Linnet St., Tarzana, CA 91356

This experiment investigated how different wing types affect flight duration and distance. Three wing designs were used in the same glider fuselage. The different wings were launched on the same day and with the same conditions. There were three trials per wing, and after each flight the flight duration and distance were recorded. Due to having the most consistent results, the tapered wing is most likely the best of the three.



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INDICES

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Aphrodite Antoniou

Robert Frost Middle School
12314 Bradford Pl.
Granada Hills, CA 91344

David Gaughen

Homeschooling (Third Grade)
San Juan Bautista, CA

Terri Miller

Oliver Wendell Holmes Middle School
9351 Paso Robles Ave.
Northridge, CA 91325

Darshana Shah

Portola Highly Gifted Magnet Center
18720 Linnet St.
Tarzana, CA 91356

Stacy Tanaka

Northridge Middle School
17960 Chase St.
Northridge, CA 91325

Greg Zem

Ernest Lawrence Gifted/Highly Gifted Magnet
10100 Variel Ave.
Chatsworth, CA 91311

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