The New Journal of Student Research Abstracts 2018
Volume XXIII
An Annual Journal for Young Investigators and Their Teachers

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Welcome to the 2018 edition of the *Journal of Student Research Abstracts*. The brainchild of Dr. Steven Oppenheimer, Professor of Biology at California State University, Northridge, the *Journal* for more than 28 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. We are especially pleased this year to include abstracts from students of new teachers, thanks to the dedicated work of Acquisitions Editor Torri Miller.

The excitement of conducting true, hands-on research and seeing the results of their work published in the *Journal* provides students with the 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 is essential to our nation’s place as a leader in research and innovation, as well as to its continued security, health, and welfare. This program has become a nationwide model for the effort to encourage more youth to pursue a science and research track and was a key reason Dr. Oppenheimer was honored 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 to 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.
President

Stella Theodoulou, Ph.D.
Interim Provost and Vice President for Academic Affairs

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

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

Honoring a Great Mentor and Donor

JULIE GORCHYNSKI, M.D.
Professor
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ABOUT THE EDITOR

Steven B. Oppenheimer, Professor Emeritus of Biology, received his Ph.D. degree from Johns Hopkins University and is currently 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 published papers, abstracts, letters, books, and national presentations; 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 Foundation. In addition, he 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. Her research interest is in the cellular response to radiation exposure, particularly in the stimulation of DNA repair and cell death. In addition to her work with Dr. Oppenheimer and *The New Journal of Student Research Abstracts*, Dr. Chun also is involved in various collaborations with the College of Education (CSU Dominguez Hills) to enhance STEM instruction in K-12 and undergraduate education.

Mindy Berman, owner of Mindy F. Berman Communications, has 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. www.mfbcommunications.com

ABOUT THE DESIGNER

Alvalyn Lundgren has designed and art directed *The New Journal of Student Research Abstracts* since 2006. As the founder of Alvalyn Creative, a full-service design firm, she assists businesses and organizations in building their influence through visual branding, illustration, and publication design. Among her design awards are two for *The New Journal of Student Research Abstracts*. She was an undergrad at CSUN and completed her degree at Art Center College of Design in Pasadena, CA. In addition to her design practice, she teaches at Art Center College of Design, Otis College of Art and Design, and UCLA Extension. www.alvalyn.com

ABOUT THE ACQUISITIONS EDITOR

The journal’s Acquisitions Editor, Terri Miller, retired in 2016 after teaching middle school in the Los Angeles Unified School District for nearly three decades. She consistently involved her students in hands-on research that was published in this journal and presented at poster symposia, and now is very pleased to continue promoting science education by recruiting additional teachers to contribute student abstracts. Among her many accomplishments over the years, Terri received the Julie Gorchynski, M.D., Center for Cancer and Developmental Biology K-12 Teacher Research Award for the journal for 2014-15. In addition, several of her students earned first place in the 2013 U.S.-China Space Science Education Project, a pioneering international program.
ABOUT THE SPONSOR

California State University, Northridge, has been ranked by the National Science Foundation in the Top 15 (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. www.csun.edu

ABOUT THE JOURNAL AND ABSTRACTS

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

The journal is intended to serve as

1) a vehicle to honor young investigators and their teachers by showcasing their work, motivating them to continue their involvement in research science;

2) a sourcebook for both students and teachers who are looking for ideas for research projects; and

3) a volume to disseminate student research discoveries.

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

Abstracts are reviewed by the teachers and the journal editors, 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.

From the Editor

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

To those underrepresented science students who select California State University, Northridge (CSUN), 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 CSUN. 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.
In emergency rooms across the United States, nurses, doctors and hospital staff know never to say the “Q” word. The dreaded word isn’t “question,” “quarrel” or “quick” — it’s “quiet.”

It’s a rare time for an emergency room when the phones aren’t ringing and patients aren’t arriving, but that can all change in minutes, according to an ER superstition. As soon as someone remarks, “It’s going to be a quiet night, isn’t it?” everything changes: Ambulances flood the ER with patients until it’s bursting.

As a doctor of emergency medicine and Co-Medical Director of Burbank Emergency Medical Group at Providence Saint Joseph Medical Center in Burbank, it’s a situation that Celina Barba-Simic ’92 (Cell and Molecular Biology) knows all too well.

Barba-Simic’s only access to medical care as a child was the busy county emergency department, which “normalized” long waits, chaos and language barriers for the alumna. When she decided to pursue a career in medicine, emergency medicine was the only specialty she considered.

“Attending to people at times of crisis represents the greatest privilege of medicine,” Barba-Simic said. “I am most grateful to be able to alleviate anxiety and have an impact on patients’ acute medical needs...”

Barba-Simic always knew she wanted to work in medicine, but she never imagined that learning not to say the “Q” word would be such a valuable lesson — nor did she know that she would be drawn to the fast-paced world of emergency medicine.

Her path became clearer when she took a human embryology course with — and later joined the Center for Cancer and Developmental Biology of — esteemed biology professor Steven Oppenheimer at California State University, Northridge.

His influence on her was so profound that Barba-Simic recently made a gift to the CSUN College of Science and Mathematics to create the Dr. Celina Barba-Simic Biology Scholarship in Honor of Dr. Steven Oppenheimer. The annual scholarship will provide one award for an undergraduate student with demonstrated financial need who is also conducting laboratory research in the College of Science and Mathematics’ Department of Biology.

In unraveling 20 years’ worth of layers, Barba-Simic remembered her inspiring professor of human embryology. “Dr. Oppenheimer at CSUN gave me the comfortable, accessible starting point where I could really start building those skills and seeing that there are possibilities,” she said. “He was absolutely essential.”
Barba-Simic said the professor’s encouragement made a profound impact on her life.

“You walk in and he’s saying, ‘You’re wonderful and you’re the best!’ It was life-changing, his teaching and his classes,” she said. “It prepared me for medical school. I knew I had the study skills, the research skills and the knowledge base [to succeed].”

Although she learned many things from him, the most important idea the professor instilled in Barba-Simic was this: You can be a doctor if you want to be.

“I reflected on the impact my time in Dr. Oppenheimer’s lab had on my career,” Barba-Simic said. “He gave me the confidence to apply to [medical school]. Dr. Oppenheimer changed the trajectory of my life.”

**Overcoming Barriers**

A first-generation college student born in Mexico and raised in Pacoima, Barba-Simic and her parents came to the U.S. when she was 3 months old. She started working at the age of 15 and had two jobs by the time she was 16. She used her wages to pay for essentials.

“When I was graduating high school, I brought the UC application to my mom and was like, ‘How many of these boxes can I check off?’ I think the applications were around $50 each,” Barba-Simic said. “And she said, ‘Oh, honey, we can’t afford that and you can’t move away from home.’"

Financial and cultural constraints led Barba-Simic to CSUN, where she initially enrolled as a physical therapy major. Once at CSUN, she encountered cultural barriers to her education from well-meaning family and friends.

“I knew I wanted to be a physician, but everybody told me, ‘Oh, don’t be a doctor. It takes too long and you’re going to get married anyway,’” Barba-Simic said.

Despite the financial and cultural barriers, Barba-Simic paved her way to medical school by volunteering at the Veterans Affairs Sepulveda Ambulatory Care Center, just a few miles east of campus, doing research and participating in on-campus organizations such as Chicanos for Community Medicine.

At the end of her undergraduate time at CSUN, Barba-Simic received multiple awards, including Graduating Student of the Year Award from the Department of Biology and the Minority Achievers in Science Student of the Year Award. She also received multiple scholarships, fostering her appreciation of the financial needs of low-income students and later inspiring her to make a gift to aid those in need.

Barba-Simic made the gift to her alma mater in hopes of supporting “CSUN students that share similar challenges and career goals.”

As an involved undergraduate, Barba-Simic applied for — and later received — the National Institutes of Health Minorities Access to Energy Related Careers grant, with Oppenheimer’s encouragement, she said.

“The grant paid for two years [of undergrad], so I was able to stop working,” she said. “In the summer, the grant allowed me to conduct research in a Department of Energy lab and use the skills that Dr. O taught me.

“I was lucky to be at Lawrence-Berkeley National Laboratory working under Dr. Levy … where my job was to irradiate mice brain cell cultures, subjecting them to different levels of radiation and testing Bragg peaks using the linear accelerator. This was but a small part of the research that Dr. Levy used to perfect proton therapy for high-precision treatment of brain tumors and vascular malformations,” she added.

**Perseverance**

After graduating from Stanford Medical School, Barba-Simic completed a three-year emergency medicine residency at Harbor-UCLA Medical Center, where she started work as early as 4 a.m. and ended as late as 7 p.m. — the following day. This meant Barba-Simic often worked 38-hour shifts and 120-hour weeks.

On top of extremely long hours, in the first three months of her residency, Barba-Simic became pregnant with her first child. She went to her fellow residents and asked to switch schedules around so that her vacation was at the end of her first year.

“Once I switched it all, I went to my residency director and said, ‘I have a plan.’ I did not miss a day,” Barba-Simic said. “I actually went into labor my last day. I guess you’re so used to, as a minority, working harder and trying to prove yourself that it’s just part of you.”

At the start of her residency, she was one of two women in a class of 12, but she didn’t let that disparity discourage her from accomplishing her goals and realizing her full potential.

“You make it happen,” she said. “I’m kind of tough — I think that’s the Pacoima in me.”

“…take a moment to remember those individuals that have made a difference in your life.”

The influence that Oppenheimer had on her was invaluable, as was the education and training he provided. “Dr. Oppenheimer changed my life by believing in me and providing the opportunity,” she said.

To her fellow Matadors considering making a gift, Barba-Simic said: “Please take a moment to remember those individuals that have made a difference in your life while at CSUN. Reflect on your ability to share the fruits of your education with the next generation, your community and those in need.”
Dr. Oppenheimer Honored for Bringing Journal to the World

Congratulations to journal Editor-in-Chief Steven B. Oppenheimer, Ph.D., Professor Emeritus of Biology, for receiving CSUN’s prestigious Oviatt Library Open Access Award.

Dr. Oppenheimer was chosen for his contributions to science and education, including his work to make the journal available online at no cost through CSUN’s ScholarWorks Open Access Repository.

According to CSUN Today, "Open science is a movement to make all scientific research, data, and dissemination accessible online to all levels of an inquiring society, including amateurs and professionals."

Thank you, Dr. Oppenheimer, for your commitment to open science, and for enabling the world to see the K-12 student research in the journal every year!

See all 23 volumes of the journal at http://scholarworks.csun.edu/handle/10211.3/125029

Abstract Contributor Stacy Tanaka Takes on Exciting New Role

Stacy Tanaka, a long-time contributor of her students’ abstracts to the journal, brings a wealth of experience to her new role as Magnet Coordinator for Northridge Middle School’s Medical and Health Careers Magnet, now in its first year.

Prior to taking on this prestigious position, she taught in middle school for 11 years, and loved educating her students in a fun, hands-on way about how science helps make sense of the world.

Now she’s taking her extensive background in science education to the magnet. She said, “This magnet was developed to educate and give our community and students the chance to dream bigger. The medical field provides so many future opportunities, whether in sports medicine, veterinary science, environmental health and safety, or more traditional careers like physicians or dentists.

“Northridge Middle School’s proximity to CSUN and local hospitals lends itself to providing our students with many unique opportunities. We pride ourselves for our commitment to giving our students a high-quality education with authentic career experiences,” she added.

Stacy said that some highlights of her career include working closely with journal Editor-in-Chief Steven B. Oppenheimer, Ph.D., Professor Emeritus of Biology, in his CSUN lab to give students more authentic science fair experiences. In 2017-18, Stacy was honored with the Dr. Julie Gorchynski K-12 Teacher Research Award for her work with students and the journal.

In 2013, when Stacy taught at another San Fernando Valley middle school, a project submitted by her and her students was selected from more than 140 proposals for consideration, via the prestigious China Space Science Education Project, for experimentation on a future Chinese space shuttle launch. The Education Project is a collaborative effort between CSUN and China’s Nanjing University of Science and Technology.

A prior Los Angeles Unified School District Teacher of the Year nominee, Stacy has continually given back by mentoring many new, up-and-coming science teachers.

Thank you, Stacy, for all of your hard work and dedication to science education!

CSUN Student Research Journal Celebrates 23rd 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.

College Destinations

Highlighting success stories, students from the 2014 graduating class of Greg Zem (Ernest Lawrence Gifted/Highly Gifted Magnet) who had their abstracts published are now starting exciting college careers at:

- Boston College
- Bucknell University
- Cal State Long Beach
- Cal Poly San Luis Obispo (three)
- CSUN (three)
- Drexel University
- Harvey Mudd College
- Lake Forest College
- Moorpark College (two)
- Occidental College
- Oxford
- Pepperdine University
- Pierce College
- Stanford University
- UC Berkeley (four)
- UC Irvine
- UC Riverside (three)
- UC San Diego (four)
- UCLA (two)
- Valley College

Watch our video and read more about the excitement the journal generates at http://bit.ly/1MaPsGF
WHAT IS A SCIENTIST?

ART BY
Grigor Greg Tonikyan
Ernest Lawrence Gifted/
Highly Gifted Magnet
Greg Zem, Teacher

ART BY
Natalie Kim
Ernest Lawrence Gifted/
Highly Gifted Magnet
Greg Zem, Teacher
6419 
**Electro Plates**  
*Shervin Shokoohy and G. Zem (teacher)*  
Ernest Lawrence Gifted/Highly Gifted Magnet  
10100 Variel Ave., Chatsworth, CA 91311

In my science fair project I made a system that converts kinetic energy into electricity using cars. This system goes into the ground. It has a flying wheel that is connected to the plates and it is also connected with a generator with an electricity control. The color of each plate is green so the drivers can see the plates. When the car goes on the plate it moves up and down and creates kinetic energy that goes to the generator and converts it into electricity. The drivers will not feel uncomfortable while going over the plates. I made this model and tested it on a track. I broke the first model and then I made a second one, and everything worked perfectly fine. My results showed that each car, depending on the weight and speed of it, converted more electricity. Each car gave about 5 to 10 kilowatts of electricity.

6420 
**How Much Protection Do Helmets Provide Against Concussions?**  
*Allan Dewey and G. Zem (teacher)*  
Ernest Lawrence Gifted/Highly Gifted Magnet  
10100 Variel Ave., Chatsworth, CA 91311

My project showed how much protection helmets provide against concussions. This explained why people get concussions so much in sports, even with helmets. It is thought that concussions are caused by sudden acceleration being applied to the brain, causing damage to the brain. Thus, finding ways to reduce this acceleration could reduce the number and severity of concussions that people get. I tested current helmet technology to see how good it is at reducing the acceleration felt by the wearer. The materials I used for this experiment were a football helmet, a motorcycle helmet, and an iPhone 5c. iPhones and other smartphones contain accelerometers that feed the phone information about the phone's and user's movements. I dropped this phone from various heights onto a solid surface and read the acceleration measured by the phone. I used an app called "Mobile Science – Acceleration" (made by Ray Wisman and Kyle Forinash at Indiana University Southeast) to capture this raw data. The data produced was in g, which is the acceleration of gravity on Earth at sea level. For example, a reading of 2.0 g represents an acceleration twice that of gravity. This app captures acceleration in the X, Y, and Z directions. I used the formula \( S = (x^2 + y^2 + z^2) \) to give the total force experienced by the phone during testing. The app can capture 100 observations per second, so I measured and recorded the peak acceleration experienced by the phone in each drop. I tested the phone at 10 cm, 20 cm, and 30 cm. For the helmets, I tested both of them at 30 cm. For the control tests (dropping the phone by itself), I got 10 cm: 3.38 g; 20 cm: 3.65 g; and 30 cm: 4.30 g. For the football helmet dropped at 30 cm, I got 8.96 g. For the motorcycle helmet dropped at 30 cm, I got 6.63 g. So in conclusion, the helmets did not decrease the acceleration, and in fact increased it. That is the reason why many people get concussions when they fall in sports, even with a helmet.

6421 
**The Effects of Different Liquids on Fungal Growth**  
*Naum Yankelevich and G. Zem (teacher)*  
Ernest Lawrence Gifted/Highly Gifted Magnet  
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Fungal infestation is a problem for many households. My experiment was designed to figure out which materials that can be found in anyone’s house are the most effective at eliminating fungi. My hypothesis was that fungi would die more quickly in the most acidic environments, such as chlorine water, saltwater, etc. For the experiment, I used fungi growing on top of leftover coffee grounds, which imitated "naturally generating fungi." I used eight identical boxes to hold the coffee with fungi. One of the boxes (the control one) stayed as it was until the end of the experiment. A variety of different liquids were added to the other seven containers. The liquids that were poured onto the coffee with fungi every other day were sugar water, carbonated water, chlorine water, soapy water, honey water, saltwater, and pure water. The amount of liquid received by fungi was exactly 1 tablespoon per pouring. The experiment lasted 20 days. At the end of the 20th day, it turned out that fungi in the acidic environment were actually living and still growing better than in others. The most fungi were spotted in the container that was treated with saltwater. The container treated with chlorine had a limited amount of fungi. The containers treated with honey water and sugar water produced nearly identical results, with more fungi than in the chlorine-water-treated sample. The soapy-water-treated container had more fungi than the containers treated with sugar water and honey water. The container with plain water had slightly more fungi than the sugar water sample and slightly less than the soapy water sample. At the end, the place where fungi grew the least was in the carbonated-water-treated sample. This showed that my hypothesis was not fully correct and I need more research.

6422 
**How Does the Design of a Wire Affect the Speed of an Electric Motor?**  
*Rosibel Tapia and G. Zem (teacher)*  
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The purpose of my project was to find out if the design of a wire would affect the speed of an electric motor. I made a simple electric motor out of three neodymium magnets, an AAA battery, and three pieces of wire of the same length. I then bent two of the wires into different designs, along with one wire that acted as the control with the traditional coils. I marked the wires and a spot on a piece of paper, and then recorded each wire spinning for a minute. To count how many times the wire...
spun, I slowed the footage down. After counting how many times the wire spun in each video, I graphed the information to see how long each spun in 5 minutes. The results were as follows: The traditional coils were the fastest (at 210 spins per minute), followed by the “lines” design (at 170 spins per minute), and finally the “wavy” design (the slowest at 140 spins per minute). After performing the experiment, I found out that the design of a wire does affect the speed of an electric motor. In conclusion, we should stick to the traditional coiled wire for the fastest electric motor.

6423
What to Make Your Paper Airplane Out of?
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My project showed how the weight and thickness of the paper used to make a paper airplane influences the flight of the paper airplane. I chose this topic to find the most efficient material to make paper airplanes out of. I made the same model airplane out of four different types of paper, ranging from lightweight paper to cardboard. I laid a measuring tape across a long hallway in my house that measured from 0-600 inches. I threw the four airplanes in a controlled environment 105 times each and recorded the data on a spreadsheet. The throws were fast extensions of the forearm to make them as similar as possible. The results of the experiment showed that the lightest and thinnest paper airplane had the highest average distance flown, and the heaviest and thickest paper airplane had the lowest average distance flown. The average distance was in direct proportion to the weight and thickness of the paper used. The lighter and thinner the paper, the farther the plane flew. This is the result of aerodynamics and the force of gravity on different objects.

6424
UV Versus Mold: The Ultimate Showdown
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In this project I tested the ability of sunlight (more specifically the sun’s UV rays) to kill mold and mold spores when they are in a container with a viable food source. My hypothesis was that since 80% of UV rays seem to penetrate plastic, the mold spores would still deteriorate once in the sun. In the past, I have conducted experiments relating to the energy produced by different acidic fruits, but have never conducted any experiments relating to mold growth. From the website Wonderopolis.org, I found that UV rays from the sun are very adept at killing bacteria, and upon further research I found that the same UV rays kill mold and mold spores just as effectively when in open air. I then chose to develop two specific types of mold to test whether the sun would have the same results for different molds under the same circumstances. I figured that having a host made of simple sugars and starch would be best for this specific experiment. I used plain white bread for the development of the mold Penicillium (a green-blue mold most commonly found on bread), and fresh red strawberries for the development of the black-gray mold Rhizopus. I set up the experiment, and then sealed the containers and laid them in a dark corner of my garage before laying three green towels on top of them. On Day 3 of Trial 1, a black mold spot (presumably Rhizopus) had started to develop on two strawberries in Container 2. By Day 6, all of the strawberries were covered in mold. On Day 8, I put the strawberry containers in a sunny spot outside. The bread specimens were placed outside on Day 12. The mold on the strawberries perished by Day 15 in Container 4. The bread mold took longer to deteriorate and actually only showed signs of perishing on Day 16 (last day of the experiment). I came to the conclusion from the data extrapolated from both experiments that a large enough amount of sunlight was able to penetrate the plastic containers. However, it is still unclear to me why the sun had such a drastic effect on the Rhizopus and not on the Penicillium, but it may have had to do with the preservatives in the bread. Regardless, my hypothesis was proven correct.

6425
How Does Wing Surface Area Affect Lift?
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My project showed the correlation, if any, between the surface area of a paper airplane’s wings and the total lift force placed against it during its flight. My hypothesis was that planes with a larger wing surface area have a greater lift due to a greater area for the air to push up against. For my experiment, I folded seven paper airplanes, each with different wing shapes and sizes. I then calculated the combined surface area of both wings for each plane and made sure that each had a distinctly different surface area. Then I created a slingshot, which I used to ensure that each plane would receive the same amount of thrust. To calculate the lift of each plane I needed to know its velocity, angle of attack, the surface area of the wings (which I already had calculated), and the density of the air outside (which I looked up on the Internet). To calculate the average velocity of each plane, I timed the flight of each plane and the total distance traveled, minus the velocity of the tailwinds behind the plane. I calculated the angle of attack by taking pictures of each plane in flight and using the pictures to find the angle, which is formed by a line parallel to the plane’s flight and a line parallel with the plane’s wing. I plugged my variables into three equations: \( \Delta V = \Delta d/\Delta t \) (L = lift; Cl = coefficient of lift; r = air density; V = velocity; A = surface area of the top (sky-facing side) of all wings; \( \Delta d = \) distance; and \( \Delta t = \) time). I recorded the values of my variables and created a graph comparing the amount of lift force to the surface area of the wings. My hypothesis was proven right, and for the most part, the planes with larger wing surface areas had the greater lift. However, in three planes, due to abnormalities in their angle of attack during takeoff, two had
much higher lift forces than the size of their wings should have suggested, and one had a much lower lift. After performing this experiment, I discovered that there are a lot of factors that might affect the flight of a plane, including the surface area of its wings and its angle of attack.

6426
How Do Various Surfaces Affect How High a Basketball Bounces When Dropped From a Specific Height?
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My project was an experiment to determine how different surfaces affect how high a basketball bounces relative to the height it is dropped from. This would explain why a basketball bounces higher on some surfaces compared to others. I decided to test it on four surfaces that vary in hardness and malleability. These four surfaces were concrete, thermoplastic tiles, carpet, and turf. I prepared a wall next to the surface I was testing so I could measure the height of the basketball’s bounce on the wall by using a tape measure and painter’s tape. I marked every 12 inches, starting from the floor and going up to 48 inches. This resulted in four tape marks. I set up a video camera to record all of the surfaces and marked measurements. I recorded each bounce of the ball so that it was centered/evenly framed in the camera’s recorder. I used someone else to record this with a camera. I held the basketball close to the wall at a maximum limit of about 5 centimeters away. Then I dropped the basketball without pushing down so I didn’t add extra force on the ball. I made sure the basketball bounced and reached its peak height, and then I let the basketball hit the ground a second time before catching it. This way I was able to measure its peak height with no interference. For each surface, I did this five times, resulting in five trials to record my data in the form of a data table and graph. The data that I recorded for each surface was the ball’s drop height, peak bounce height, and its average height difference. From my results I found out that the surfaces that made the basketball’s bounce height really high were the two hard surfaces (concrete and thermoplastic tiles), as these two surfaces had a lower average height difference, which is the difference of the bounce height relative to the drop height. In addition, to my surprise, in terms of the bounce height values, the softer carpet surface results were not much lower than the harder surface results. But clearly, the one surface with different results compared to the others was turf. Its bounce height (in inches) on every trial was in the single digits, compared to the other three surfaces, which had bounce heights of roughly at least 20 inches on every trial. The surface with the greatest bounce height was concrete. All in all, based on these results I found out that a hard surface like concrete causes a basketball’s bounce height to be significantly higher due to absorption of less kinetic energy, and a soft surface like turf causes a basketball’s bounce height to be significantly lower due to absorption of more kinetic energy in inelastic collision.

6427
Planarians: Pavlov’s Dog 2.0?
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In this project, I explored the possibility of planarians being able to be trained, then untrained, which is similar to the Pavlov’s dog experiment. I hypothesized that they could be trained in a manner like the one used by Pavlov. For my project, I primarily used raw beef liver, spring water, Petri dishes, and the planarian species Dugesia dorotocephala. I divided them into four groups: Variable Group 1, Variable Group 2, Variable Group 3, and the Control Group. I used the shaking of the Petri dish as a stimulus, and I then trained them by placing the liver in a certain spot. My results were that planarians can indeed be used to replicate the results of the Pavlov’s dog experiment. My original hypothesis was correct. Planarians can be trained to respond a certain way to a stimulus, then change their response to that stimulus, proving that they have a changeable and updatable memory, which can replace useless and unneeded material. These are just my results, and have not been backed up by any other researchers or studies that I know of.

6428
pH Levels in Relation to Corrosion
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My experiment analyzed the effects that different pH levels have on rates of corrosion. For my different acids, I used black coffee, two different (in proportion) mixtures of citric acid, ascorbic acid, and other molecules (lemon juice and orange juice), and distilled water left out for a few hours so as to soak up carbon dioxide. I dipped 12 1-inch x 3-inch strips of steel wool (three per acid) in the acids for 30 seconds each, then spearred each sample on a probe thermometer, and stored both in an insulated (wrapped in a kitchen towel) test tube. For each trial, I took measurements of the temperature (heat is given off as iron corrodes) every minute for the first 10 minutes, and once more at 15 minutes, after which I rinsed or threw out the supplies in preparation for the next experiment. I graphed the data via a spreadsheet. My hypothesis was that pH levels and rate of corrosion have a negative (though tests with bases may prove it to be parabolic) correlation. The lemon juice (having the lowest pH) produced the highest temperature increase, while the black coffee (having the highest pH) produced the least change. Additionally, during the lemon juice trials, a foul odor was emitted almost immediately after submerging the steel wool. I think that sufficient amounts of hydrogen sulfide were created when combining the steel wool with the lemon juice to be detected by human nostrils (that is, the reaction smelled like rotten eggs). I believe this result was due to sulfur impurities in the steel wool. This furthered my conclusion, as the other acids did not produce such a smell, and because all acids contain hydrogen.
My science fair project was based on the growth of marigolds from the use of different types of liquids poured onto the plants. I used three plastic cups, filled them with soil to the top, and planted a few marigold seeds in each cup. The three different liquids I used were water, Coca-Cola®, and milk. I experimented and observed for three months and watered my plants with the different liquids every other day. I measured the heights of my plants each day after they started to sprout until my experiment was over. Before conducting the experiment, I hypothesized that the plants in the cup with water would grow the tallest and the others would not grow at all. But after conducting the experiment, I found that the marigolds in the cup that received soda only grew a centimeter and then wilted; the ones in the cup with milk grew the tallest; and the ones that got water grew shorter than the ones that got milk. I learned a lot from this experiment about how milk has a lot of essential nutrients that help a plant grow and is stronger than water. The Coca-Cola had too much sugar and the marigolds in that cup didn’t survive. I was surprised how the marigolds in the water cup grew less than the ones in the milk cup. I enjoyed doing this project and hope to learn more in the field of science!
because they are dyed with organic and all-natural vegetable and wheat dyes to enrich the color and taste. I now know much more about different food dyes, all by having people sample some of the tastiest snacks!

6433
The Rubber Hand Experiment
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Can we really trick the brain to think that a fake hand is its own? The purpose of this experiment was to test the theory that the perception of our own body is malleable. Using the rubber hand illusion, we are able to understand how sight, touch, and the sense of body position combine to create a convincing feeling of body ownership. This experiment helped me understand and learn how the body represents the body and if the body can be manipulated by sensory signals. I conducted this experiment using two paint brushes, a rubber hand, a divider, and two gloves. Using these I tried to convince the participants that the rubber hand was their own by stroking their fake hand and real hand with a paintbrush at the same time with the same motions. I saw a lot of different reactions and results from different participants. I learned that the younger sixth-grade participants were easily tricked compared to the older seventh- and eighth-grade participants. Only 11/20 of the people I tested thought that the fake hand was their own. That is barely over half, so my conclusion based on this data was that the brain is not easily susceptible when it comes to body membership. I also concluded this because everything had to be perfectly timed and placed for the brain to believe that the rubber hand was its own hand. This means that it is hard to trick the brain into believing a rubber hand is its own.

6434
Which Liquid Is Densest?
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My science fair project was based on finding out which liquid is densest out of these four: water, oil, vinegar, and dish soap. The densest liquid is the one that sinks to the bottom of the container. To conduct the experiment I gathered these materials: water, oil, vinegar, dish soap, and three containers. For the containers, I used transparent plastic cups. In one cup, I poured an approximately equal amount of oil and vinegar. In the second, I did the same, but instead used water and dish soap. The results of this part of the experiment were that dish soap is denser than water, and vinegar is denser than oil. For the final part of the experiment, I took the third container and filled it with vinegar and dish soap, because these were the two denser ones out of the four liquids. The results of this experiment were that the dish soap, when poured into a container with vinegar, sunk down to the bottom of the container, meaning that it is denser than vinegar. This also makes dish soap the densest liquid out of oil, vinegar, water, and itself. This is the main information that I learned and I hope it can be used later on.

6435
Calorimetry!
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My science project tested three different foods and the number of calories each food contains. Using a large metal cylinder (without a top or bottom), a smaller metal can, a metal skewer, water, a cork, a paper clip, a pie crust pan, and a thermometer, I constructed a calorimeter. A calorimeter is used for measuring the amount of heat involved in processes such as chemical reactions. Once I collected the data from my calorimeter, I had to input the mass of the water, the change in water temperature, and the change in mass into the equation Q = MCΔT. Without looking at the nutrition facts, I predicted that the CHEETOS® would have the most calories per gram, followed by the almonds, and followed by the Wheat Thins. In order to collect data, I placed the food on the skewer, lit it on fire, and then placed my calorimeter over the burning food. I recorded the data from the experiment as I tested each food. After using the formula, I concluded that the CHEETOS had 6.62 cal/g, the almonds had 5.14 cal/g, and the Wheat Thins had 4.05 cal/g. I think the results came out the way they did because of the mass, volume, and fat content of each sample. My experiment goes to show that mindful eating is healthy eating.

6436
Does Tea Stain Your Teeth?
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This experiment was about different beverages and their effects on teeth. I used eggshells to represent teeth during the experiment, and the three beverages I used were Coca-Cola®, coffee, and tea. These different substances had different effects on the eggshells. The soda started decaying the eggshell, as you could see small, rough grooves in the eggshell where it decayed with the carbonation of the soda. The coffee stained the eggshell in a more even way. The line of the staining was much smoother. As for the tea, the eggshell was stained, but not as evenly as the coffee eggshell. The stain was slightly lighter and was blotchy. The soda was thin so it didn't stain, but the reason the other substances did stain was due to something called tannins. These are found in plants, and tea and coffee are made from plants that contain tannins. Tannins are used to stain wood like redwoods, cedars, and other kinds. In conclusion, this experiment explained that tannins are present in drinks like coffee and tea. Don't drink these drinks too often, as they might
darker the color of your teeth. Occasionally is okay, but drinking them every day may turn your teeth the color of a chocolate bar. However, Coke is even worse, because it will gradually weaken your teeth.

6437
Acids and Sugar Versus Human Teeth
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One of the most significant problems in the world is the lack of care given to one's teeth, especially the enamel. This is because of certain conditions. Therefore, I decided to see how different substances affect teeth. These substances were liquids such as Coca-Cola®, tea, coffee, orange juice, lemonade, sugar water, pineapple juice, and vinegar. Since I didn't have a supply of teeth to do this project, I used the next substance that is closely related to tooth enamel: eggshells. I used eggshells both because they contain calcium carbonate and they are roughly the same thickness as enamel. I poured the different drinks in different cups and placed an eggshell in each one. The liquids that I used contain sugar and/or are acidic. I did this to observe the damage that occurs from most of the drinks that have these properties. I also placed an eggshell in water to compare the damage of the other drinks. I did this because water has no effect on tooth enamel, so therefore it should have no effect on an eggshell. After placing all of the eggshells in the liquids, I recorded data for a couple of weeks. After this amount of time, the eggshells showed significant changes. The eggshell that was in water barely had any effects. The color was only a bit dim to the point where you couldn't recognize it. On the other hand, there were major changes to the other eggshells. The eggshells in drinks that contain sugar were turning yellow and/or brown. For example, the eggshell that was in Coke had turned brown and slightly yellow. The tea and coffee had only stained the eggshells. The sugar water and lemonade had turned the eggshells into a shade of yellow that was dark on the bottom half and light on the top half. The orange juice and the pineapple juice had made the eggshells turn orange and yellow. Finally, the eggshell that was in vinegar was completely gone except for its outer skin. From these results, I concluded that liquids that are acidic and are sugary tend to damage teeth more. This was supported by the tests that were conducted. A liquid with sugar, like sugar water, turned the eggshell dark yellow. This meant that the eggshell had bacteria on it from the sugar that existed there. An acidic liquid such as vinegar damaged the eggshell to the point where the layer was thinner and chunks of it were missing. This means that acidic drinks damage enamel and make it weaker. Overall, this project provided insight into the status of human teeth when they are exposed to different drinks with unique factors.

6438
Could Something Sweet and Delicious Be the Key to Your Testing Success or Downfall?
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Breakfast is said to be the most important meal of the day, yet in this day and age teenagers often opt for a fast breakfast of sugary cereals and foods. In 2012, UCLA researchers conducted an experiment on rats and found that a diet high in sugar reduced synaptic activity and communication between brain cells. Insulin appears to help brain cells communicate by strengthening the synaptic connections between them, which improves memory, but because of the rats’ heavy sugar intake, they developed a resistance to it. Having recently read studies such as these on how a diet high in sugar can affect learning and memory, I was curious to find out if a sugary breakfast can hinder memory and attention. Additionally, because these factors are crucial for optimal test results, I wondered if an excess of sugar can be detrimental to a child’s performance on tests. Based on my research, I had hypothesized that teenagers who had more than 12.5 grams of sugar (half of the recommended amount for teenagers per day) would recall less than those who had a less sugary breakfast. However, because sugar, specifically glucose, is the brain’s main fuel and is essential for its function, I believed that people who had not eaten any breakfast would not score as well as those who did. For this experiment, I asked 26 teenagers, 13 girls and 13 boys ranging in age from 13 to 15, what they ate for breakfast (including specifics such as the brand of cereal and type of milk). Then I gave the test subjects a paper with 25 colorful images, with 30 seconds to memorize the objects and a maximum of 2 minutes to indicate what they remembered. I later calculated the total amount of sugar each individual subject had for breakfast, and how well they scored on the memory game, and compiled a graph of the results from which I was able to find the following pattern: Those who had less sugar for breakfast remembered more, and those who did not have breakfast scored the worst, as they could only recall a maximum of 12 objects. With the understanding that not all people have the same memory, this project can be further studied and improved in the future. With more test subjects and a controlled diet, this experiment can become more precise and results and findings can be more accurate. In conclusion, eat a hearty breakfast not containing too much sugar on your big test day!

6439
The Impact of Peppermint Aromatherapy on Alertness
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This science experiment tested whether the essential oil peppermint, acting as a stimulant, has a significant impact on alertness. Essential oils are commonly used through aromatherapy, either inhaled or topically applied, and can affect
physical, emotional, and mental health through interactions with the brain and delivery through the bloodstream. To test peppermint oil’s stimulant properties, study participants were divided into four different groups, each receiving a different treatment, and then given the Harvard Alertness Test to gauge reaction times. Two groups were given peppermint. One of these groups was told they were receiving peppermint, and the other group was not informed. The two remaining groups did not receive peppermint, but one was given a placebo (water) and told that it was peppermint, while the other group was a control group. Each individual then took the Harvard Alertness Test, a computer-based assessment that times the participant’s reaction to images as they appear on a screen. Both groups that received the peppermint aromatherapy performed the same on average, averaging 0.32 seconds. Each of the two groups that did not receive the peppermint, even when told otherwise, averaged 0.31 seconds. The difference of only 0.01 seconds (one one-hundredth of a second) indicated that the peppermint had no significant effect on the individuals’ alertness as measured through test performance. Furthermore, there did not appear to be any correlations or patterns in individual test results within each group or between groups. Overall, this study suggested that the peppermint essential oil has no significant effect on alertness. While peppermint may have other benefits not tested by this study, consumers may not want to rely on peppermint aromatherapy to enhance alertness.

6440
Retaining Memory
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The science fair project I did was very interesting, but it did take several steps. I came up with the project idea by just noticing my surroundings. I am currently an eighth-grader, and I got the idea for the project from noticing that many people struggle with retaining memory. So, I decided that I should do research for my project on retaining memory. The second thing I did was start to research data on how to retain memory and the best possible way to do so. I also researched whether working out before you study helps you retain information. From my research I decided to do live experiments to show if my hypothesis was proven correct. Once all of the data was collected, I put it together for my project. This was a great experience, but I think that the best part was what I found in my project. I learned that studying after working out helps you retain information. My experiment with the tests also proved that doing some type of workout, even if it’s for 5 minutes just to get blood flow through your body, helps you retain information. It is very mysterious how this happens, but the main reason is because when working out, new cells are created, which means there’s more room for new memories of the things you’ve learned. That’s what helps you keep your information. As I did this project, I learned many interesting things that I never thought possible.

6441
The Horse’s Heart Rate
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My project was based on whether a horse’s heart rate increases during activity. I performed this by using a lunging pen, a horse, and a timer as a few of my main materials. To start my experiment, I lunged my horse for about five rounds for each of several gaits, such as the walk, trot, and canter, and included resting periods by taking breaks of a few minutes between each one. I did each gait for about 5 minutes to get a consistent blood flow. After each gait, I took my index and middle fingers and felt the horse’s pulse on the artery under the jaw and counted for 15 seconds. Next I multiplied that number by four to find the number of beats per minute. I did that for each round and gait, and recorded the information on a sheet of paper. After doing the rounds of the experiment, my data proved that the faster the exercise, the faster the blood flow based on the average number of beats per minute after each gait. The bar graph in my data showed that the number of beats per minute in a canter was much higher than the heart rate in a walk. I found out that a horse moving at a consistent speed for at least 4-5 minutes develops a consistent, non-changing heart rate unless the activity slows down or speeds up. My experiment led to my conclusion that when a horse starts at a slower gate, like walking, or even a still position (a resting state), an increase in the heart rate only happens at faster speeds when there is more need for oxygen for the heart to give to the rest of the body.

6442
The Effectiveness of Homemade Glues Versus Synthetic Glue Across Materials
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This experiment tested the effectiveness of homemade glues against a synthetic glue on a variety of materials. The synthetic glue tested was a basic Elmer’s® Glue, which is made up of monomers, which harden due to polymerization. Polymers are chains made of CH₃, and Cl, and the chemical bonding causes the synthetic glue to have a high tensile strength. While a wide range of natural glues exists, four different homemade glues were chosen for this experiment, each with a different base. These included a gum arabic glue, a flour glue, a milk glue, and a cornstarch/corn syrup glue. The materials tested for the glues’ effectiveness were cardboard, wood, metal, and plastic. Overall, the synthetic glue held the most total weight across the materials, although it was not effective on all of the materials. The gum arabic glue was the only glue that was effective on all of the tested materials. Test results indicated that the most effective glue varied by material. The milk glue performed the best on cardboard by holding 10.65 pounds, slightly better than the synthetic glue. The gum arabic glue performed the best on
How Do Different Products Clean Tarnished Pennies Differently?
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My project tested different products to see what cleans tarnished pennies the most efficiently and effectively. The tarnish that is found on pennies can be dissolved in a weak acid. Each product that I used has some level of acidity so I could see the different effects of each material. The materials I used for this project were vinegar, salt, cranberry juice, Coca-Cola®, lemons, an eraser, Crest® toothpaste, hot sauce, apple cider vinegar, ketchup, newspapers, tarnished pennies, plastic cups, paper towels, and an old toothbrush. Before starting this experiment, I hypothesized that the Coca-Cola and salt and vinegar methods would work the best. I had done some background research and I found that these two items have very high acidity levels. To test my hypothesis, I took each product and cleaned a tarnished penny with it. I took a before and after picture of each penny cleaned by each product. I then printed out each picture and compared them to one another, trying to figure out which method worked the best. In conclusion, I really enjoyed doing this project. Overall, I learned that time is key to cleaning pennies, and if you want a super clean penny, you have to take your time. My hypothesis was correct, and the Coca-Cola method definitely worked the best because of how acidic it is. Doing this experiment not only taught me how to clean pennies, but it also taught me how copper oxide is formed on pennies and how certain acidity levels remove it.

How Does the Height Where You Put a Ball Affect How High the Ball Bounces Back?
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I created a science fair project about how the height of a ball affects how high it bounces back. I had to first choose which balls I should use in this experiment and included a soccer ball, a basketball, and a tennis ball. I made sure that the balls were new and then placed them at different heights, which were 4 feet, 5 feet, and 6 feet. I used a measuring tool to measure the height where I put each ball and then I dropped it. The sequence of where I put the height of the balls was the same and the basketball bounced back the highest. This was key in building my poster and my tables, because with the data I could make a conclusion on how the results depended on the height of and air in the balls. I dropped the balls on a flat surface outside so the results were more accurate, because I did this outside and not inside on a wooden floor. In this project, I learned pretty much how the starting height of a ball and how much air the ball has in it affect how the ball bounces back up. If the ball has a greater height to drop from and has more air in it, this allows the ball to bounce higher compared to a ball filled with the recommended amount of air. I learned that the soccer ball bounced higher than the tennis ball, but then I realized that the soccer ball had a little bit more air in it than recommended. The whole idea for this project was to get the main point across, and that is to know that the starting height of the ball affects how it bounces back up in the air.

Black Holes and How They Work
Saleh Pasha, Henry Bausley, and G. Zem (teacher)
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Our science project explained what black holes are and how they work. This would explain the mysteries scientists have just discovered about them. A black hole is formed when a large star with 25 solar masses or more explodes. Scientists have discovered three different types of black holes: stellar, intermediate, and super massive. Black holes that appear at the center of galaxies are classified as super massive. The experiment we did modeled a black hole’s strong gravitational force. We used a rectangular box with a piece of stretch fabric stapled over it, and then placed a large heavy ball in the center to represent the center of the black hole. The fabric deformation caused by the weight of the heavy ball represented space and how it is deformed. Next we got a marble, which represented the object in space. When we ejected the marble into the deformation it spiraled toward the center in and couldn’t come back out. This proved our hypothesis. In conclusion, we deduced that a black hole’s gravitational force is so strong that no object, not even light, can escape. This also showed how it can warp and deform time and space in such a way that time is completely destroyed.

Cokesplosion
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This project explained how to prevent a soda can from exploding when shaking and opening it. I believed that tapping the sides of the can would cause the rogue bubbles to move to the top, thus not displacing any liquids nor causing an explosion when a sealed can is opened. I used six 12-ounce Coca-Cola® cans for the experiment. I placed a bowl under each can and used a measuring spoon to record the amount of liquid that escaped out of each one. I conducted the first part of the test
6447

Acid-Base Indicator
Janani Kalyan and G. Zem (teacher)
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My science experiment tested my research on anthocyanins, the pH scale, acids, and bases. I wanted to prove a method for students to create acid-base indicators using ingredients found at home instead of using ready-made kits. If students are able to understand why each ingredient (of the acid-base indicator) adds to the revealing of the pH balance of the substance they’re testing, they will comprehend the pH scale better. First I researched what water-soluble substances have pigments that associate solutions and other liquids to their corresponding color on the pH scale. I came across multiple answers, so I picked the option that people could find commonly in their home, purple cabbage. Using the cabbage, water, and tools (a knife, cutting board, blender, and strainer) to create my indicator solution, I performed multiple trials to see what measurements and ratios of water to cabbage would produce the best results to bring out the colors of the pH scale. When I poured my indicator solution into the liquids I was testing, the colors changed instantly. Even better, I understood exactly what was happening from the moment I started making the indicator to the end of the experiment. I’m positive that this experiment will be very fun for students and help them understand acids and bases on the pH scale better than studying from a book.

6448

How Cats React to Catnip
Rylan Knight and G. Zem (teacher)
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I tested several different cats of different breeds, ages, and genders to see how they reacted to catnip and which kind of catnip they reacted to most. In all I tested six cats, which is a good number for testing a hypothesis and conducting an experiment. The two kinds of catnip I used were dried catnip and fresh-grown catnip. I set down two plates, with the first kind of catnip on one and the second kind on the other. I observed which ones the cats went to and how they reacted. I did this individually with each cat. First of all, I will talk about gender. I had only two female cats, but from what I saw they both reacted to the dried catnip. Both of the females sniffed it and started to rub on things like the wall, and rub or roll on the carpet. I think that their responses were pretty similar, but the males reacted in different ways, so gender somewhat affects the reaction to catnip. Next I will discuss age. The younger cats reacted by rolling around and sticking their faces in the catnip to eat it. They both didn’t get too crazy. I think that the younger the cats are, they less they have a reaction to catnip, or they even have no reaction. I have heard that kittens cannot really smell catnip. The two older cats didn’t really have a huge reaction to the catnip. One cat in particular had a very active reaction because he is 7 and cats are still active and hyper at that age. I think age does matter and affects a cat’s reaction to catnip. Most of the cats were tabby cats and one was a Bombay cat, but from my results they all reacted in different ways, so breed does not affect the reaction to catnip.

6449

Does Color Have an Effect on Memorization?
Tina Adnani and G. Zem (teacher)
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My project was about whether color has an effect on memorization. This would explain if people can get better results if they study with some sort of colored ink rather than plain black ink. I got some test subjects and asked them to study three cards that I set out for them. One of the cards was written in black ink. The next card was written in a solid color ink that wasn’t a neutral color. The third card was written in multiple colors together. I asked my test subjects to take a certain amount of time to study the historical facts written on each card. Then they needed to go home and get a good night’s sleep. The following morning, I asked my test subjects individually to indicate which fact they best recalled. More than half chose information on the two cards written in color. There were a few people who recalled information on the black ink card easily. They had to take time to think. The most common were the ones in color. I did this test with about 20 people and my results proved that color does have an effect on memorization. I tested this science project out because I wanted to see if I could help those who need a different or better study method. They could try to highlight key facts or write notes in different-colored inks to represent certain things. In fact, I believe that color for sure has an effect on memorization. Isn’t that why we have highlighters? They show the key details that we need to remember in the long term. I found out that color can help students and adults to better memorize things. This project overall was fun and hopefully can help those who have struggled with study methods.
6450  
**Can a Fingerprint Pattern Reveal Your Personality?**
Maryam Omran and G. Zem (teacher)  
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My science experiment focused on whether you can or cannot reveal a person's personality just by looking at their fingerprint pattern. I used an ink pad and a pen to look at 60 people’s fingerprints (30 adults and 30 teens). First I took each person's fingerprint using the ink pad, and then I took a minute to analyze it. Then I put the fingerprint in one of three main categories for further inspection. Under the three categories, there were 10 different additional categories I could use to determine more specific behavioral patterns. Once I checked those, I read the overall personality to my test subjects and they either agreed or disagreed with me. Out of the 60 people I tested, 53 people agreed with my results! My conclusion was that there is some reasoning behind this science and I intend to find out more. Of the seven people who disagreed on their personality with me, most of them were adults. I think that when you are dealing with a crime, the suspect's personality would be very useful to know. For example, someone who is very humble, pleasant, and peaceful would not commit a crime. Overall, I thought that this experiment was fun and interesting, and I hope that I will get to do something like this in the future.

6451  
**How Does Fabric Softener Affect the Flammability of Certain Fabrics?**
Sofia Kirchen and G. Zem (teacher)  
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This project focused on finding out which fabric has the highest flammability rate and whether or not fabric softener contributes to the flammability of any given fabric. The results of this project may be beneficial in reducing the number of fire-related deaths, especially in babies and young children. To begin the project, I took eight squares of fabric, two of each type (silk, cotton, rayon, and polyester) and washed one of each with fabric softener and one without. After I had completed the preparatory washing, I built an apparatus out of cardboard and string that could suspend the fabrics in the air when the fabrics were lit on fire without causing damage to any of the surroundings. I then proceeded to light the fabrics on fire for a total of 5 seconds before dousing the flames with water. In the aftermath of the experiment, I observed that the most flammable fabric out of the four used was cotton. Furthermore, the square of cotton washed with fabric softener was reduced to ashes almost instantaneously. The results of this experiment provide crucial information to consumers regarding the flammability of certain fabrics and fabric softener's effect on those fabrics. I hope this data raises consumer awareness and potentially saves lives from fire-related incidents.

6452  
**How Does the Angle of a Solar Panel Affect the Speed of a Solar Car Model?**
Somil Jethra and G. Zem (teacher)  
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My project explained how the angle of a solar panel affects the speed of a solar car model. With this project, people will learn that when the angle is perpendicular to the sun, the solar car gets maximum energy. If you decrease or increase the angle, the solar car’s speed decreases. To make the solar car model, I used a car frame and attached a DC motor. I used the gear to drive the motor, which made the wheels move. I attached the solar panels such that the angles could be changed. To test the speed of the solar car, I used a smooth 24-foot pathway. I measured angles ranging from 50˚ to -10˚ to see the change in the speed of the car. I recorded the time, speed, angle, and distance in my data, and also made a graph to see how the angle affected the speed of the car and the time taken to travel 24 feet. After performing my experiment, I found that my hypothesis was correct. The solar panel at a 90˚ angle with the rays of the sun got maximum energy. I found that at 30˚ with respect to the ground and solar panel (which is the same as 90˚ with sunrays), the solar-powered car got the highest speed when compared with any other angle. Therefore, the car got maximum energy. From 90˚, as the angle decreased below 30˚ or increased above 150˚, the speed decreased.

6453  
**Cleaning Pennies**
Joie Solano and G. Zem (teacher)  
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My science project explained the components used to clean pennies conveniently at home. I wanted to see how you can clean pennies with amazing results. Finding the materials to clean the pennies was the easiest part. All of the materials could be found at home. I used vinegar, baking soda, salt, and orange juice. I made a mixture of salt, baking soda, and vinegar in one cup. In another, I put baking soda and vinegar. The third cup had vinegar and salt in it. After all of the mixtures were ready, I put pennies in and let them sit in their cups for 30 minutes. For a fun bonus, I also put pennies in a cup of orange juice. Some of the ingredients are acidic. The acid should kill the gunk and bacteria that is left on the pennies, leaving them squeaky clean. Sadly, that was not the case. It didn’t work as well as I had hoped. The best mixture used to clean the pennies was the one with vinegar, baking soda, and salt, but even that mixture didn’t take off all of the dirt. If I were to do the experiment again, I would be more diverse with my ingredients and let the pennies sit in the mixtures longer. Overall the experiment was fun and I encourage you to do it as well.
6454
Cleaning Oil Spills
Tsehai Michael-Davis and G. Zem (teacher)
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In this project I tested two different ways to clean up oil spills that harm our marine life. I compared dispersants and solidifiers. The results of this project can show us how to help keep our oceans clean and prevent death and harm to marine life. Dispersants break down oil, while solidifiers soak up oil and then turn into a solid that you can take out of the water. For the dispersant I used Dawn® dish soap, which quickly broke down the oil using chemicals. For the solidifier I used polymer powder, which is super absorbent and nontoxic. The polymer powder soaked up all of the oil, and I was able to remove it from the water once it was solidified. In the end, after comparing both approaches, the solidifier seemed like the most effective way to clean oil spills without harming marine life.

6455
How Does Color Affect Heating By Absorption of Light?
Rohan Goyal and G. Zem (teacher)
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My science experiment showed how color affects absorption of light. How I set up my experiment was extremely simple. First I filled six jars with water, allowing them to sit until they reached the same temperature (room temperature). Then I wrapped different papers around five of the jars, leaving one jar without any paper. These colors were white, red, yellow, blue, and black. Each paper was supposed to absorb or reflect the light. It would obviously reflect the paper’s color away, leaving the rest of the colors to be absorbed or a small amount of light passing through. When passing through the water, the photons colliding with electrons would cause energy transfer between the photons and electrons. This would affect the temperature of the water. I used a thermometer to measure the temperature of the water, and then I got incandescent lamps and used them to send light to the jars. I did three tests: 30 minutes, 1 hour, and 2 hours. In the end, I got great results. I made a graph to show the data side by side to compare the unequal heating due to the different colors. Some of my hypothesis was proven correct, and some of it was not proven. I was correct that the jar with no paper would be the hottest, the one with white paper would be the coldest, and the black-papered jar would be the hottest of the jars with paper. For the other jars, the results were not exactly what I thought they would be like. Overall, this experiment was a fun one to do and yielded great results and data.

6456
Reducing the Process of Strawberry Molding
Kirsten Odelia Tampubolon and G. Zem (teacher)
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The experiment I conducted for seven days showed ways to slow down the process of molding. I used strawberries as my subject, since a strawberry’s molding time is a lot faster than any other fruit’s, especially since even being in the wrong temperature or being soaked for too long can cause it to mold. I used multiple mixtures – water, sugar water, saltwater, and aloe vera – and an empty cup to see how quickly a strawberry would mold. Soaking a strawberry in vinegar is the best way to keep it from molding, but I wanted to make sure there aren’t other ways to keep it fresh, because personally I don’t think using vinegar is the best idea. Once you take the berry out of the vinegar, you use water to wash the fruit. But once a strawberry that’s been held back from the process of molding comes in contact with water, it will start to mold. Mold on a strawberry, when consumed, can become one of the most dangerous viruses in your body, so it’s best to keep it safe and stay away from vinegar unless you’re only storing it overnight. This experiment allowed the strawberry to be edible for the first two days of being in the substance to keep mold off of the fruit. I found that it was best to soak a strawberry in sugar water than in any other mixture, since sugar water contains resources a strawberry already has or needs. High concentrations of sugar exert osmotic pressure that draws water out of bacteria. Without enough water, the bacteria can’t grow or divide. The aloe vera kept the strawberry from molding just as well as the sugar water, though when I looked closely the strawberry’s seeds had started to come off or sink in, and it had started to lose its red color. Aloe vera broke down the strawberry and caused white strings to come off the pores where the seeds were. This experiment didn’t account for all fruits and vegetables, but using saltwater, regular water, or leaving the fruit or vegetable alone will not help it from spoiling.

6457
Electrolysis of Water
Kevin Tran and G. Zem (teacher)
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For my science project, my purpose was to figure out which electrolyte affects water the most during electrolysis of water. I hypothesized that salt would end up having the highest conductivity, since the solution of salt and water contains sodium and chlorine ions. These ions are both good conductors. This project can help companies use certain solutions in order to make electricity. This could pave a path to more sources of power, and to find new sources of energy that do not harm the environment. In the project I used a 9V battery, a small plastic cup, and thumbtacks. I poked the thumbtacks inside the cup and placed it on top of the 9V battery. Then I put in certain solu-
The majority helped it, some people did do what I thought would completely ignore it or feel uneasy about it. Although it got stuck, and that was surprising since I thought people of the people who saw the robot actually helped it whenever expected and some that were indeed surprising. The majority valley" factor. But instead I got varying results, some that I expected and some that were indeed surprising. The majority of the people who saw the robot actually helped it whenever it got stuck, and that was surprising since I thought people would completely ignore it or feel uneasy about it. Although the majority helped it, some people did do what I thought they would. One person turned and walked away to the next sidewalk when she saw the robot. I believe that in the future more people will participate in this experiment since they will get used to robots around them. In conclusion, the majority of the people in this experiment actually helped the robot, which contradicted my hypothesis.

6458

Little Lost Robot
Premkumar Senthilkumar and G. Zem (teacher)
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My science fair project showed how humans react to robots. It can help scientists learn more about how humans might feel about robots in the future, when we will be more dependent on them. My project was based on an earlier one called "Tweenbot." That project was about a small cardboard robot that roamed around New York City and how people reacted to it. My project was different because I made my robot as strange looking as possible in order to learn more about the “uncanny valley.” The uncanny valley is a phenomenon in which humans feel revulsion around things that are artificial. I built a simple robot that has two wheels and googly eyes. Next I let it roam around my neighborhood and decided to see the reactions of the people who saw the robot. My hypothesis was that people would feel uneasy around my robot because of the “uncanny valley” factor. But instead I got varying results, some that I expected and some that were indeed surprising. The majority of the people who saw the robot actually helped it whenever it got stuck, and that was surprising since I thought people would completely ignore it or feel uneasy about it. Although the majority helped it, some people did do what I thought they would. One person turned and walked away to the next sidewalk when she saw the robot. I believe that in the future more people will participate in this experiment since they will get used to robots around them. In conclusion, the majority of the people in this experiment actually helped the robot, which contradicted my hypothesis.

6460

Organic Versus Nonorganic Apples
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The food we consume every day has a big impact on how we feel and how we appear to others. Many foods give you a positive outcome, and some a negative one. I wanted to see what the differences are between organic and nonorganic products. To test and see these differences, I decided to buy the same brand of apples (Fuji apples), one nonorganic and the other organic, and watch the changes in the apples over time. I placed the apples in the same location and marked down what I observed for 26 days. The organic apple seemed to rot and have small flies (known as Drosophila flies) circling the base of the apple. On the other hand, the nonorganic apple showed little to no change in physical appearance. To see if this test was conducted correctly, I checked a group of apples placed in a different location and got identical results. After noticing the changes, I decided to conduct some research and to my surprise, I found out that nonorganic apples have chemicals applied that make them stay fresher for a longer period of time and have a fresher taste longer as well. The organic apples, unlike the nonorganic apples, do not have these chemicals applied. At the end I found out that organic items are truly better for you, although many of these organic items are more expensive. If you can afford it I would buy organic no matter what product it is. Organic ingredients prove to be purer and provide more nutritional value than any other nonorganic ingredient can. So I say go organic!
all received the same amount of light. I did this for a month. I hypothesized that the plants being fed coffee would grow faster because coffee has been proven to increase productivity in humans, so it should work on plants. Right off the bat, the plants being fed coffee were already starting to grow roots and multiplying long before the control group even grew one root. The plants being fed coffee were much taller than the plants not being fed coffee, and also had more leaves and more roots. I took the average height of both sets of plants. The experiment group average was 15 inches and the control group average was 10 inches. My hypothesis was correct: The plants being fed coffee grew much taller and faster. It is important to know this information, because in the future it may be valuable to have plants grow faster in order to supply people with fresh crops. In conclusion, my experiment showed that the plants being fed coffee grew faster and were much more productive. I could tell because of the large 5-inch height difference between the two sets of plants when all of the other factors were the same.

6462
Does Green Clean?
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In this experiment, I tested two different cleaners to find out which is more effective: chlorine bleach with water (the non-environmentally friendly option), and a 3% hydrogen peroxide solution with water (the environmentally friendly version). The cleaners were both tested on three different stains on white shirts. The first stain was grass, the second was pomegranate juice, and the third was chili paste. After the shirts were stained, they sat out for a day and were placed on garbage bags in preparation for cleaning. A measured amount of the two different cleaners was placed on two different sections of the stains, and these were soaked. After a few hours, the stains were scrubbed with a brush and rinsed with water. The shirts were hung and left to dry. Overall the eco-friendly choice (the 3% hydrogen peroxide solution) worked better than the non-eco-friendly cleaner (the chlorine bleach). This showed that hydrogen peroxide is not only better for the environment, but it also works better on stains too.

6463
Testing pH Levels of Different Brands of Water
Sarah Georgie and G. Zem (teacher)
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My science fair project was about testing the pH values of specific brands of water to determine if they are safe for our bodies. pH is short for potential of hydrogen, and it is the measure of the number of hydrogen ions in a solution. Solutions with a high concentration of hydrogen ions have a low pH (acidic), and solutions with a low concentration of hydrogen ions have a high pH (alkaline). It is measured on a scale from 0 to 14. Our kidneys balance the electrolyte levels of calcium, magnesium, potassium, and sodium. When we are exposed to acidic substances, the electrolytes combat it. If the pH levels in our bodies are highly acidic, the acidity forces our bodies to lose minerals from the bones, cells, organs, and tissues. Cells end up lacking enough minerals to properly complete their normal functions, including disposal of waste or oxygenation. This also can cause toxins to accumulate in the body and cause the immune system to become suppressed. A pH of 7 is neutral, and normally our bodies’ pH levels fluctuate within the range of 6.5 to 7.5. For this project, I got different brands of water and tested the pH levels using pH testing drops. The results were similar to the ones I had predicted in my hypothesis. The water that was closest to alkaline was the filtered water. The next closest to alkaline was the Arrowhead® water. The only water out of the ones I tested that was neutral was the smartwater®. I had actually hypothesized that the smartwater would be more acidic, since its cost is much less in comparison to other brands. The most acidic waters were the Aquafina® and the Dasani®. The acidity of these waters is very dangerous for your health, ranging from 1.5 to 2.5. Surprisingly, Aquafina and Dasani are the two most popular brands of water in the U.S.

6464
Sensitive Much?
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This project was designed to see if sensitivity is heightened by stimuli on a person’s dominant hand. We use our five senses to observe and perceive everything around us. I tested one of the senses: touch. There are touch receptors all over our bodies, and we feel things with the touch receptors on our hands. A person can be left-handed or right-handed or even ambidextrous (able to use both hands equally well). I wondered if the sensitivity and touch receptors are heightened or increased on the dominant hand. I tested this by applying one to three toothpicks to both a right-handed and a left-handed person. I did this three times in three different areas, which were the wrist, palm, and back of the hand. I then asked them how many they felt. I recorded the overall number of toothpicks each person perceived correctly in the applied areas, as well as when they misperceived the number of toothpicks. Both individuals had more accurate determinations for their dominant hand than for their non-dominant hand. Based on the evidence and results I observed, I found that sensitivity is heightened on a person’s dominant hand.
6465
Which Method Is “Betta”?
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The purpose of this experiment, titled “Which Method Is “Betta?” was to test the aquaponics gardening system using betta fish. This system uses fish feces to fertilize and feed plants nutrients by recycling the dirty fish tank water. For this experiment, I gathered two betta fish, fish food, a 3-gallon fish tank, six plants, gravel, a fresh water supply, and a camera to record all of my data. While conducting the project, I learned about the symbiotic relationship between the plants and fish. The fish provided dirty water that would later be recycled to feed the plants while refilling the fish tank with clean water. Through this experiment, I discovered that the aquaponics gardening system is less expensive, more environmentally friendly, and an easier way of gardening.

6466
Is the 5-Second Rule a Myth or a Fact?
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Many of us have dropped food on the floor, and then picked it up and eaten it. Many people even say that if the food has been on the floor for less than 5 seconds, it’s still clean. However, after conducting my experiment, the results showed that bacteria are everywhere. After I dropped each food item on the floor for 5 seconds, I swabbed the item and placed it in an agar plate. Then I waited and checked every day (for three days) to see if any colonies developed. At the end of the experiment, over eight colonies had developed. On the first night there was little to no bacteria, but as time went by the amount of bacteria increased. The truth is, bacteria can actually transfer to food in less than a second, depending on the type of surface, type of food, and how much moisture the food contains. From conducting my experiment, I learned that the transfer of bacteria from surfaces to food appears to be affected most by moisture. From the locations I dropped the food on, I realized that a carpet surface has the lowest transfer rate, while tiles and stainless steel have higher rates. Therefore, I concluded that the 5-second rule is not a rule, but a myth.

6467
Heat Absorption and Retention of Different Objects
Natalie Kim and G. Zem (teacher)
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This project showed whether stone or metal retains heat longer. To do the experiment, I used a ceramic pot, a metal pot, and a stovetop burner, along with a laser thermometer and a timer. I put each pot above the burner for 30 seconds at medium strength, and used the laser thermometer to record how hot each one was for a minute afterward. By the end of a minute, the ceramic pot’s temperature was 165˚F, and the temperature of the side of the metal pot was 118˚F. I observed that the ceramic retained heat from the burner longer. I kept repeating this process in intervals of every 30 seconds, and used the laser thermometer to measure how hot the metal pot and ceramic pot got. After several attempts at my experiment, I found out that the ceramic pot retained heat longer. However, what was interesting was that the ceramic pot’s heat measurements compared to those of the metal pot declined at a much faster rate, despite heating up more quickly and to a higher temperature. From the graph showing the project results, it can be seen that the ceramic pot heated up faster and retained more heat than the metal pot, but the metal pot’s heat retention stayed much more consistent than that of the ceramic pot. I found out that ceramic pots are better for quickly heating up food, but not for keeping it hot afterward for an amount of time. What is more consistent for this job is the metal pot, because its heat stays much more level and consistent when compared to the ceramic pot.

6468
Using Ultrasonic Sensors to Control Volume
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My project was something out of the ordinary, and it involved using an Arduino® board as the main feature. The whole purpose of the project was how elaborate I could make something using the simple basis of an Arduino IDE program and a board. But I wanted something where I had all of the materials at home. So the base materials were some speakers, an Arduino board, a breadboard, some little LED lights, ultrasonic sensors, some wires, and a little bit of programming. Most of the materials in the project was stuff I already had lying around, so I took advantage of the resources. After some programming of the Arduino IDE into a laptop, I wanted the project to stand out. I had the idea of using the ultrasonic sensors as volume control for the music I’d have playing out of the speakers. The idea was that if an object was less than 10 centimeters away, the volume of the music would get quieter, depending on the distance. If the object was more than 10 centimeters away, the volume would increase. My hypothesis was that the ultrasonic sensors wouldn’t be so accurate, and somehow would misidentify the distance of the object and mess up the volume. But I was wrong. The ultrasonic sensors were actually pretty accurate, but only with objects within a certain range.
6469  
Do Skittles® Boxes Have the Same Number of Skittles of Each Color?  
Zack Ahadi and G. Zem (teacher)  
Ernest Lawrence Gifted/Highly Gifted Magnet  
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My science project determined if Skittles boxes have the same number of each color of Skittles in each box. For this experiment I got two boxes of Skittles, two containers, and paper to write down my observations. I opened the first box and put the Skittles onto a napkin, where I separated them by color, and then I wrote down the number there were for each color. After recording the data, I took the Skittles and put them into the first container. I repeated the same process for the second box. I then went on to compare the results to answer the question if there actually are the same number of each color of Skittles in each box. For the first box of Skittles, my data results were red: 14; green: 18; yellow: 22; brown: 22; and orange: 19. For the second box, my data results were red: 20; green: 20; yellow: 20; brown: 18; and orange: 18. Based on the results, and comparing both data sets, I came to the conclusion that each Skittles box does not have the same number of each color of Skittles. The main result was that there are not the same number of each color of Skittles in different boxes.

6470  
The 5-Second Rule  
Sumedha Budaraju and G. Zem (teacher)  
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The purpose of this project was to find out if picking up food that has fallen on the ground within 5 seconds will prevent the transfer of bacteria, if the type of food will affect how much bacteria may transfer, and if the type of ground surface will affect how much bacteria may transfer. I predicted that the dry items (crackers) would have no bacteria and that the wet items (cucumbers) would have a little bit of bacteria. My prediction was wrong. I made quite a few mistakes during my experiment, so my results were not 100% accurate. In conclusion, the 5-second rule is incorrect and any type of food will have bacteria.

6471  
How Different Temperatures Affect the Growth of Crystals  
Faith Gibbs and G. Zem (teacher)  
Ernest Lawrence Gifted/Highly Gifted Magnet  
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My project explained how it looks when crystals form in different temperatures. At the beginning of the project, I had to create the solution in order for the crystals to start forming. The solution contained borax and hot water. The water was boiled on the stove and the borax was bought in a box. From there a tablespoon of borax was poured in the hot water nine times (three times each for three jars). After the borax was poured, the water was evenly distributed among the three jars. A string was eventually tied to a No. 2 pencil and placed on top of the jars. I took Jar 1 and put it in the refrigerator. Jar 2 was placed on my countertop in room temperature. Jar 3 also was placed on the countertop, but with ice cubes in it. Every two days I checked on the jars and wrote down what I saw. On the last day (Day 5), I marked my final results. Jar 1 seemed to be the most affected. Jar 2 was the second most affected, and finally Jar 3 was the least affected. I determined which jar was the most affected by gently grabbing the pencil and pulling the string out of the water. Whichever jar had the most crystals on the string was the one most affected by its temperature. My hypothesis, however, was inaccurate about which jar would have the most compacted crystals on the string. In conclusion, the colder the climate is, the more that crystals will grow.

6472  
Elephant Toothpaste  
Vivienne Carvajal and G. Zem (teacher)  
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This is an easy project for all ages, but taken to another level. What happens when the recipe of the experiment, elephant toothpaste, is changed? The basic procedure for this investigation required materials such as 20-volume hydrogen peroxide liquid (a 6% solution), dry yeast, warm water, liquid dishwashing soap, a separate cup, food coloring (optional), and a bottle/beaker. I mixed together 3 tablespoons of warm water and a packet of dry yeast in the separate cup for 30 seconds; poured a cup of the 6% solution into the bottle/beaker; and added a tablespoon of dishwashing soap to the bottle, plus about six-eight drops of food coloring. Then, finally, I added the mixture of yeast and water to the chemicals in the bottle. After that I observed the exothermic reaction, which, due to the catalase enzyme in the yeast that broke down the hydrogen peroxide into gas, water, and oxygen, created a stream of foamy bubbles, in turn creating heat. I went to the next level in my version of the investigation. I revised the original recipe about three times, once with less yeast, another time with an overnight mixture of the yeast and water, and the last time with the yeast and water not mixed together. In all of the experiments, heat was created and could be felt through the plastic bottles I used. Foam was formed, but each investigation had a different amount of foam created, as well as a different reaction time. I had believed in my hypothesis that the overnight mixture would have more foam and bubbles, and would react more quickly because the yeast and water would have more time to mix, but the opposite was true. The yeast basically dissolved in the yeast, causing that experiment to have the slowest reaction time and fewest number of bubbles. The one that had the best results was the bottle with less yeast. The product of
all of the materials, the foam, gushed out quickly in generous amounts, unlike in the other two experiments and the control experiment.

6473
The Process of Denaturing Proteins
Brian Huynh and G. Zem (teacher)
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My project showed the process of denaturing proteins within an item. I broke down the process into smaller portions to get a closer look at the multiple elements and variables that are involved in denaturing proteins. I tested multiple materials using heat, which is an external source of energy used to break down the sequences and structures within the materials. The different bonds and chemical compounds that were mixed together to create certain items made the difference between the time it took for the denaturation process to completely occur. Using powdered milk, human hair, and egg yolks, I added the external source of heat, with it ranging from a stove to a countertop oven. I exposed the materials to the heat, and, measuring with a thermometer, I slowly increased the temperature. The increases in temperatures varied depending on the item. For example, for the hair in the countertop oven, I increased the heat every 10 minutes in increments of 25 degrees. As the heat was slowly increased, I recorded data and the differences in texture and overall appearance. There was a great difference in temperatures among the three items. My hypothesis was right. It took a variety of temperatures and many different times in order for the denaturation process to successfully occur. The breakdown of chemical compounds and sequences is a very complex process, and there are also multiple other ways that can be used instead of heat, such as cold temperatures, acids, and alcohol.

6474
Which BAND-AID® Brand Sticks the Longest?
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Which BAND-AID brand sticks the longest? In our experiment, we used the BAND-AID brands CURAD® and Emoji TM. Our experiment gave us new scientific information because it told us which brand is better to buy. This information can improve our lives because we will know which is better. This will save our time, and we won’t buy every brand and waste money. Our procedures were to gather materials: water, a bowl, and BAND-AIDS. To do this experiment, measure the water and place it in a bowl. Then put the BAND-AIDS on your hands, move your hands around in the water, and time the experiment. Conduct the experiment many times, compare the results, and record your data. Now we know which BAND-AID brand to pick. The brand we will pick is CURAD, because it stuck longer every time in our trials. Next time we would like to experiment with more brands.

6475
Does Music Affect a Plant’s Growth Rate?
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We conducted an experiment to see if playing classical music helps a plant grow faster. This information can help improve the quality of our lives by helping our crops grow faster, thus leading to a larger food supply. Our question was, “Does music affect a plant’s growth rate?” During our experiment, we grew plants in two separate rooms. In one room, music was playing near the plant. In the other room, there was no music being played near the plant. Our results were that the plant exposed to music had a smaller growth rate than the other plant, but it appeared to be healthier. In conclusion, playing music near a plant doesn’t make it grow faster, but it makes it grow healthier.

6476
Does the Type of Soda Affect the Nucleation Reaction?
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Does the type of soda affect the nucleation reaction? We believed that Diet Coke® would affect the nucleation reaction the most because it is the most widely used soda in this experiment. To confirm this, we dropped a Mentos® in a variety of 16-oz. soda bottles. After we gave them each a small shake, the nucleation reactions began. To find out the results, we measured the height of the soda fountains. We found out that Coke Zero® had the strongest effect, followed by Diet Coke. Regular Coca-Cola® produced the lowest height. In conclusion, Coke Zero had the strongest nucleation reaction by a lot (20 cm) compared to Diet Coke. We think this has to do with the diverse types of sugar that are used in the sodas. This is something that we would like to investigate more.

6477
Do Video Games Improve Your Reflexes?
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The purpose of this experiment was to figure out if video games improve hand reflexes. In order to determine this, I had to play a short, fast-paced video game to see if my hand reflexes improved. Then I had someone drop a ruler over my fingers without telling me. Where I caught the ruler and the amount of time it took me to catch it were my results. My average time to catch the ruler was 3.5 seconds and the average distance
I caught the ruler at was 1 inch. I concluded that my hand reflexes improved when I played video games. People should do this experiment because it will help their hands move faster. I had a fun time doing this experiment because playing video games is one of the things I love doing.

6478
Can Hot Water Freeze Faster Than Cold Water?
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Have you ever run out of ice for your beverage on a hot day? It’s scorching and you need to get your hands on some ice immediately. You put some cold water into the freezer. Soon after, your friend tells you that hot water freezes faster. Is this true, you ask? If it were, you could get ice a lot faster, which would be beneficial if you’re in desperate need to cool down. Can hot water freeze faster than chilly water? Our hypothesis was that no, hot water will not freeze faster than chilly water. First, we got cold water and hot water, and then we measured to make sure that the same amount of cold and hot water were put in the freezer. We set a stopwatch and waited for all of the water to freeze. When all of the water had frozen, we stopped the stopwatch and recorded our data. We performed four trials overall. Our first trial used 16 oz. of hot water, which froze in 4:38:17 hours. The second trial included 8 oz. of cold water, which froze in 1:35:20 hours. Our third trial had 8 oz. of hot water, which froze in 3:28:48 hours. Our fourth used 16 oz. of chilly water, which froze in 3:05:31 hours. In conclusion, no, hot water didn’t freeze faster than chilly water in our experiment. That doesn’t mean that the experiment wouldn’t work for others, since the experiment’s results depend on the conditions. Our results supported our hypothesis because the chilly water froze in a lesser amount of time than the hot water, no matter the amount. We would improve our experiment by using a freezer that doesn’t turn off occasionally, so that we could see if our results would change.

6479
Does Using a Cell Phone Affect Your Vision?
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People these days spend most of their time looking at an electronic screen. This is the reason we wanted to figure out if staring at your electronic device damages your vision. To determine if it does, we tested a subject’s vision before using a phone’s screen and then tested the subject’s vision after using the phone’s screen for 30 minutes. It turned out that the vision improved according to the vision chart we used to test our subject. We would improve our test next time by testing our subject multiple times and by testing a wider variety of people.

6480
Does Temperature Affect the Crispiness of Your Cookie?
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When it comes to cookies, people tend to have two preferences: crunchy/crispy or chewy. I have always preferred the crispy kind, but had never found a way to successfully bake them. Leaving them in the oven too long ended up with the cookies burning. After my frustration with trying to perfect the recipe, I decided to test whether the temperature of the dough would affect the crispiness of the cookies. I hypothesized that room-temperature cookie dough would make a crispier cookie. To test my hypothesis, I baked two batches of cookies. Both batches had the same ingredients in the dough. The only difference was that I kept the dough for one batch at room temperature and put the other in the refrigerator. I also made sure to bake both batches on the same kind of pan in the same oven at the same baking temperature. After testing my hypothesis, I realized that it was not supported by my data. The dough that was left in the refrigerator became drier, making the sugar in the dough more concentrated. Once I baked those cookies, they turned out crispier compared to those made with room-temperature dough. Despite my hypothesis not being true, I discovered the best method to bake the crispiest cookies.

6481
What Type of Vinegar Blows Up a Balloon the Most?
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What type of vinegar blows up a balloon the most? In our project, we combined baking soda and vinegar in the classic experiment usually used to model a volcanic explosion or to show a chemical reaction. We used three types of vinegar to see which one produced the most carbon dioxide (product). We hypothesized that the apple cider vinegar would blow up the balloon the most. To perform the experiment, we first filled each balloon with 2 tablespoons of baking soda. Then we filled each of our empty bottles with half a cup of each of our different vinegars. After that we put the balloons over the bottles and gave them a shake to see how much the balloons inflated. The white vinegar turned out to blow up the balloon the highest. Our results did not support our hypothesis.
6482

Are Dogs Color Blind?
Leslie Hernandez and S. Tanaka (teacher)
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Have you ever wondered how dogs see the world? That was exactly what my project was about. I did this project because it caught my eye and I honestly wanted to know if dogs are color blind. This experiment can provide new scientific information by telling us more about how dogs see the world. First I got three jars and wrapped them with construction paper. The colors were chosen based on whether they looked similar when photographed in black and white. Then I had to train my dog to choose the correct jar (the jar I wanted him to go to). Finally, I tested him. My results were that he chose the jar that I wanted him to go to more often than the incorrect jars that looked similar. In conclusion, I figured out that dogs are not completely color blind and that they can see some shades of color. My results did support my hypothesis because the dog went to the correct jar more. I would improve or change this project by using a greater variety of colors and other dog breeds.

6483

Do Different Name-Brand Footballs Affect Your Throwing Performance?
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How many of you like a specific brand of something? There is no explanation that you can think of for liking the brand except that you prefer the quality of the brand. That is why I tested two name-brand footballs (Nike® and Wilson®) to see if there is a noticeable difference between them. My question was, “Do different name-brand footballs affect your throwing performance?” The first thing I did was to gather the materials and make sure the footballs were 0.5 kg (when filled with air). Then I got a mannequin, a measuring tape, and duct tape and went to the park. Once I was at the park, I set up a reference point (the starting point that I stood at). From the reference point I threw each football five times. I marked down the spots where the footballs landed and measured the distances. I averaged the distances out for each football to get the results. Then I set up a mannequin and repeated throwing each football five times. The focus of this part of the experiment was to see how many times I could hit the mannequin (for accuracy). I averaged the results again. The results were that the Nike ball had a better grip, resulting in me being able to throw the ball farther than the Wilson ball. For accuracy, there were no differences in the brands. Overall, I would choose the Nike brand over the Wilson brand football since I did notice a difference in the grip.

6484

Do Certain Types of Packaging Affect Food Spoilage?
Asal Ghilzai, Althea De Jesus, Vivian Ly, Julia Santos, and S. Tanaka (teacher)
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Our project was about testing which container/packaging type helps food spoil the least. The project question was, “Do certain types of packaging affect food spoilage?” For our procedure, we cut up a variety of fruits, including strawberries, bananas, avocados, and apples. Then we put one of each fruit into one of each container/packaging type, including Saran™ Wrap, Ziploc® bags, Tupperware®, and tinfoil. We left the food in the containers/packaging for five days to see which spoiled the fastest. Our results showed that the Tupperware food spoiled the most, the tinfoil food spoiled the second most, the Saran Wrap food spoiled the third most, and the Ziploc bag food spoiled the least. In conclusion, a Ziploc bag may be the best thing to store certain fruits and vegetables in.

6485

Which Brand of Diaper Absorbs the Most?
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Which brand of diaper absorbs the most? I performed this experiment because I wanted to know which of these two popular brands of diapers – Huggies® and Pampers® – is better to purchase for babies. People should care about the work I did because parents may be changing their babies’ diapers more often than they need to. This may lead to financial issues and can be a hassle. I believed that Huggies would absorb more water and thus would be the better diaper to buy. To do this experiment, I bought both brands of diapers, borrowed a graduated cylinder, and made sure to have a sink nearby. Then I measured how much water each diaper absorbed by using the graduated cylinder. In the end, my hypothesis was proven correct. After further research, I learned that Huggies absorb more water because they contain more sodium polyacrylate than Pampers. Sodium polyacrylate is a compound that absorbs a lot of water. In this experiment, Huggies absorbed more than twice as much water compared to Pampers, which contain much less sodium polyacrylate.

6486

Which Type of Liquid Affects Plant Growth the Most?
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How do different types of liquids affect a plant’s growth? To do this experiment, we first gathered materials: four plants, four different types of liquids – coffee, water, juice, and soda – and measuring spoons. Every day for a week, we used 2 tablespoons ...
of each liquid and put one of the liquids in each of the four plants. Two liquids were killing two of the plants, while the other two liquids were helping the plants grow taller and fuller. We concluded that unsweetened coffee and water kept the plants healthy, while juice and soda killed the plants due to the sugar present in these drinks. People should be careful when pouring liquids into plants because some of them will cause the plants to die. We would like to do further research to see if giving coffee to plants could have long-term growth benefits.

6487
Which Cell Phone Charger Is the Best?
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Which cell phone charger charges the fastest? I wanted to know if chargers that claim to have specific features to charge faster work better than the name-brand iPad® or iPhone® chargers. I predicted that the specialty charger would fail to charge the phone quickly, the iPhone charger would be mediocre, and the iPad charger would be the fastest. To test this, I took an iPhone and drained the battery. Then I charged the phone with one of the three chargers and recorded the process until the phone was at a 50% full charge level. I repeated this with the two remaining chargers. The specialty charger got the battery to 5% in 10 minutes; 10% in 20 minutes; 17% in 30 minutes; 22% in 40 minutes; 29% in 50 minutes; 36% in 60 minutes; 42% in 20 minutes; and 50% in 1 hour and 23 minutes. The iPad charger charged the phone from 0 to 9% in 1 minute; 20% in 10 minutes; 31% in 20 minutes; 42% in 30 minutes; and 50% in 37 minutes. The iPhone charger charged the phone to 5% in 10 minutes; 10% in 20 minutes; 31% in 30 minutes; 32% in 40 minutes; 31% in 50 minutes; 43% in 60 minutes; and 50% in 1 hour and 7 minutes. In conclusion, the special charger did not charge the iPhone faster. The iPhone charger charged faster than the special one, and the iPad charger charged the fastest. This supported my hypothesis. To change up the experiment, I would set the phone to Airplane Mode to charge it a little faster.

6488
Who Is Better At Solving Riddles?
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Who is better at solving riddles: teens or adults? We did this project to see which age group is better at outside-the-box thinking. We thought that the teen group would solve the riddles faster and get more of them correct. The procedure was to create a riddle test, assign it to an 18-plus age group and an 18-minus age group, and make sure to time each one. When everyone had taken their test, we gathered the data, and compared the times and how many they got right. The group with the most correct answers and the least time taken was the better riddle-solving group. The results showed that the younger group took less time and got more questions correct than the older group. In conclusion, the younger group had better riddle-solving skills. This information may be helpful for scientists so they can better understand the developing teenage brain.

6489
Can Violent Video Games Increase Your Heart Rate?
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Can violent video games increase your heart rate? This is a scientifically important question since many violent video games are aimed at adults. These adults could experience an increase in heart disease and an increase in heart rate, which could cause health problems. I think that violent video games do increase your heart rate. There are a variety of violent video games, but I decided to play “Call of Duty: Modern Warfare 3.” I experimented for 2 hours and 25 minutes playing it and checking my heart rate as I was playing. My heart rate did increase after playing the violent video game. I would improve this experiment by performing more than one trial and by testing this experiment on adults too.

6490
Does Multitasking Affect the Performance of the Task at Hand?
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People live busy lives and need to do so many things. To make life easier, people attempt to multitask. However, how does multitasking affect the performance of the task at hand? To test this, we presented a task to a test subject and tried to find the time it would take to complete the task. We recorded the number of errors that the subject made while listening to music and carrying out a conversation with another person. Then we had the subject perform the same task, but while only focusing on that. After testing, we found that the task completed while multitasking always took longer to complete and was of lower quality. From this we can conclude that multitasking decreases efficiency and quality of work. Therefore, people should avoid multitasking in their everyday lives to produce higher-quality work more efficiently.
6491
Are You More Likely to Remember What You See or What You Hear?
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Our project question was, “Are you more likely to remember what you see or what you hear?” We thought that people would be more likely to remember what they see. We think people should care about our work because it might help them figure out which of these senses helps them remember things better. Our experiment also gave us new scientific information about how the brain works, and this information can be used to improve people’s lives. To do this experiment, we got two index cards and wrote down 10 digits. The first set of numbers was shown and the second set was read to see which group did better. Our results indicated that people remember what they hear more than what they see. In conclusion, our hypothesis was incorrect. To improve our experiment, we would test this out on more subjects.

6492
Wind Turbines Could Be Used to Power Lights in a Multi-Story Parking Structure
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Our research started when we learned that Metro at Los Angeles’ Union Station was considering adding wind turbines to reduce expenditures as a result of capitalizing on their existing system of monitoring the carbon monoxide levels in their four-story underground parking structure. We looked at many websites and articles in order to get a better understanding of why and how they were planning on making this addition. To learn even more about the subject, we visited Metro, and there we were informed why they were considering adding the wind turbines to their existing carbon monoxide monitoring system and how they planned to go about the implementation. Metro at Union Station uses approximately 100,000 kilowatt-hours (kWh) per year of electricity to power the lights of their four-story underground parking structure. They are in the process of replacing their fluorescent light fixtures with LED fixtures to reduce the electric power used per light annually from 200 kWh to 40 kWh. They currently have a fan system to remove smoke in case of a fire and to remove auto exhaust if the carbon monoxide level in the air reaches 50 parts per million (ppm). The wind turbines, if added to the system, would take advantage of the airflow through the air shafts when the fans are running and generate electricity to be used for lighting the garage. In addition to adding wind turbines to their system, they would need to upgrade the fans to operate continually and adjust speeds based on the carbon monoxide level. We researched the possibility and feasibility of creating a wind turbine that would generate enough electricity to power the lights in the parking structure. The hypothesis is that Metro at Union Station can and should generate the needed electricity to power the four-story parking structure based on the wind turbines operating from the airflow from the fans in place that are used to monitor and remove the levels of carbon monoxide, and adjust the speeds of the fans as necessary, thereby generating the wind needed to operate the wind turbines. Although it would be a huge capital expenditure, they estimate that their costs could be recuperated within four years. Our findings were that Metro at Union Station should allocate the funds because there is a short return on their investment. It is a win-win situation because they would recoup the funds within four years and, at the same time, they would save electricity, which in turn helps the environment.

6493
Technology Used in the Advancement of Prostheses
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The purpose of this study was to research advancements and functionality of prosthetic hands and arms. Extensive research about prostheses and the advancements through robotic technology was completed. We looked at a great number of websites and articles as well as on-site, first-hand research at a VA hospital, where we spoke with a number of veterans who wear prostheses so we could learn about their personal experiences. Our research also took us to SynTouch, a firm that invented the first prosthesis with tactile sensors integrated with robotic capabilities. Robotic sensory capabilities are incorporated into the device without placing sensors directly on the skin. The robotic sensors are activated by pressure from the user’s muscles inside the prosthesis. Prosthetic input sensors are like translators that communicate the user’s wishes to the motors of an externally powered prosthesis. Fingertip sensors are designed to sense how much pressure is necessary to apply to an object by how much the sensor is deformed or pressed in. The amount of force is automatically adjusted. The robotic technology is camouflaged under natural-looking latex or other material that enables the sensors to work through the material. Robotic technologies in the prosthetic industry are mimicking natural human reflexes. We did test the feasibility of prostheses with touch sensors and found that after much practice, the touch sensors were definitely a benefit. Those without prosthetic hands feel things in their environment without necessarily thinking about it since touch is subliminal yet an important human experience.
6494
How Does Temperature Affect a Solenoid Engine?
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Our project was about how temperature can affect the way a solenoid engine works. Our hypothesis was that the colder temperature would improve the running speed of the engine. We built our own engine using household materials except for copper wire, which ran on a 12V plug-in. We first tested the engine at room temperature (21°C). We did three trials and calculated the average, which was 1,340 revolutions per minute (RPM). Then we tried a colder temperature (3°C) and got 1,510 RPM. Finally we tested a hotter temperature (49°C) and got 1,670 RPM. According to our results, we found that our hypothesis was incorrect, and that the engine worked the best at the hotter temperature of 49°C.

6495
What Concentration of Salt Prevents Freezing?
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The purpose of my experiment was to find out how different amounts of salt affect the freezing point of water. The reason I wanted to do this experiment was to understand why oceans don't freeze. I filled three jars with different concentrations of saltwater: one with ocean water, the second with freshwater, and the third with freshwater and salt. My first trial started with the same amount of water in all of the jars and only included 1 tablespoon of iodized salt in the freshwater and salt sample. After 12 hours in the freezer, the freshwater froze, while the ocean water did not. Next I added 2 tablespoons of salt in the saltwater and kept the samples in the freezer for 6 hours. The freshwater froze once again and the saltwater became slushy, but the ocean water did not freeze. In my last trial, I added one more tablespoon and reduced the time to 4 hours. My results were that the water with the 4 tablespoons of salt in it did not turn slushy or freeze, which meant that this saltwater had the same consistency as the ocean water and neither of them froze.

6496
How to Find Protein in Food
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The purpose of my experiment was to find out which foods contain protein. I tested milk, soy sauce, and a banana. According to my research, if a food has protein, red litmus paper will turn blue. If the food does not contain protein, the litmus paper will stay red. My hypothesis was that milk contains the most protein. My results were that milk had the highest reaction, which means that it contains the most protein, and the banana had the lowest reaction. My hypothesis was correct.

6497
Stethoscope
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My project was about how to make a stethoscope and to see how efficient it would be. I wanted to find out if a handmade stethoscope would work just as well as a real one. I built the handmade one by using plastic aquarium tubes, the head of headphones, and a bottle cap. My hypothesis was that the one I built would work just as well as the commercial one. While doing the experiment, I found out that the homemade one had only one side that worked. I tried to fix it, but in the end it still did not work efficiently. I tested both stethoscopes on 10 people. My results were that there was a discrepancy between the two stethoscopes. The heartbeats recorded when using the homemade stethoscope were always less than those recorded when using the bought one. For example, 76 beats with the homemade one versus 79 beats with the real one; 50 beats with the real one and 49 beats with the homemade one; and 84 beats with the real one and 75 beats with the homemade one. My hypothesis was that the homemade stethoscope would work as well as the bought one, but I was wrong. The stethoscope I made was not as efficient.

6498
Cold and Heat Insulations
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The purpose of my experiment was to find out which material can keep the temperatures of cold and hot water the longest. I performed four experiments by using Styrofoam cups, plastic cups, glass cups, and metal cups. My hypothesis was that the metal would be a great insulator for both hot and cold. I used the same amount of cold and hot water in each of the four different types of cups and waited 15 minutes, and then read the temperatures in Celsius with a thermometer. According to my
results, the metal was the best heat insulator and the Styrofoam was a good cold insulator. My data showed that when I started, the hot water was at 108°C and the metal kept it the same for the longest period of time. The cold water started at 5°C, and the cup that kept it at that temperature the longest was the Styrofoam one.

6499
How Well Can a Robot With an Arduino® Board Sense Obstacles?
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The purpose of my experiment was to find out how well a robot with an Arduino® board can sense obstacles. My hypothesis was that the robot would be able to sense obstacles very well. I built the robot before testing it, and used an Arduino board. Then, when I was done building it, I programmed it to be able to sense obstacles that were in its way. I tried three different codes to see which one worked the best. The first and second codes didn’t work very well, but they did work minimally. The third code I used was the best one and the most accurate. So, if I had to suggest a code to use, I would suggest the third one I used. My hypothesis was correct, as the robot was able to sense the obstacles in its way pretty accurately. I can conclude that an Arduino board is a great part to use while building and programming robots. It is great for making the robot work the way you want it to work.

6500
Which Vegetable Generates the Most Electricity?
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The purpose of my experiment was to find out which vegetable can generate the most electricity (in volts). I tested an onion, tomato, cucumber, and potato. I hypothesized that the tomato would have the highest voltage. I inserted a copper nail and zinc nail into each vegetable, and connected them with wire. This allowed electricity to flow within the vegetable. I measured the voltage for each vegetable with a voltmeter. I did trials using two of each kind of vegetable to find an average voltage, since vegetables of the same type don’t always have the same voltage. According to my results, the tomato had the greatest voltage, with an average of 7.05 volts. The onion was second with 7 volts, the cucumber was third with 5.8 volts, and in last place was the potato with 3.65 volts. I concluded that my hypothesis was correct, and the tomato had the highest voltage of the vegetables that I tested.

6501
What Generates More Static Electricity: A Comb or a Balloon?
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The purpose of our experiment was to test which household item would generate the most static electricity. Our hypothesis was that a balloon would generate a lot of static electricity and a comb a little bit. We thought this based on our research, since the comb is made of plastic, and when going down a slide a couple of times you get static electricity. This causes you to shock someone when you get close. We also thought the balloon was going to work a lot because of the rubber material it is made of, and because when you play with a balloon, your hair gets very staticky. To test our hypothesis, we used an electroscope. We made one by using a jar with a foil ball on top, connected to a wire through the lid. At the end was a bent piece of wire that was attached to two foil strips. The electroscope could tell us if there was static electricity by touching an item with the foil ball. If the strips at the end separated, there was static electricity. If they didn’t, then there was no static electricity. Our results were that the balloon generated a lot of static electricity, and the comb generated less.

6502
The Electromagnet
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In my experiment, I made an electromagnet out of an iron nail, copper wire, and a 0.5-volt battery and tested it to see if it would work or not. My hypothesis was that it would not work because it would not be strong enough. I first wrapped the copper wire around the nail so that the nail would absorb the electricity given by the battery. Then I placed the two ends of the copper wire onto the two terminals of the battery, the positive and negative. According to my research, an electromagnet works because the battery has a magnetic field and the magnetic field creates an electric current. The current travels from the battery to the wire, and from the wire it goes to the nail, and that’s the reason the nail is able to work as a magnet and pick up metal items. I tested it with paper clips and small iron nails. The results were that my electromagnet worked well and was able to pick up a large number of the items I tested it with. In conclusion, my hypothesis was incorrect because the electromagnet did work and I was able to make it stronger by using a stronger battery (9 volts) and by wrapping a long wire around the nail. I found out that having too many items on the electromagnet at once caused the battery to heat up.
6503
How Much Does Sunlight Affect the Amount of Juice From Oranges?
Marissa de Leon and A. Antoniou (teacher)
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The purpose of my experiment was to find out how much sunlight affects the amount of juice produced by oranges. I have two trees, one partly in the shade and one in the sun. My hypothesis was that the one in the sun would produce more juice than the one in the shade, because the sun would lead to a larger production of flowers, which then would lead to more fruit production. I timed how much sunlight each tree got. The tree in the sun received 9 hours per day and the other received 7 hours per day. I then picked five oranges, about 1 pound, from each tree and squeezed them into separate glasses. The oranges from the tree with less sun produced 14 ounces, while the oranges from the tree in the sun produced 15 ounces. So, I can conclude that orange trees should have full exposure to the sun in order to produce oranges that provide the most juice. My hypothesis was correct. The tree with 28.5% more sun produced 7% more juice.

6504
How Does Color Affect Memory?
Roxanne Moro, Leah Contreras, and A. Antoniou (teacher)
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The purpose of our project was to figure out how color affects memory. We wanted to find out if color really has an impact on memory. To do our experiment, we tested seven different colors: red, blue, green, black, yellow, orange, and purple. On seven separate cards we wrote letters in the same color as the card. Each subject had 1 minute to study the set of cards. At the end of the minute they were asked to recall as many letters from the colored cards as possible. Once we finished testing, we calculated the averages of all of the subjects based on their results per color. The average for black was 25.6%; for orange was 6.8%; for blue was 15.4%; for red was 20.5%; for yellow was 10.3%; for green was 13.7%; and for purple was 7.7%. In conclusion, we found that black was the most effective color. This may have to do with the fact that we are used to reading and writing in black. Red was the second most effective; blue was third; green fourth; yellow fifth; purple sixth; and orange seventh. Our hypothesis was correct. Color does affect memory.

6505
Which Inhibitor Works the Best to Prevent Metal From Rusting?
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The purpose of my experiment was to find out the best inhibitor that can prevent metals from rusting, because every year the U.S. spends $400 billion on fixing or replacing things that have rusted. For my experiment, I used a mixture of hydrogen peroxide and chlorine bleach and placed a ¾-inch elbow black steel pipe, a ¾-inch straight steel pipe, and a copper pipe in separate jars with the solution. In another set of jars, I placed the same metals that were previously sprayed with Rust-Oleum® spray, which was used as the first inhibitor. Another set of samples was sprayed with Turtle Wax®, which was my other inhibitor. My observations were that the rust started right after I added the metals to the mixture. After I observed the metal samples for a week, I found that the copper pipe with the Rust-Oleum spray lasted the longest with very little rust on it. The one that had the most rust was the steel pipe with no inhibitor application on it.

6506
What Works Better: Steam Power or Solar Power?
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The purpose of my experiment was to find out whether a steam-powered car works better than a solar-powered car. This experiment was designed to determine whether past transportation is better than future transportation. I measured a distance of 64.4 centimeters, placed the cars in position, and then timed them one at a time until they reached 64.4 centimeters. I tested them on three different terrains, which were Terrain #1: a straight road; Terrain #2: a bumpy road; and Terrain #3: uphill. I timed the cars on the terrains and calculated their speeds. The speed of the steam car on Terrain #1 was 2.93 cm/s, and the speed of the solar car on Terrain #1 was 5.37 cm/s. The speed of the steam car was 0.74 cm/s on Terrain #2, and the speed of the solar car was 1.79 cm/s on the same terrain. For Terrain #3, the steam car’s speed was 0.45 cm/s, and the solar car’s speed was 0.93 cm/s. I then calculated the average speed of both the steam car and the solar car. The average speed of the steam car was 0.76 cm/s and the average speed of the solar car was 1.65 cm/s. My conclusion was that overall, the solar car was faster.
For my project I wanted to figure out which cryptocurrency — Bitcoin, Litecoin, or Ethereum (which I used the Ether token for) — is most profitable. My hypothesis was that Bitcoin would make the most profit, because it is the most popular. Many people believe that mining cryptocurrency is a difficult process that requires expensive hardware. They are partially right, because if you want to make a profit, you must have specialized equipment. However, I tested the cryptocurrency mining on my desktop computer. It used up most of my computer's resources, and my fans were blowing very loudly. In the end, after deducting electricity costs, Bitcoin lost me, on average, 29 cents/day. Litecoin lost me 23 cents/day. Ethereum, the only one to make me a profit, gained me 15 cents/day. My conclusion was that Ethereum is the most profitable cryptocurrency.

The purpose of my project was to find out which of four toothpastes whitens teeth the best. I used Crest® 3D White™ (the blue one), Colgate® Optic White®, Sensodyne® Pronamel®, and Colgate® Cavity Protection. I used four different eggshells and stained them in coffee for two weeks. Then I let them dry and I brushed them twice a day for three weeks. Each toothpaste I used is one of the best toothpastes. Throughout the whole experiment, I noticed that the Colgate Optic White toothpaste was whitening the eggshell the fastest, and at the end of the experiment it ended up being the most effective. The Colgate Optic White toothpaste worked the best to whiten the eggshell.

In this experiment, three products were tested to see which would clean a stain the best. The three products were detergent, regular soap, and soda water. They were tested by staining three cloths, which were each washed with either the detergent, regular soap, or soda water and then dried out in the sun. The results from the data showed that the regular soap worked the best.

During this experiment, three different insulation materials were tested to see which would protect eggs the best. They were tested by wrapping each egg with its own insulation. Each egg was also measured. The eggs were dropped from a height of 6 feet. After three rounds of testing, the marshmallow insulation came out as the best protection for the three eggs tested, with no damage to the egg.
6512
Which Substance Stains the Most?
Chloee Labucay, Haidy Gonzalez, Tammy Nguyen, and J. Fodor (teacher)
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This science project looked at which liquid substance stains chalk the most. We took three pieces of chalk — one for coffee, one for grape juice, and one for cola (soda). Our hypothesis was that the coffee would stain the most. The soda didn’t exactly work, because it looked faded a little, and the grape juice showed a lot more color compared to the soda. Coffee worked the best, and so our hypothesis was right.

6513
What Water Temperature Freezes the Fastest?
Destiny Flores, Leyana Kim, Camila Martinez, and J. Fodor (teacher)
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During this experiment, we used three different types of water. Each type of water was poured into a bowl and placed in the freezer. We made sure that they were in the same area in the freezer so that they were placed under the same conditions. Every 10 minutes, we checked each bowl for progress until the water in them froze. In the end, our hypothesis was wrong because the room-temperature water froze faster than the cold and the hot water.

6514
Which Bandage Lasts the Longest After It’s Been Wet?
Natalie Ramirez, Elisa Del Toro, and J. Fodor (teacher)
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For this experiment, we used three different bandages: BAND-AID®, Pure-Aid™, and Curad®. Each brand was tested to see which one would stick to a wall the longest. Every bandage was dipped in water for 1 minute. Afterward, the bandages were stuck to a wall to see which one fell off first. The last one to fall was Curad, with Pure-Aid second, and BAND-AID the first to fall off of the wall.

6515
Does Saliva Have a Role in Increasing the Healing Process of Wounds?
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This experiment tested to see if saliva has a role in increasing the healing process of wounds. After obtaining a wound, dogs are most commonly seen licking themselves. The purpose of the experiment was to determine whether dog and human saliva inhibits or encourages bacterial growth. To test this, we used probiotics to mimic bacterial growth in a wound. We then added human and dog saliva to probiotics to test the antibacterial factors within the saliva. We found that the control plates that had only probiotics showed no growth. Four out of the six human saliva samples without probiotics grew; two samples did not. Of the human saliva with probiotics samples, half of the sample size showed growth. Of the dog saliva without probiotics, both samples grew bacterial colonies. Six out of the eight dog saliva with probiotics samples grew bacteria as well. Due to the data collected and the lack of results from the control groups, the results of the experiment were inconclusive.

6516
Bacteria in Yogurt?
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There is a good in bacteria, but how do we know? It’s in the yogurt we eat. In our experiment, we tested three different store-bought yogurt brands — Yooplait®, Chobani®, and Activia®. Our goal was to discover whether or not different types of bacteria are present in different types of yogurt brands and, if so, which yogurt has the most bacterial colonies. The three brands we chose were based off of ratings of the most sold yogurt brands. We used three common flavors — blueberry, strawberry, and peach — to keep the experiment as fair as possible. We hypothesized that there would be different types of bacterial strains present in the yogurts, that the most common strain of bacteria would be Streptococcus thermophilus, and that the yogurt with most bacterial colonies would be Activia because it is probiotic. The control in this experiment was the store-bought plain Chobani yogurt. The yogurts were placed in various temperatures: Blueberry went in room temperature, strawberry and the control went in the refrigerator, and peach went outside. The start time of this experiment was 7 p.m. on Monday, April 23. The end time was 7 p.m. on Wednesday, April 25. Throughout this time the temperatures in the environments changed constantly and were measured by a mercury thermometer. As we read our results we were surprised that the control had a significantly lower number of bacterial...
colonies than the other yogurt flavors. It was interesting to see the number of bacterial colonies increase day by day, and we believe that if we had prolonged the experiment, the bacteria would have continued to increase at a steady rate.

6517
The Effectiveness of Stimuli in Soliciting a Fixed-Action Response
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The purpose of the experiment was to study how effective stimuli are in soliciting a fixed-action response from seagulls. We tested this by conducting research at the Santa Monica beach with bread as a stimulus. The results showed that a high number of seagulls did respond aggressively to the stimulus. Our data showed the large number of our study group that responded. We concluded that stimuli are extremely effective in soliciting an aggressive response.

6518
How Do Gravitational Influences Affect the Directional Growth of Plants?
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This investigation’s main purpose was to discover the effects of different gravitational influences on the directional growth of plants. To conduct this experiment, there were 10 gravitational influence apparatuses in total — two for each different effect — that were tested within a 25-day period. The goal of this investigation was to observe the directional growth of cherry radish seeds, both their roots and the stems, in the gravitational influence apparatuses. Newton’s Law of Universal Gravitation states that any two point masses in the universe are attracted to each other by a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. So with this law it can be assumed that plants, along with everything else in the universe, are affected by gravity. This relates back to the guiding question, “How do gravitational influences affect the directional growth of plants?” because it explains the reasoning behind my hypothesis that the plants, both roots and stems, will grow in the direction in which the gravitational influence apparatuses impact them. There were two of each gravitational influence apparatus, color coded, and 10 jars total. Each apparatus contained approximately 150 Candora water crystal soil beads and five seeds, and were watered every two days for a 25-day period. The seeds in the jars were placed at least 1 ½ inches from the bottom of the jars and about 1 ½ inches from each other. The pink, green, and blue apparatuses were the only jars with the black flex netting, rubber bands around the rims, and wax paper sheets under them because of the turning — placed so that the soil beads and plants would not fall out of the jars when they were turned every day. The data collected were mostly qualitative due to the fact that the research was on the effects of gravitational influences on the directional growth and not the overall growth. Gravitational influences affect the directional growth of plants by influencing the direction in which the roots grow. This concept is called gravitropism and explains that an organism whose directional growth and development respond to gravity exhibits positive gravitropism; this investigation confirmed this. Gravitational influences did not have much of an impact on the directional growth of the stems of the radishes due to the fact that they (the stems) exhibit positive phototropism, which means that their directional growth and development respond to and depend on light. This investigation confirmed this concept as well. In the case of the root data and the direction they grew in, 62% of the plants in total exhibited positive gravitropism and were influenced by the different gravitational apparatuses. In the case of the stem data and the direction they grew in, 94% of the plants in total were not influenced by the different gravitational apparatuses and instead exhibited positive phototropism. Sources of error in the investigation probably would be that the hanging/spinning apparatuses were in a different location than the rest of the jars. The stationary, clockwise, counterclockwise, and 45-degree-angle apparatuses were placed on a windowsill where light was abundant; and the hanging/spinning apparatuses were placed about 3 feet away from the window sill in order to hang them. They got the same amount of sunlight every day and were on the same watering schedule, but they were not in the exact same location as the others; therefore, this could have been a source of error in the investigation. Something I would do if given the chance to repeat the experiment would be taking more pictures of the plants during the investigation or a time-lapse video.

6519
Do Video Games Create Psychological and Physiological Changes in Humans?
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The purpose of our experiment was to observe the effects of video games on blood pressure, heart rate, and mood. We tested 20 different people from the ages of 13 to 17, 10 male and 10 female, with five gamers and five non-gamers for each gender. In each trial, we made sure each participant had eaten. We then monitored their blood pressure and heart rate, as well as had them rate their mood on a scale of 1-10 (1 being irritated, 10 being relaxed), prior to their playing a solo match in “Fortnite.” When the player was eliminated from the game (they “died”), again we took measurements of their heart rate, blood pressure, and mood. After each person had one turn, we noticed that all of the non-gamers experienced higher changes in their systolic, diastolic, and heart rate levels. The gamers, primarily male, did experience some level of change as well, but were more relaxed in terms of mood. In conclusion, we came to the consensus that non-gamers experience more dramatic physiological and psychological changes as opposed to experienced players.
### 6520

**Testing the Effects of Different Chemicals on Daphnia**  
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The purpose of my study was to see how Monster Energy drink and melatonin would affect the various functions of *Daphnia*. I drew inspiration from the ongoing opioid crisis among people in the United States, and how those drugs and chemicals alter the functions of the human body and eventually can lead to death. I chose to use *Daphnia* because of their transparent exoskeleton. The transparency allowed me to see the heart and the organs and record an accurate heart rate. I used four solutions of 50 mL of Monster Energy: one was pure, one was with 50 mL of deionized (DI) water, one was with 100 mL of DI water, and the last was with 150 mL of DI water. My other solution was 5 mg of melatonin (a crushed melatonin pill) mixed with 250 mL of DI water. I placed 15 different *Daphnia* in each solution and allowed them to be exposed to the chemicals for 1 hour. After the hour, I placed them under a microscope to record their heart rates and observe their behaviors. After collecting my data, I found something that shocked me. The median heart rate of the *Daphnia* exposed to Monster Energy with 150 mL of DI water was 222 beats per minute (BPM). The median heart rate of the *Daphnia* exposed to the melatonin was 294 BPM. That is a huge difference, especially when I was expecting the results to be completely opposite, where Monster Energy yielded a higher median BPM and the melatonin yielded a lower median BPM. The *Daphnia* exposed to the other concentrations of Monster Energy and DI water died within 2 minutes. However, I found that the solutions of 50 mL of Monster Energy + 150 mL of DI water, and 5 mg of melatonin + 250 mL of DI water, caused the *Daphnia* to essentially “die” and be brought back to life. When taken out of each solution, they remained idle for about 2 minutes and then their hearts started beating again. At the end of the study, I learned that simple chemicals can do a lot to the nervous and cardiovascular systems. If we were to take the results of my study and scale them to fit humans, I think we would see a lot of deaths and open the eyes of everyone.

### 6521

**Will Goldfish Show an Indication of a Memory Span After Being Placed Through a Maze Several Times?**  
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Goldfish are said to have a small and less-extensive (than humans) cerebral cortex and hypothalamus, leading to the firm belief that they have little or no memory. However, scientists are able to confirm that goldfish do maintain the ability to remember. That is why there is controversy about whether or not goldfish are able to maintain a memory span from 3 seconds to a memory span that can last up to five months. This is something that we as a group decided to put to the test, and also the foundation of our purpose: whether goldfish have memory or not. We used two 8.5” x 11” containers, one for the assembly of a maze and the other to utilize as a control, which had no maze. Using plastic, we formed chambers for the maze and glued them onto the containers with nontoxic glue. Fish food was used as a stimulus and placed at the end of the maze as a way to lure the fish to the end in hopes that the fish would connect the positive stimulus to that area. As a result of doing this multiple times, we would be able to see whether or not the goldfish were able to recognize previous encounters in the maze and thus have the ability to retain information. This would then show us if goldfish have a memory span. In order to track if the goldfish showed signs of memory, we recorded time as a source of measurement, checking to see whether the time it took the goldfish to get to the end of the maze increased (an indication of struggle), or decreased (a sign that the fish were navigating the maze more efficiently, which is an indicator of memory improvement). We ran this experiment using three goldfish, which were placed individually into each container separately. As a group, we performed six trials over the course of six days; what we considered a trial was for all three of the goldfish to be tested in the control and the maze individually. The indicator to stop the timer occurred when the goldfish reached the final destination, which was the food. Initially, the fish all preferred the chamber at the left, when the food was lying in the right chamber, but gradually, as the days passed, the fish warmed up and began to swim directly to the chamber with the food. Even though there were many challenges present and there were many factors that may have interfered with the results, in the end we noticed that the time from the last trial compared to the time from the first trial showed a 5-10 minute improvement. This indicated that the fish that ran through the trials not only showed the presence of a memory, but also an improvement in navigation and recall, something that can come in very handy. Overall, there is not enough data present to assure that fish have a memory span, and, if they do, how long that memory span may be. However, based on our results and data, we can conclude that because we saw a significant decrease from our first day of testing to our last in the time it took the fish to reach the end of the maze, the fish were able to retain information from previous trials. This is why their time decreased; therefore, they showed an indication of a memory span.

### 6522

**How Do Betta splendens Affect Anubias barteri?**  
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Throughout our experiment we observed the effects that *Betta splendens* have on *Anubias barteri*. We placed three *Anubias* into three different fish bowls with freshwater. We left one alone as our control, and for the other two fish bowls we added moss balls and one male *Betta* to each. Once a week we recorded the length and the health of the leaves. We noticed that the leaves on the *Anubias* plant that was in the fish bowl
alone were turning yellow/black and were shriveling up instead of growing. The Anubias barteri that were placed with the Betta splendens had leaves that were growing and were all a healthy green. Also, the Bettas grew over the three weeks of observing them. Both of the Anubias barteri grew about .04 cm in the three weeks while being in the same environment as the Bettas. The other Anubias barteri shrunk a total of .01 cm in the three weeks. We concluded that Bettas and Anubias have a symbiotic relationship because they both benefit from one another. The overall conclusion from our data was that Betta splendens do affect the physical health of Anubias barteri.

6523
Effect of Music on Plant Growth
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Music can greatly influence the growth of plants. In this paper, the effect of music was studied on the growth of a selected plant: Raphanus raphanistrum subsp. sativus. It was found that seed germination and the growth of the plant were enhanced as compared to a control set. Two sets were selected — one treated with a piece of music, and the second set untreated (control). Looking at the two sets, the music-treated plant showed better performance in terms of the number of leaves and the growth of the plant. The number of leaves and plant height were found to be greater for the plants exposed to music and less for the control set.

6524
The Impact Different Fertilizers Have on Tomato Plants
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The objective of this experiment was to determine what kind of impact different fertilizers have on tomato plants. We purchased one soil (Miracle-Gro® garden soil) and three different types of fertilizers (Tomato-tone® organic fertilizer, Miracle-Gro tomato plant food, and Vigoro®). We created four different plots using bricks, and the bricks separated each square plot. In one of the plots we had our control, which contained only the soil. We gave each of the other plots a different type of fertilizer to check the effects the various fertilizers would have on the growth of the tomatoes. For each plot we measured the amount of fertilizer, how deep we put each seed, and the amount of water given each day to make sure that all of the seeds grew under the same conditions. To ensure that our tomato plants would germinate, we watered them every day with ½ gallon of water for two months straight and put them in a spot where they each would receive the same and necessary amount of sunlight recommended for tomato plants. The results were that the Miracle-Gro tomato plant food resulted in the highest number of sprouted tomato seeds in the two months: 14. The Vigoro fertilizer sprouted the fewest number of tomato seeds in the two months: 10. The control and the Tomato-tone organic fertilizer resulted in the same number of tomato seeds: 12. Overall, the fertilizers did have an impact on the tomato plants, including the rate at which the plants grew, their height and width, and the number of tomatoes that were produced.

6525
How Does pH Affect Your Health?
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The purpose of this study was to see if there are any negative effects that medications might cause by changing the pH level in your body. We wanted to analyze if these changes can contribute to potential health problems. pH is the measurement given to determine the acidity and alkalinity of the body. pH is the fundamental driving force of all of our body functions, because it reflects the events that occur in the body. The normal pH range for arterial blood is 7.35–7.45, and the human body must keep its pH level within this range in order to survive. Many diseases are caused because of pH levels that are out of range; the farther out of range the cells are can cause them to be poisoned by their own toxins and die. Sometimes people take medications with different beverages instead of water. So we decided to test if there is a significant difference in the pH level change during this process that possibly could cause health problems in the stomach. Using two different over-the-counter medications, TYLENOL® and Excedrin®, we tested two beverages plus a control. Water was the control, and the other two beverages were Sprite® and orange juice. We placed pills into six different beakers — three with TYLENOL and three with Excedrin. The beakers included HCl to simulate the stomach acid to make the situation similar to the inside of the stomach. There were two beakers with water, two with orange juice, and two with Sprite. After testing the three solutions to check the pH changes, we realized that there was no significant different in pH changes that could cause health problems in the short term. However, we did have other findings that we did not test for, such as drinking water with TYLENOL causes the pill to dissolve faster compared to Excedrin in soda.

6526
The Effect Age Has on Our Memory, Focus, Reaction Times, and Problem-Solving
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The objective of this experiment was to determine if age affects reaction time, memory, concentration/focus, and problem-solving in females ranging from 14 to 18. Our expected results varied for each test. For memory testing, we hypothesized that the younger subjects would pass the test in faster times.
In the second test, we assessed how quickly the subjects were able to find and identify objects in a picture. We hypothesized that concentration would be faster for the older compared to the younger subjects. In the third portion, we tested the effect of age on problem-solving. Similar to concentration, based on evidence and past experiments, we hypothesized that problem-solving steadily increases with age due to experience and maturity. Lastly, if reaction times decrease with age, then it is a cognitive process also affected by the aging of neurons. First we tested 20 female individuals who either played or are currently playing softball. There were four females in each age group. The first of the categories we tested was memory. All 20 females were required to match pairs of cards as fast as they could. They weren’t allowed to have more than two cards flipped over at one time that weren’t paired. Second, the subjects were tested on focus. Each participant was required to find a duck, a turtle, a pear, and a paper crane in an image with various other objects among them. The idea was for the subjects to find the objects in the shortest time possible. The third test analyzed reaction time. Each participant was given a series of words and was required to read the word shown, not the color. For example, a card said the word “red,” but the word was in the shade of green. Therefore, the participant needed to respond by saying “red,” not “green.” Finally, the last category was problem-solving. Each participant was required to unscramble words out loud to come up with a phrase. For example, one phrase read, “ABE LANE KISS DARE.” When read aloud and put into the correct words, it should have been correctly read as, “A BLANK STARE.” Each female was given each test in four trials. In all, they were tested 16 times. After testing all 20 females, the average memory time for the 14-year-olds was 96 seconds; for the 15-year-olds 91 seconds; for the 16-year-olds 89 seconds; for the 17-year-olds 83 seconds; and for the 18-year-olds 78 seconds. The average times in the next tested category, focus and concentration, were 5.3 seconds for 14-year-olds; 6.5 seconds for 15-year-olds; 7.7 seconds for 16-year-olds; 5.5 seconds for 17-year-olds; and 6.2 seconds for 18-year-olds. For the third category we tested reaction time. The 14-year-olds averaged out to 37 seconds; the 15-year-olds to 39 seconds; the 16-year-olds to 35.7 seconds; the 17-year-olds to 32 seconds; and the 18-year-olds to 31 seconds. Finally, in the last category we assessed problem-solving. The average for 14-year-olds was 94 seconds; for 15-year-olds 91 seconds; for 16-year-olds 67 seconds; for 17-year-olds 61 seconds; and for 18-year-olds 67 seconds. In conclusion, when testing memory, our hypothesis that the younger subjects would pass the test faster was supported by our data. For the test in which we hypothesized that concentration would be quicker for older females compared to the younger ones, our hypothesis was not supported because the data showed that the older females had a higher average than the younger subjects. Next we tested the effect of age on problem-solving. Similar to concentration, based on evidence and past experiments, we hypothesized that problem-solving steadily increases with age due to experience and maturity. This also was not supported by the data we collected. Lastly, if reaction times decrease with age, then it is a cognitive process also affected by the aging of neurons. This hypothesis was supported due to our data showing a decrease in reaction times with age.

6527
Bacteria Growing in Different Concentrations of Sugar
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This study observed if adding different amounts of and different types of sugar affects bacterial growth in yogurt. We tested this by making our own yogurt, using as a control a batch with no sugar. We also had four different groups, all with different concentrations of sugar. In each group we had two different yogurts, one with cane sugar and the other with powdered sugar. Everything else was the same and all of the yogurt went through the same things. To do this experiment, we took a liter of whole milk and boiled it until it reached 180°F, and then let it cool down to 115°F. Once it was cooled, we took a cup of the warm milk and put it in a separate bowl. Then we added yogurt starter, mixed it well, and added it back to all of the milk. After this we put 100 ml of the milk in each of seven mason jars. For the control we added no sugar – just added a lid, labeled it, and placed it aside. In another mason jar we added ½ teaspoon of powdered sugar, mixed it well, and then closed the jar and placed it aside. After this we repeated this process with the rest of the jars. The next jar contained ½ teaspoon of cane sugar, another had 1 teaspoon of powdered sugar, and another had 1 teaspoon of cane sugar. For the last two jars, one had 2 teaspoons of powdered sugar, and the other had 2 teaspoons of cane sugar. Once we labeled the jars, they were incubated for 21 hours. We observed our findings by examining each of the jars to see if the yogurt was still in liquid form or if it had become a semi-solid. We observed that the cane sugar slowed down the process of fermentation more than the powdered sugar. The yogurt in the jars that contained more sugar was in more of a liquid state than the yogurt in the jars that did not have as much sugar.

6528
Bacterial Growth
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The idea behind this study was to find out whether different temperatures have an impact on the growth of bacteria. I examined if body temperature can cause bacteria to grow more or less, and which of the four temperatures I tested leads to the highest amount of bacterial growth in a period of five days. I began by gathering the materials needed to conduct the study. Then I boiled water and put a pitcher of water in the refrigerator for 15 minutes. Afterward, I poured gelatin mix into a bowl. Then I added the boiled water and began to mix for 2 minutes. After the 2 minutes, I put in the cold water and began to mix again for 2 minutes. Right after this, I poured the gelatin mix into a plastic container for 6 hours. Once the 6 hours were finished, I left the container at room temperature for 6 hours to allow bacterial spores to land on it. Then I cut the gelatin into roughly equal sizes and placed them on four different plates. I
made sure to label each gelatin sample to not get them confused. However, one of the gelatins (#4) was placed back in the refrigerator and the next day was placed in an incubator. Each gelatin was left in its temperature for five days. I made sure to monitor any bacterial growth within those plates. From the data I collected, gelatin #4 had the highest number of bacterial colonies of all four gelatins, with about 55 bacterial colonies. Second was gelatin #1 at room temperature, with about 49 bacterial colonies. Gelatin #3 came in third with about 37 bacterial colonies, and gelatin #2 had zero bacterial growth. My hypothesis that gelatin #4 would have the highest amount of bacterial growth was correct, as were my hypotheses that gelatin #3 would have more bacterial growth than gelatin #2, and gelatin #1 would have more colonies than gelatin #3. I estimated that gelatin #4 would have 50 colonies. The gelatin melted while in the incubator and dried up around the fifth day. It had the highest amount of bacterial growth, as some bacteria are known to grow at temperatures around 25˚C to 40˚C. Gelatin #1 had the second-highest amount of bacterial growth, with about 50 bacterial colonies grown within five days. Most of its original shape was lost and led to the gelatin drying up. Gelatin #3 had about 37 bacterial colonies grow in a period of five days; however, these bacterial colonies only grew on small patches of the plate, not the whole gelatin. Gelatin #2, which was frozen solid, had zero growth of bacteria. These results demonstrated that bacteria grows much better at body temperature, with the data showing that about 55 bacterial colonies grew within a five-day period. Meanwhile, gelatin #3, which had a slight 1-degree difference, only had about 37 bacterial colonies grow in the same amount of time as the other gelatins.

**6529**

**Seed Germination**

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How does salt concentration in water affect seed germination of plants? In order to figure this out, we created an experiment using lima beans and five different solutions of water containing different salinity levels, plus a control group. Six different pots containing three lima beans each and Miracle-Gro® were used over an 18-day period to test our hypothesis. Initially, we predicted that as salinity levels increased, germination levels would decrease. In conducting our experiment, we found that none of the lima beans being tested grew past imbibition, and they died due to the high concentrations of salt. As a result, our hypothesis technically was not proven wrong largely because our salt-concentrated solutions were far beyond the tolerance level of any of the lima beans. Salt decreases the rate of germination within populations of seeds much more severely than we had predicted.

**6530**

**What Effect Does Light Have on Cilantro Growth?**

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The purpose of this investigation was to determine the effect of a variety of colors of light and the presence of light on the germination and the growth rate of cilantro. The experiment was performed by setting up two boxes each with red, blue, green, yellow, and colorless transparent (controls) plastic filters inserted into the sides of the boxes, as well as two boxes without the presence of light. Each category we tested (labeled A) had an extra sample size (labeled B) for more reliable results. In total, there were 12 boxes. We placed a pot, with 1 ½ cups of soil and eight evenly spread out cilantro seeds, in each box. The 10 boxes with filters were placed under a light source, and the two boxes without filters were placed where the least amount of light possible could reach. For about seven weeks, we watered each cilantro and took note of which category of cilantro sprouted first, and also measured the rate of growth under each circumstance. We noticed that Green A sprouted first and Blue A sprouted last. The plant with the highest average growth rate was Clear, with a 4.79 average growth rate, and the lowest was Red, with a 1.86 average growth rate. Another interesting observation we made was about the cilantro grown in the dark. It grew without any pigmentation, creating a white coloration. The average growth rate for the cilantro grown in the dark was 2.23, showing the plant’s emergency response to grow upward for a source of light to continue the process of photosynthesis. In conditions where there is a small amount of light reaching a plant, it grows to the source of light in a process called heliotropism. In conclusion, our results showed us that white light (Clear) leads to the best growth rate for plants, because it’s able to absorb a larger spectrum of light.
3b, making the cotton balls acidic. For the alkaline cups, we added 5 ml of ammonia and 80 ml of tap water, giving us a pH level of 10.51, and put 30 ml of the alkaline solution into three cups labeled 1a, 2a, and 3a. Lastly, we added 30 ml of distilled water for our neutral solution into cups labeled 1c, 2c, and 3c. We covered each cup with Saran Wrap. Every day each cup received the same amount of sunlight: between 8-10 hours. The type of data we collected was qualitative, as pictures were taken every day showing the growth of the sunflowers. We noticed that all of the seeds in the alkaline cups died off after four days, but the neutral cups and the acidic cups continued to have living seeds. The hypothesis was incorrect: The sunflower seeds that were germinated in an alkaline environment experienced the greatest negative effect compared to the sunflower seeds in an acidic environment.

6532
What Is the Most Common Type of Phobia in Teenagers?
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The purpose of this experiment was to find out the most common types of fears in males and females. There were four types of phobias given: coulrophobia (fear of clowns); claustrophobia (fear of tight spaces); arachnophobia (fear of spiders); and acrophobia (fear of heights). To see what the most common fear was out of these four, a survey was created for each gender. There are specific phobias and complex phobias. Specific phobias are developed between the ages of 4 and 8. Complex phobias are caused by a combination of life experiences, brain chemistry, and genetics. There are many options for treatment to decrease the amount of fear individuals have for a certain type of phobia. There are three key parts to the brain, which are the reptilian brain, the limbic system, and the neocortex. Phobias are often linked to the amygdala, which lies behind the pituitary gland in the brain. This is part of the limbic system, a neural network that affects the emotion and memory of the brain. People who have a larger amygdala can have higher anxiety in their childhood and can develop clinical anxiety. The reptilian brain controls our basic needs for living and our “fight or flight” instinct. This natural instinct comes from human ancestors when they faced danger in their own environment. The neocortex is involved in our perspectives on how we see things, our consciousness, and the development of language and imagination. When looking at the four phobias in this experiment, three of them (coulrophobia, claustrophobia, and acrophobia) have something in common, which is social anxiety. When clowns are viewed in a social context, they always are. Most people have social anxiety and get the fear of being judged on their appearance or something they do in front of others. Looking at the background of these issues, each phobia is feared for a different reason. Coulrophobia mainly comes from being scared of people dressed in multiple colors, big shoes, and painted faces, making it scarier subconsciously. People with claustrophobia tend to avoid small spaces because they feel like there’s no way out. When people with arachnophobia see a spider crawling out of a corner near them, they usually freak out and start to panic, stay frozen in place hoping it won’t see them, or kill it. People with this phobia will do whatever they can in order to make sure no spiders come near them. The last type of phobia is acrophobia, which is the fear of heights. This type of phobia can range from standing by a tall building to just climbing a ladder. A survey was created for both females and males to determine their biggest fear out of coulrophobia, claustrophobia, arachnophobia, and acrophobia. After conducting a 24-hour poll on the most common type of fear in both genders, arachnophobia (fear of spiders) was the most common type of phobia.

6533
What Is the Effect of Acid Precipitation on Plant Germination and Plant Growth?
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The study that was conducted was designed to research and determine the effect of acid precipitation on plant germination and plant growth in plants grown around March to June on the West Coast and East Coast of the United States. The seed types and where they grow were chosen based on the fact that the pH levels of rain on the East Coast are more acidic than those on the West Coast, partly because of the concentration of fossil-fueled power plants located in the east. Power plants are one of the main sources of acid precipitation, as they release sulfur dioxide, one of the main components of acid precipitation. In the experiment, there were four different planters used and two different seeds used: Pinwheel Zinnias, which bloom and are grown around March to June on the West Coast, and daisies, which are typically grown around the same time period on the East Coast. The control groups were one planter with daisies and another planter with Pinwheel Zinnias that were watered with distilled water. The experimental groups were one planter with daisies and another planter with Pinwheel Zinnias, both of which were watered with an acid rain simulation solution made by mixing vinegar and distilled water. The pH it resulted in was approximately 4.6. The planters were left outside where they all had the same access to sunlight, and were watered every other day. Data for our experiment was collected biweekly. At the end of our experiment, which lasted seven weeks, we observed that the Pinwheel Zinnias that had been watered with the vinegar solution grew more than the daisy seeds watered with the vinegar solution. The data collected supported our hypothesis. This stated that around the months of March to June, the seeds (Pinwheel Zinnias) normally grown in an environment where they are prone to
experience scarce conditions would grow more efficiently than the seeds (daisies) grown in an environment with a normal and desirable pH level.

6534
 Does Color Affect the Hummingbird’s Feeder Preference?
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This study showed if hummingbirds have a color preference for their feeders. Two hummingbird feeders were spray painted (where the translucent plastic is, not the feeding hole) with different colors such as red (my control, no paint), green, and blue. They were all hung out together in a line, using a ribbon, on the backyard patio for a series of eight trials, with each trial lasting 1 hour. Inside each feeder there was homemade nectar consisting of boiled sugar water and red food coloring. Two trials were conducted per day, the first one at 1 p.m.–2 p.m. and the second at 5 p.m.–6 p.m. After each day, the feeders were rotated so I could see if the hummingbirds preferred to drink out of one color feeder versus the others. The feeders were rotated four times. I also observed the behavior of the hummingbirds during their feeding times. From all of my data and what I observed, the hummingbirds did not have a color preference. Instead they had a directional preference for where the feeders were placed. My data showed that a larger concentration of hummingbirds went to the feeders more to the left side of the yard than to the right. As for behavior, the hummingbirds were very protective and aggressive over their feeders. For example, if a hummingbird was drinking and another one tried to feed off of that same feeder, then the hummingbird chased it away and went back to the feeder. I also noticed that more hummingbirds came to the yard at 5 p.m.–6 p.m. than 1 p.m.–2 p.m. A factor and a source of error that could have led to the colors of the feeders not mattering were that each feeder was not painted at the bottom feeding hole, thus resulting in all of the same colors and making the choices all the same. So, in conclusion, the hummingbirds had no preference for feeder color. They had a preference for the location of the feeder, which was the left side of the yard.

6535
 Impact of Dietary Variation on Development and Behavior of the Red-Eared Slider (Trachemys scripta elegans)
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The primary focus of our experiment was to observe and ascertain developmental and behavioral distinctions of the young Trachemys scripta elegans when their diets have been altered. T. scripta, otherwise known as red-eared sliders, are omnivores. Their diets mainly consist of aquatic vegetation, small fish, and decaying material like dead fish and frogs. In our experiment, we obtained a sample size of nine red-eared sliders and separated them equally into three diet categories: herbivorous, omnivorous, and carnivorous. The T. scripta on the omnivorous diet functioned as the control group, while the herbivore and carnivore groups were independent variables. Once the red-eared sliders were separated into their respective tanks, we fed the herbivore group leafy greens, including spinach, kale, and romaine lettuce; the carnivore group freeze-dried baby shrimp; and the omnivore group an equal mixture of both. By keeping several factors constant, including the amount of food given, size of tanks, and amount of water in the tanks, we attempted to limit the possibility of a source of error that could affect our results. The T. scripta were fed and had their tanks cleaned on a daily basis. Observations of behavioral changes also were recorded on a daily basis. Measurements of each slider’s mass and length of shell were recorded every other day. By manipulating the diets of the herbivore and carnivore groups, we anticipated we would observe deviations from the control group in development and behavior, in addition to deviation from each other. Within the 50-day period, variations among the diet groups became evident. Overall, the herbivore group grew the largest in both mass and length. It also was perceived that the herbivore group was the most active among the diet groups. On the other hand, the carnivore and omnivore groups were similar in both mass and length. The sliders in the carnivore group also seemed to exhibit more aggressive behavior, fighting one another for food and quickly snapping at their freeze-dried shrimp. Another observation of the carnivore group was the pigmentation of their shells. The shells of the shrimp-fed T. scripta appeared to be a darker color than the shells of the others on different diets. Another interesting inconsistency among the diet groups was the hardness of their shells. The herbivore group had the hardest shells, and the omnivore group followed. Intriguingly, the carnivore group had generally soft shells, which may have suggested unhealthiness caused by lack of vital nutrition. The evidence showed a correlation between the diets of the red-eared sliders and their overall fitness and health. Their development was apparent among the diet groups became evident. Overall, the herbivore and carnivore groups were similar in both mass and length. The sliders in the carnivore group also seemed to exhibit more aggressive behavior, fighting one another for food and quickly snapping at their freeze-dried shrimp. Another observation of the carnivore group was the pigmentation of their shells. The shells of the shrimp-fed T. scripta appeared to be a darker color than the shells of the others on different diets. Another interesting inconsistency among the diet groups was the hardness of their shells. The herbivore group had the hardest shells, and the omnivore group followed. Intriguingly, the carnivore group had generally soft shells, which may have suggested unhealthiness caused by lack of vital nutrition. The evidence showed a correlation between the diets of the red-eared sliders and their overall fitness and health. Their development was apparent through their diets. The herbivore group proved the healthiest out of the three and remained the most balanced throughout the course of the study. The carnivores and omnivores were deprived of the nutritional benefits of a strictly herbivorous diet. It is evident that the turtles with the herbivorous diet received the necessary nutritional intake for a growing and developing Trachemys scripta elegans.

Editor’s Note: While our journal policy is to not publish abstracts on projects that involve harming vertebrate animals (including humans), in this case we are publishing this abstract since the red-eared sliders (turtles) in the project were returned to their normal diets upon conclusion of the research.
6536
Increase in Height of Strawberry Plants in Relation to Sugar
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This experiment studied the increase in the height of strawberry plants in relation to the amount of sugar added to their water. The hypothesis was that 3 teaspoons of sugar added to a strawberry plant’s water would cause the plant to grow higher than a strawberry plant receiving any other amount of sugar. First, six groups of three plants each were planted in six pots. Each group of plants received a different amount of sugar in their daily water, from 0 teaspoons to 5 teaspoons. For a week, the groups of plants were watered with their designated amounts of sugar, after which the changes in the heights of the plants were measured. As per the hypothesis, the plants that received 3 teaspoons of sugar grew the most, at 2.33 inches; followed by the plants that received 5 teaspoons of sugar at 1.217 inches; the plants that received 1 teaspoon of sugar at 0.833 inches; the plants that received no sugar at 0.64584 inches; the plants that received 4 teaspoons of sugar at 0.333 inches; and finally the plants that received 2 teaspoons of sugar at a mere 0.25 inches. These results may have been skewed because the plants that received 3 teaspoons of sugar were the shortest of the plants at the beginning of the experiment, and therefore were able to grow the most. It also must be noted that the plants that received any amount of sugar grew far fewer leaves than the plants that received no sugar, which would lead one to believe that a strawberry plant must receive sugar throughout its lifetime or not at all.

6537
The Unique LEGO® Egg Dropper
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The purpose of my experiment was to see what would happen if I put an egg wrapped in paper and surrounded by LEGOs and dropped it. In the first trial, I dropped the egg from 30 inches. It survived the first drop with only a few scratches on the LEGOs. For the second trial, I dropped the egg from 36 inches. This time the outcome was different. The LEGOs were super close to breaking, but the egg was safe and sound and the paper towels did not have one scratch or tear. My height and the bench height combined with me standing on top of the table or the bench would be up to 8 feet 7 inches high.

6538
How Fast Can Ice Melt Under Different Heating Conditions?
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The purpose of this experiment was to see how fast ice can melt under different heating conditions. The experiment included four steps: purpose, procedure, results, and conclusion. I used a hot bowl of water, a heat lamp, a heater, and just let a cup of ice melt by itself. My hypothesis was that the heater would melt the ice the fastest. There were four procedural steps to perform the experiment. First I poured quarts of water in four cups, froze them, and put them under different melting conditions. Then I timed each of them, one by one, with a stopwatch and recorded their time. The hot bowl of water was the item that melted the ice the fastest. The ice in this cup melted in less than 9 minutes. Therefore, my hypothesis was incorrect. I thought the heater was going to melt the ice the fastest, but it melted it in 27 minutes, 18 minutes more than the hot bowl of water did. I think that the hot bowl of water worked better because the cup was plastic, making the ice easier to melt over a shorter period of time.

6539
Elephant Toothpaste
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I wanted to find out what would happen if I poured all of the chemicals in the experiment into a beaker, and if there would be an explosion with the elephant toothpaste. I thought if I put in 1 cup of hydrogen peroxide, then the eruption would be at least 50% bigger. I only got to do one trial, but the experiment erupted to more than twice the size of what it was at the start. In the beginning, I put a total of 133 mL in the beaker with all of the liquids inside of it. After the mixture in the beaker erupted, the total was exactly 400 mL, so the difference was gigantic. In conclusion, I learned that in a scientific experiment you need to measure every substance in the experiment, and you have to be very careful with the types of chemicals that are in the experiment.

6540
Fire Lab
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The purpose of this experiment was to see which of these three liquids — hand sanitizer, isopropyl alcohol, and hydrogen peroxide — lasts the longest when lit. I believed that if you light 5 mL of hand sanitizer, it will burn for 1 minute or less. To con-
duct this experiment, I placed down a piece of tinfoil, poured on 5 ml of hand sanitizer, and lit it. I timed how long it lasted and repeated the same process with the other liquids. The hand sanitizer burned the longest, for 3.13 minutes. The isopropyl alcohol burned for 1.26 minutes, and the hydrogen peroxide for 0. Out of all three of the liquids, the hand sanitizer burned the longest. It burned 2 more minutes than the next closest one.

Does Age Affect Heart Rate After Moderate Exercise?
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I tested four subjects and wanted to find out if their heart rates would change after varying amounts of exercise. I also wanted to find out who would have the highest heart rate after three walking sets. For the control, I used the group members’ resting heart rates, and for the experimental data, I had them each record their heart rate after 5, 10, and 20 minutes of walking. At resting, the adult male had a heart rate of 103 beats per minute (BPM), the male child had a heart rate of 91 BPM, the adult female had a heart rate of 99 BPM, and the female child had a heart rate of 100 BPM. But after 20 minutes of walking, the adult male had a heart rate of 130 BPM, the male child had a heart rate of 121 BPM, and the female adult and child had heart rates of 124 BPM. In the end, the adult male had the highest heart rate overall, and it rose 27 BPM after the exercise. The female child had the lowest heart rate increase, with it rising 24 BPM. As shown by the data, my hypothesis was incorrect.

The Best Slime Activator
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I conducted my experiment because out of all of the slime activators out there, you can never figure out which one is the best. So by seeing how much the slime shrinks, I can figure it out. I made three different slimes, one using Purex® Sta-Flo® (a liquid starch detergent), another using a saline solution, and the last one using borax. I chose these activators because they are all known as the best, and after this experiment, I would really know. I color-coded the three slimes I made so I could remember them. Then right after I made them, I weighed them in grams. The borax slime was 197.9 grams, the Sta-Flo slime was 160.9 grams, and the saline solution slime weighed 139.8 grams. Then after two-three days I weighed them a second time. The borax slime was 195.7 grams, the Sta-Flo slime was 160.6 grams, and the saline solution slime was exactly 138 grams. So the Sta-Flo laundry detergent was the best compared to the saline solution and borax. After two-three days, the Sta-Flo slime shrunk the least, as it went from 160.9 grams to 160.6 grams. The saline solution slime dropped 1.8 grams and the borax slime dropped 2.2 grams. So after the three slimes sat for two days in plastic bags, the Sta-Flo slime shrunk the least.

The Vinegar Egg Drop
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I conducted this experiment because being able to bounce and drop an egg without it breaking is awesome. The YouTubers who conduct this experiment say not to drop it more than a few inches, so I’m going to tell you how I proved them wrong. The first thing I did was soak the eggs in vinegar for 24 hours. When I took them out I cleaned them off and grabbed two rulers. I had to tape them together because of how high I got. For the first trial I measured at 11 inches, or 27.9 centimeters. When it was time for the second trial I got up to 14 inches, or 35.6 centimeters. After the eggs were soaked in vinegar, they were protected enough to be dropped more than a few inches.
I proved this because overall the highest I got was 14 inches (35.6 centimeters) on just a table, and the egg did not break when dropped from that height. So what I learned was that the YouTubers are not being truthful when they say that an egg “will burst if you bounce it over a few inches, so be careful.”

6545
Mold Growth
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My experiment was designed to see which environment has the greatest mold growth. If I put food in different environments, then I would see which grows the most mold. I started off by taking a slice of bread and cutting it up into nine pieces. Next I took my first three samples and rubbed them between my unwashed hands to get some germs on the bread. I put the three pieces into separate plastic bags and labeled them dirty. After that I took my next three samples and sprayed them lightly with water. I then placed each wet sample into its own plastic bag and labeled them wet. Then I took my last three samples and left them as is. I placed them each into their own plastic bags and labeled them dry. After preparing all of my samples, I placed one dirty, one wet, and one dry in a dark spot. Then I took another set of wet, dry, and dirty samples and placed them on a windowsill that got a good amount of sun. The last samples were placed in a refrigerator. I then monitored them daily. On Day 3, all of the samples had changed in color and slightly darkened. On Day 5, the refrigerated samples had softened, while the ones in the sun had hardened. On Day 7, the refrigerated samples were squishy and the samples in the sun were hard, while the ones in the dark did not have any more changes. In conclusion, my bread did not grow any mold. During the seven days, the only changes were in texture and color. I did not get the results I was looking for, although I learned about the process of bread spoiling.

6546
How Far Does Slime Stretch?
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The purpose of this experiment was to see how far slime would stretch when made with detergent and when made with eye contact solution. I believed that if I used eye contact solution for the slime, then it would be stretchier than if I made it with detergent. For my experiment I used glue, a container, food dye, Tide® detergent, baking soda, and eye contact solution. After I made the slime, I stretched it out on two tables and measured it with a 12-inch ruler. The slime that I made with eye contact solution was 26 inches, and the other was 62 inches. The slime made with Tide detergent stretched the farthest. It was 3 feet longer than the slime made with eye contact solution.

6547
What Food Gives Bearded Dragons the Most Energy?
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The purpose of this experiment was to get information on what food gives the most energy to a bearded dragon while still keeping the dragon healthy. Once I got a bearded dragon, I bought food a lizard would eat. For example, for this experiment, I used carrots, crickets, an apple, and a banana. Then I gave one of everything to the dragon. I didn’t feed the dragon a whole apple, carrot, or banana, because that would injure it. So I sliced up the fruit and gave one slice each. I measured the amount of energy per each type of food my dragon got, waited a day and then repeated. Before I fed the dragon the next food, I made sure to take the dragon outside to test its energy. (I could probably tell by how much the dragon moved.) My results were that the banana managed to defeat the carrot, cricket, and apple. My conclusion was that the banana won because of its “healthy sugars” and potassium. My hypothesis was correct that the banana would be victorious in terms of health and energy.

6548
Paper Airplane Experiment
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In this experiment I wanted to see which paper material would go farthest as a paper airplane. My hypothesis was that the construction paper would go the farthest. There were three different types of paper airplanes: normal writing paper, drawing paper, and construction paper. My method of collecting data was to put measuring tape on the ground and measure the distances the airplanes went in inches. I made sure every piece of paper was the same width and height, and tried to throw each paper exactly the same way. If one hit any obstacle, I threw it again. There were five throws for each airplane. My results gave the total for each throw for every airplane and the average for every plane. The total for the writing paper airplane was 979 inches, and the average was 195.8 inches. The drawing paper airplane’s total was 1,103 inches, and the average was 220.6 inches. The construction paper airplane’s total was 1,176 inches, and the average was 235.2 inches. The conclusion was that the construction paper went the farthest, so my hypothesis was correct. I think the construction paper went the farthest because that paper is kind of thicker. Normal writing paper is really thin so the air goes through it and it doesn’t stay off the ground for that long.
6549

**Coin Drop Lab**  
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The experiment I did was a lab where I dropped coins to see how many can be on a foil boat without sinking the boat. My hypothesis was that if I put 30 pennies on a foil boat, then it would float. To conduct the lab, I needed foil, a container, napkins, water, 35 pennies, 35 nickels, and 35 quarters. First I needed to fold the foil into a boat. After that I needed to cover the floor with napkins, fill the container with water, put the foil boat in the water, and drop the coins in one by one. My results were that 34 pennies, 23 nickels, and 31 quarters each allowed the boat to float. In conclusion, my hypothesis was correct that 30 pennies would float on the foil boat.

6550

**Paper Airplane Flight Distances**  
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My project purpose was to see if paper airplanes would fly farther with extensions (toothpicks). There were three paper airplanes with a certain color marking on them: green, red, and yellow. The materials needed for this experiment were six different-colored toothpicks (three pairs of the same color), three sheets of paper to fold into the airplanes, scissors, and tape. For my control groups, I measured the weight of each plane without extensions. For example, the yellow airplane’s weight was 6.4 grams. The experiment groups had extensions and were timed for airtime and the number of feet traveled per plane. For the results, the red paper airplane’s weight was 5.9 grams, the yellow’s was 6.4 grams, and the green’s was 6.4 grams. For the red airplane without extensions, the airtime was 0.76 seconds and the distance traveled was 12.8 feet. For the red airplane with extensions, the airtime was 1.35 seconds and the distance traveled was 9.5 feet. For the yellow airplane, the airtime was 0.46 seconds and the distance traveled was 8.7 feet. For the yellow airplane with extensions, the airtime was 1.66 seconds and the distance traveled was 7.8 feet. For the green airplane, the airtime was 9.5 seconds and the distance traveled was 10 feet. For the green airplane with extensions, the airtime was 3.41 seconds and the distance traveled was 9.6 feet. Given my results, for the claim that adding the extensions would weigh the planes down, the extensions worked to improve airtime, but lowered distance. So add the extensions if you want more airtime, but don’t add them if you want more distance.

6551

**Dry Ice Bubble Experiment**  
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The purpose of my lab was to see if I could make a dry ice bubble form or not, and also to see if it would form if I put a big chunk of dry ice and then added a cup of dish soap and ½ cup of water. I wanted to see if I was able to create the bubble to form the right way without something being wrong. My experiment went as planned and I was able to get the exact recorded data. But a few times there was a dysfunction with how much of the items I used in the bowl, which resulted in the bubble not forming. The claim was when I put the dish soap and the water into the metal bowl with the dry ice, I found out the dry ice was so cold that the outside of the bowl got ice crystals. I also found out that when I put water and dry ice in the bowl, the two ingredients mixed and the water started to get very cold, but not cold enough to burn me. The bubble was able to form with the right amount of ingredients but not exactly, because I did have a malfunction so I kind of made a mistake.

6552

**Coca-Cola® and Mentos® Experiment**  
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In my experiment, I wanted to see how much Coca-Cola (Coke) poured out of a bottle when Mentos were added and how much was left. I also wanted to see how long it took for the Coke to stop pouring out. I thought if I put four Mentos in the Coke bottle, it would start to fizz and then it would explode. I used regular Coke for my experiment. In my first trial out of 1,000 mL, with six cracked Mentos, 400 mL was left. In my second trial out of 1,000 mL, with six whole Mentos, 398 mL was left. I discovered that the whole Mentos had a bigger effect on Coke than the cracked Mentos, so I am glad that I did two different experiments. My project went very well and I noticed that the cracked Mentos had more remains left over. I always thought that the cracked Mentos would have fewer remains left than the whole Mentos, because there would be more pieces of them in the bottle than of the whole ones. Basically if you have six whole Mentos, you have 12 cracked Mentos.
6553
The Lima Bean Light Experiment
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For my experiment, I put lima beans in different types of light. I wanted to see which lima bean would grow the most in eight days. I made a box and made sure that there were no holes in it so that the beans could not get any light. After that I put one bean each in three different glass jars with two wet paper towels. I put one jar in the dark box, one under a turtle light, and one by the window. After eight days, the bean in sunlight grew to 2 cm high and 4 1/10 cm wide. The bean under the turtle lamp grew to 2 cm high and 2 5/10 cm wide. The bean in the dark grew up to 2 cm high and 1 2/5 cm wide. After eight days, the one that grew the most was the bean in sunlight.

6554
Saltwater Evaporation
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The purpose of this experiment was to see the effect that saltwater has on evaporation and whether it slows it down or speeds it up. I thought that if you added salt to regular water, it would slow down the evaporation. I collected my data by putting different amounts of salt into two mason jars filled with water, and having one mason jar with water but no salt. I put the jars on a windowsill and each day I measured the water levels with a ruler to see how much they had changed. I put my data into a graph. At the end of the experiment, I found out that salt doesn’t affect the evaporation of water, because when I measured the water levels in the three jars they were all at 6 cm and had evaporated at the same rate. In conclusion, salt does not affect the evaporation of water.

6555
Overflowing Toothpaste
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Purpose: Compare two different attempts at making elephant toothpaste. Procedure: First I got my materials before I started. I put half a cup of hydrogen peroxide and also added a little squirt of soap and three drops of food coloring. Then I got a beaker and put ¼ cup of yeast and added warm water until it reached 100°F. I measured the hydrogen peroxide and the yeast mixtures separately. Then I poured the yeast mixture into the hydrogen peroxide mixture and it started to overflow from the bottle I put it in. Results of first attempt: 87 ml of hydrogen peroxide mixture + 56 ml of yeast mixture = 776 ml of elephant toothpaste. Second attempt results: 87 ml of hydrogen peroxide mixture + 54 ml of yeast mixture = 694 ml of elephant toothpaste. Conclusion: My first attempt at making elephant toothpaste was the best. Evidence: Because I used 2 more ml of yeast, it made more elephant toothpaste. Reasoning: I used 2 more ml of yeast because I wanted to test it out and change it a little so I could get different answers.

6556
Comparing Lemon Batteries With Potato Batteries
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This experiment was done to find out if a lemon or a potato is a more reliable source of energy. At first my hypothesis was that the lemon would be a stronger/more durable source of energy because of the juices/citrus, but I was wrong. To test my hypothesis, I linked eight lemons together by using test leads, which made one whole battery, and then I used a multimeter to check the voltage levels. Every 5 minutes over 60 minutes I graphed the data to see how the voltage levels fluctuated. I repeated the same process, but with the potato. I tested and collected data from the potato battery (control group) twice using similarly sized potatoes for each test. For the lemon battery (experimental group), I tested it twice using similarly sized lemons for each test, doing the same thing as with the control group. The results were clear on which battery was superior after the first look at the voltage levels. The potato battery’s voltage level started at 4.67 volts, while the lemon battery’s voltage level started at 3.11 volts. The lemon battery’s voltage level started dropping dramatically after starting at 3.11. It dropped to 2.10 in 20 minutes. The potato battery’s voltage level did not drop as much compared to the lemon battery’s voltage level after 20 minutes. Unlike the lemon’s voltage level constantly dropping, the potato’s voltage level fluctuated up and down, which slowed the rate at which it fell. After 20 minutes, the potato’s voltage level was 4.25. After 20 minutes, the lemon’s voltage level stopped dropping at 2.0 volts. It stayed in the 2.0 volt to 2.2 volt range for the remaining time and ended at 2.15 volts. The potato’s voltage level kept shifting up and down for the whole experiment, and at the end the voltage level was 3.26. The potato was a better source of energy than the lemon, starting at 4.67 volts and ending at 3.26 volts, while the lemon battery started at 3.11 volts and ended at 2.15 volts. The lemon battery was the weaker source of energy, so my hypothesis was wrong.


6557

Pepsi™ and Mentos® Eruption

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For my experiment, I wanted to find out how many mints it would take for a 2-liter bottle of soda to fully erupt. I used three Mentos to put in a launcher, and then I pulled the trigger to drop the Mentos into the Pepsi bottle. After this, I measured how much soda was left in the 2-liter bottle. There was half a bottle of soda left, which was 19.3 cm. My hypothesis matched my conclusion, which was that the soda that fizzed the most was the regular Pepsi. After the experiment, when walking back to my classroom, I put the remaining soda in my measuring cup and noticed that when I looked in my bottle of Diet Pepsi, no soda had really come out. With the regular bottle of Pepsi, the Mentos had made contact with the sugar, so that’s what caused the soda to lose more liquid in the experiment.

6558

Bone Experiment

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I conducted this experiment to see how bones change in different liquids in a two-week period. My hypothesis was: “If the bones are in vinegar for two weeks, then they will turn into rubber.” I had six turkey rib bones, and weighed each separately. I put two of the bones in water for a control group, and put two other bones in Coca-Cola and two more in vinegar, both of which were the experimental groups. I then left them for a two-week period. After the two weeks, I took them out and weighed and observed them. The results I gathered showed that the average amount of weight lost by all of the bones was 1.2 grams. The water bones originally weighed 18.1 grams, and after the two weeks they weighed 17 grams. The bones in the Coke originally weighed 17.6 grams, and after the two weeks they weighed 15.7 grams. The bones in the vinegar originally weighed 17.1 grams, and after the two weeks they weighed 16.5 grams. In conclusion, my results showed that the bones in the Coke deteriorated the most, the bones in the water the second most, and the bones in the vinegar the least. One thing I learned from my experiment is that Coke is a very powerful substance, and to my surprise it deteriorated the bones more than the vinegar. I also observed that the vinegar bones turned to rubber, and I could bend them in half without them breaking.

6559

Paper Versus Marbles

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In my experiment, I tried to find out how many marbles can be dropped on a piece of paper without the marbles ripping the paper. I used multiple types of paper to find out which one is the strongest. The materials I used were marbles, lined paper, graph paper, sketch paper, paper towels, and water. My hypothesis was that if I dropped 10 marbles on the sketch paper, then it would not rip. I took a cup with 235 ml of water in it and poured that amount on each piece of paper. Then I asked two people to help hold each piece so I could drop the marbles on them. After a paper ripped, I wrote down the results for that piece of paper and moved on to the next one. The results of my experiment were that the lined paper took 49 marbles to break; the graph paper took 29 to break; the sketch paper took 19 to break; and the paper towels took 44 to break. In my experiment, I learned that marbles always beat paper. I also learned that sketch paper is weaker when water is poured on it. The lined paper and graph paper were made out of the same material, but the graph paper was weaker than the lined paper.

6560

Insulation in a Box With Control

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In this experiment, I tested how different types of insulation affect the temperature in a 1.6-liter box. My hypothesis was that if I put a type of insulation in the box, then the temperature would differ from that of the control box. To conduct this experiment, I first wrapped the control in two layers of plastic wrap. For the second box, I cut Styrofoam to fit in the box, placed it in the box, and then wrapped it in tinfoil because I didn’t have any plastic wrap at the time. For the last box, I used a hot glue gun and put glue on the cotton balls, covered every crack with cotton balls, and wrapped the box in plastic wrap. To gather quantitative data, I measured the temperature in each box, and then set a timer for 5 minutes and monitored the temperature for 30 minutes. I ran one control and two insulation tests. The data that I collected with the control and insulated boxes allowed me find out if the insulation did anything. The results of the experiment indicated that the insulation didn’t make any difference. The end data showed a temperature of 75.4°F for the control, 75.6°F for the cotton, and 75.4°F for the Styrofoam. So there was a 0.2°F difference, which is not definitive enough to prove that the insulation did anything. The 0.2°F difference could just have been due to outside temperature fluctuations. In conclusion, the insulation was ineffective and useless. The data proved the effects of the insulated walls were the same as the plastic wrap without insulation. The temperatures were basically the same.
**6561**

**Baking Soda and Vinegar Balloon Experiment**  
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This experiment was very interesting to learn about due to the fact that the mixture of baking soda and vinegar can be a replacement for helium. Baking soda and vinegar have a special reaction with each other. The two together create a gas when mixed. All you need for this project is a balloon, an empty water bottle, baking soda, and distilled vinegar. Use small to medium-sized balloons. Depending on the amount of ingredients used in the experiment, you will get a greater effect or not as much of an effect. The different amounts change how big the balloon gets during the experiment. This is a very exciting thing to do as an experiment and a pastime. Ten teaspoons of baking soda and 4 tablespoons of distilled vinegar should give you an average effect. However, due to the size of the balloon, you will get different measurements. Some balloons start off bigger than others. When you put more ingredients into the balloon, it will increase the size the balloon reaches. The color of the balloon does not change the effect of the distilled vinegar and the baking soda inside.

**6562**

**Surface Tension and Cohesion**  
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This experiment was designed to learn about the way surface tension cohesion can make objects float on the surface of water. I thought if I changed the way I placed a paper clip on water, then my paper clip would float due to cohesion. First I folded a paper clip into four different shapes and I poured 500 grams of water into a dish. I tried to place the paper clip on the surface with Fold 1, Fold 2, Fold 3, and Fold 4. After I finished my trials, I put the information on a chart. Lastly, I cleaned up all of my materials and collected my data. The experiment was a success. My hypothesis was correct, and the paper clip floated after four different methods were used to place it on the surface of the water. After four trials, and four different paper clip folds, the paper clip finally floated. There were problems due to the temperature of the water, and some of the paper clip folds messed with the tension of the surface. I learned about cohesion. Now I know that there is a surface tension of water, but it is very weak.

**6563**

**Which Exercise Affects Your Heart Rate the Most?**  
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If a person does 20 jumping jacks, 20 push-ups, and runs 10 feet to and back 20 times, and you check the person’s heart rate after every exercise, which exercise will increase or decrease the person’s heart rate the most? I thought that the exercise that would increase or decrease the heart rate the most would be the 20 push-ups. In my experiment, I had one test subject. I collected data first before the subject did anything, I checked the (original) heart rate. After that, the subject did the first exercise (20 jumping jacks), and then I checked the heart rate. The person then waited about 5-7 minutes before the next exercise (20 push-ups). After that, the subject did the same thing (waited before doing the next exercise). In my hypothesis, I stated that the exercise I thought would affect the subject’s heart rate the most was the 20 push-ups. However, the results of my experiment were that the exercise that affected the subject’s heart rate the most was running 10 feet to and back 20 times. I learned from this experiment that running can make your heart rate rise a lot.

**6564**

**The Rising Water Experiment**  
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The purpose of my experiment was to see whether water would go backward into a cup if I put the right amount of water on a plate. I conducted my experiment with a plate and a cup with a match lit on fire to see if the water would come back up into the cup. I did five tests to see how long the water would take to go backward into the cup. I also measured the height of the water that went into the cup. My first three tests had different results of how long the water took. After that, I did my experiment two more times and got the same results. I believe this happened because my technique got better and better as I conducted the experiment. The first length of time was 10 seconds and the height was one and a half. All of my measurements stayed the same, so they were all one and a half. The water in the second test took 11 seconds, and in the third test took 12 seconds. After I figured out what I was doing wrong, I got the result of 11 seconds. The overall data showed that the lengths of time the water took to go backward into the cup were different, but the last two times it took 11 seconds.
6565
Comparing the Weight of Two Batches of Slime
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This experiment was done to see if I made two batches of slime, and added an ingredient to the second batch, would it weigh more than the first batch? Specifically, if I made two batches of slime, and added shaving cream to the second batch, would it weigh more than the calculated amount of the first batch? I poured half a bottle of glue in the first container, and the other half in the second container. I poured 1 teaspoon of detergent into each container. Then I mixed the first batch until it came together. In the second batch I added ½ teaspoon of shaving cream and mixed until it also came together. After the slime was ready, I weighed each container and then each slime batch. The last step was to subtract the containers’ weight from the weight of each slime batch. The first slime batch without shaving cream weighed 61.6 grams, and the second slime batch with shaving cream weighed 63.7 grams.

6566
Effect of Electricity on Plants
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In this experiment, I applied 5 volts of electricity to the ground of my plant to see the effects it had on the plant over a 17-day period. The reason I decided to do this experiment was because I had never heard of applying electricity to a plant. My hypothesis stated that if I applied 5 volts of electricity to a plant (grass), then the plant would be larger than the control group. I set up my experiment using one container with grass that had an Arduino® product that was wired from a battery. The Arduino product controlled the voltage that was going through it. After the Arduino product, I wired it to the plant with copper wire. There also was a control group (grass with no electricity). I watered each one with ½ cup a day, measured them each day in cm, and made a graph to show my data. The electricity plant was taller each day until the seventh day, when the control plant spiked up and was taller for the rest of the 10 days of the experiment. I believe this happened either because the copper wire messed with the mineral levels in the plant, or the plant had a different variable than the control group plant that I did not know about. In conclusion, my hypothesis was incorrect. After seven days, the control was larger than the variable/experimental group. Therefore my hypothesis was incorrect, because the control was larger.

6567
Timing the Evaporation of Dry Ice
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The purpose of this experiment was to find out how long it takes for 16 oz. of dry ice to evaporate in three cups of boiling water. I thought if I put the dry ice in the boiling water, then it would take 10 minutes to evaporate. To start this experiment, I filled a pot with three cups of water, put on safety gear, and started heating the water until it boiled. I added 16 oz. of dry ice in the boiling water, recorded four times how long it took for the dry ice to evaporate, added my data to a chart, and found the average time it took for the dry ice to evaporate. I recorded how long it took for the dry ice to evaporate on a separate sheet of paper. The results were that the average time it took for 13.2 oz. of dry ice to evaporate in three cups of boiling water was 1,116 seconds, which is 18 minutes, and the average was 76.82 seconds/oz. My question was how long it would take for 16 oz. of dry ice to evaporate. In four experiments, it took an average of 76.82 seconds/oz. to evaporate.

6568
What Heats Up Food Faster: A Microwave or an Oven?
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The purpose of my experiment was to see what heats up food faster: a microwave or an oven. My hypothesis was that if you put a Hot Pocket® in the microwave, it will heat up faster than in the oven. My supplies were two Hot Pockets, a microwave, an oven, and a thermometer. The first step was to put the Hot Pockets in the oven and the microwave. Next, after every minute, I checked the Hot Pockets up to 10 minutes. Third, after 10 minutes, I checked the Hot Pockets and took them out. My results were that the Hot Pockets in the oven had a higher temperature at the end of the experiment time. In conclusion, my hypothesis was wrong.

6569
Chips on Fire
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The purpose of my experiment was to see that if chips burn all the way through, which type of chip will burn the fastest. My procedure was to make sure that I had all of the materials I needed and that I had a safe spot to burn something. I measured the different kinds of chips to make sure they were the same weight so I would get different data, and then took them outside to the safe space. I put each chip on tongs to put it on fire, then faced it up so the fire could get oxygen. I also took a
few steps back. Then I let the chip burn all the way through, or when the fire went out I repeated the steps over again for the other chips. My experiment let me see which type of chip burned the fastest. My results were that the hot Cheetos® burned in 37 seconds, the Doritos® burned in 1:41 seconds, the Cheetos burned in 1:59 seconds, and the SunChips® burned in 1:11 seconds. In conclusion, the chip that burned all the way through was the Cheeto, and it also burned the longest. It burned 18 seconds longer than the Doritos chip, 48 seconds longer than the SunChip, and 1:22 seconds longer than the hot Cheeto.

6570
Bath Bomb Science
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The purpose of this project was to determine how changing the amount of cornstarch used in bath bombs affects their fizz. The experiment was performed by making bath bombs with the normal ingredients, adding more cornstarch to one set of bath bombs, and then adding the normal amount of cornstarch in another bowl. After doing this the bath bombs were frozen so they would form, and then I used a timer on both sets to see which would fizz the fastest. The author found out that the normal cornstarch recipe took much longer to dissolve and produced more fizz, and the recipe with more cornstarch took less time and produced less fizz. The hypothesis was rejected because the normal recipe took an average of 155 seconds to dissolve, and the recipe with more cornstarch took an average of 128 seconds to dissolve. This meant that the hypothesis was incorrect, because the normal recipe was expected to take less time. In conclusion, the normal recipe took longer to dissolve, rather than the extra cornstarch recipe, and caused the bath bomb to fizz for a longer time before stopping. The extra recipe fizzed for less amount of time in each of the three trials.

6571
Which Liquid Erases Permanent Marker the Most?
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The purpose of this project was to determine which liquid could effectively erase a permanent marker line placed on three surfaces. The experiment was performed by first making a line on each of the three surfaces (wood, cardboard, and plastic). Then I soaked a toothbrush in a cup of each liquid, which were water, toothpaste (mixed with water), and rubbing alcohol. After, I scrubbed each line with the toothbrush for 30 seconds. The author found out that the water was most effective in erasing the permanent marker. The hypothesis was rejected because based on research, it seemed that the rubbing alcohol would have the best chemical effect with the substances that make up the permanent marker. In conclusion, it was proven that water is the best in taking away permanent marker, followed by toothpaste and then by rubbing alcohol.

6572
How Does Water Temperature Affect Sunflower Growth?
Yanilette Montano and R. Avecilla (teacher)
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The purpose of this project was to determine how different water temperatures such as hot, cold, and warm affect the growth of a sunflower seed. The experiment was performed by planting sunflower seeds in three different pots. Each pot was watered using a specific water temperature. Then each day the lengths were measured and recorded to check which sunflower grew fastest and longest. The author found out that the cold water plant grew fastest and was in great condition. The hypothesis was rejected because it was thought that the hot temperature water plant would grow fastest since sunflowers prefer hot summers, and that they would grow better in hot temperatures. In conclusion, the cold water temperature plant grew fastest.

6573
Does the Cooking Sheet Type Influence How Much Brownies Burn?
Caitlin Brooks and R. Avecilla (teacher)
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9351 Paso Robles Ave., Northridge, CA 91325

The purpose of this project was to determine which cooking sheet type would burn brownies the most when baking. The experiment was performed by preparing brownie mix and pouring it into a glass dish that was divided into three sections with a plain base, one lined with parchment paper, and one lined with aluminum foil. The dish was placed into a preheated oven for 20 minutes at 350°F, and then taken out to cool. Lastly, the bottom of each section of brownies was examined. The author found out that the aluminum foil caused the brownies to bake to a darker brown than those made on the parchment paper and glass surface. The hypothesis was accepted because the author had predicted that the foil would burn the brownies the most, because it causes substances to cook faster and then the bottoms will brown more. In conclusion, the aluminum foil was the cooking sheet to burn the brownies the most due to its rapid cooking rate and property to conduct heat, while the parchment paper and glass produced light-brown treats.
6574
What Brand of Bubble Gum Blows the Biggest Bubble?
Zade Kafar and R. Avecilla (teacher)
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The purpose of this project was to determine which brand of bubble gum blows the biggest bubble. The experiment was performed by chewing the recommended serving size of five different bubble gums, each for 3 minutes. Then a bubble was blown three times per brand — Bubblicious, Dubble Bubble, Big League Chew®, Extra® Classic Bubble, and Bubble Yum® — to get the average measurements. The author found that the Bubblicious brand blew the biggest bubble. The hypothesis was accepted because my hypothesis was that the Bubblicious brand would blow the biggest bubble.

6577
Microplastics in Beaches and Ocean Waters
Briceida Montes, Brayan Lopez, Jose Velasquez, and Mark Friedman (advisor)
Ánimo Marine Biology/Environmental Club
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We chose this topic because we believe that the issue of microplastics in the world’s oceans, harbors, and rivers should be of concern to scientists, doctors, and ordinary people. With the discovery of microplastics in marine animals (they accumulate in body tissues and stomach) and human blood, it raises the question: What’s the health impact in humans and other living organisms? Our hypothesis is that microplastics in our water could have a negative impact, should be researched, and solutions found to reduce it. Microplastics must affect the health of animals within the marine ecosystem. It is important for humans to learn about microplastics in oceans, harbors, estuaries, and rivers, because we spend time at these locations and eat the fish and filter-feeding mollusks. So we also ingest microplastics. When humans dump plastics into the ocean through sewage and beach litter, the plastics break down into smaller particles and polymers by ultraviolet ray action from the sun, and then waves distribute them throughout the world. This team decided to examine local harbors, rivers, and near beach ocean water to see if microplastics exist and what type of plastic, and compare this information to that of other organizations such as Algalita and 5 Gyres. Our group will collect data from beaches or boats at various GPS locations. With plankton nets and Niskin bottles, samples will be taken at the surface, mid-water, and benthic levels. Microplastics and fibers then will be counted. We did one experimental test and found that there were about 120 microplastic pieces in 500 ml of seawater.
6578
Time to Eliminate Plastic Waste. Let’s Put Worms to Work! Or Beetles?
Victor Sanchez, Jovany Reyes, Nancy Gutierrez, and Mark Friedman (advisor)
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Our goal is to reduce environmental waste and to research and experiment with recently discovered plastic-eating worms and beetles. People should care because it will help make a cleaner and healthier environment on Earth by providing a solution to the millions of tons of annually discarded plastic products. This is also of broader concern because of the plastics that are contaminating and killing marine organisms, those that we eat, and others that comprise part of the marine ecosystem. Our hypothesis is that while specific species of worms do eat forms of plastic, it might not provide a mass solution to plastic waste. We did advance research and discovered that mealworms and super-worms have been shown to eat plastic like Styrofoam and plastic bags. We have begun our experiment with various species of worms placed in glass containers with different types of plastic (Styrofoam, films, PET, etc.). We have had rapid results, pictures, and data on weights of worms and remaining plastic pieces. Regardless of our experimental results, our project can highlight the importance of discovering technical and scientific innovations to the plastics problem. Through our outreach presentations to others we can emphasize the importance of reuse, recycling, and alternatives to plastic use.

6579
Testing Dry Erase Spray With Plants
Jennifer Tomlinson and C. Saracino (teacher)
New Middle School Pathway
8701 Park Hill Dr., Los Angeles, CA 90045

I tested what happens to a plant with dry erase spray and little water, and to a plant with no spray and little water. My project had a control group (no spray and little water) and an experimental group (spray and little water). I put my fully grown plants in my laundry room window, and then sprayed one with dry erase spray and gave it 1 teaspoon of water. For my second plant I did the same thing, but without spray. I measured them and the one with no spray was 10 inches high, while the plant with spray was 9 inches high. I later made a chart measuring up to 6 inches and labeled each plant measurement. Afterward I took photos and repeated the steps every day. I made a final measurement of my spray plant, which was 6 inches high, and of my no spray plant, which was 5 inches high. The results for my no spray plant were that it kept petals and color, grew weak, and its petals got thinner. My spray plant lost some petals, grew weak, and kept color, its leaves shriveled, and it had very thin petals. Both plants grew negatively (lost height) because instead of growing, they started to die and get weak. I measured them by standing up a ruler and counting exactly where their growth ended. They shrunk and lost a few inches. Although I didn’t measure width, I got to see what happened to both plants with different treatments.

6580
Which Type of Video Games Elevate Heart Rate and Blood Pressure?
Anthony Johnson and C. Saracino (teacher)
New Middle School Pathway
8701 Park Hill Dr., Los Angeles, CA 90045

In this experiment I tested two types of video games (sport-based and action/adventure) and determined which one increased heart rate and blood pressure more. I thought if I played more action/adventure games, my heart rate and blood pressure would increase. To conduct this experiment, I (12 years old) and my dad (40 years old) played each type of video game for 30 minutes, and I took the measurements of blood pressure and heart rate at the beginning. The next measurements were 15 minutes into the games, and the final measurements were at the end of 30 minutes. I waited 5 minutes until testing again. I recorded the data on two separate charts, turned it into a graph, and calculated the averages. The graph showed that the adult male (my dad) had higher numbers than the male child (me). The numbers dropped or rose between the first and third trials. The adult male’s average systolic blood pressure and heart rate for action/adventure games were 142.3 mmHg and 76.5 beats per minute (BPM), respectively. The adult male’s average systolic blood pressure and heart rate for sport-based games were 141.5 mmHg and 85.3 BPM, respectively. The child male’s average results for action/adventure games were a systolic blood pressure of 113.3 mmHg and a heart rate of 84.7 BPM. For the sport-based games, the child male’s average results were a systolic blood pressure of 108.3 mmHg and a heart rate of 85.8 BPM. All of the results showed that action/adventure video games increased blood pressure but not heart rate, and sport-based games elevated heart rate but not blood pressure.
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