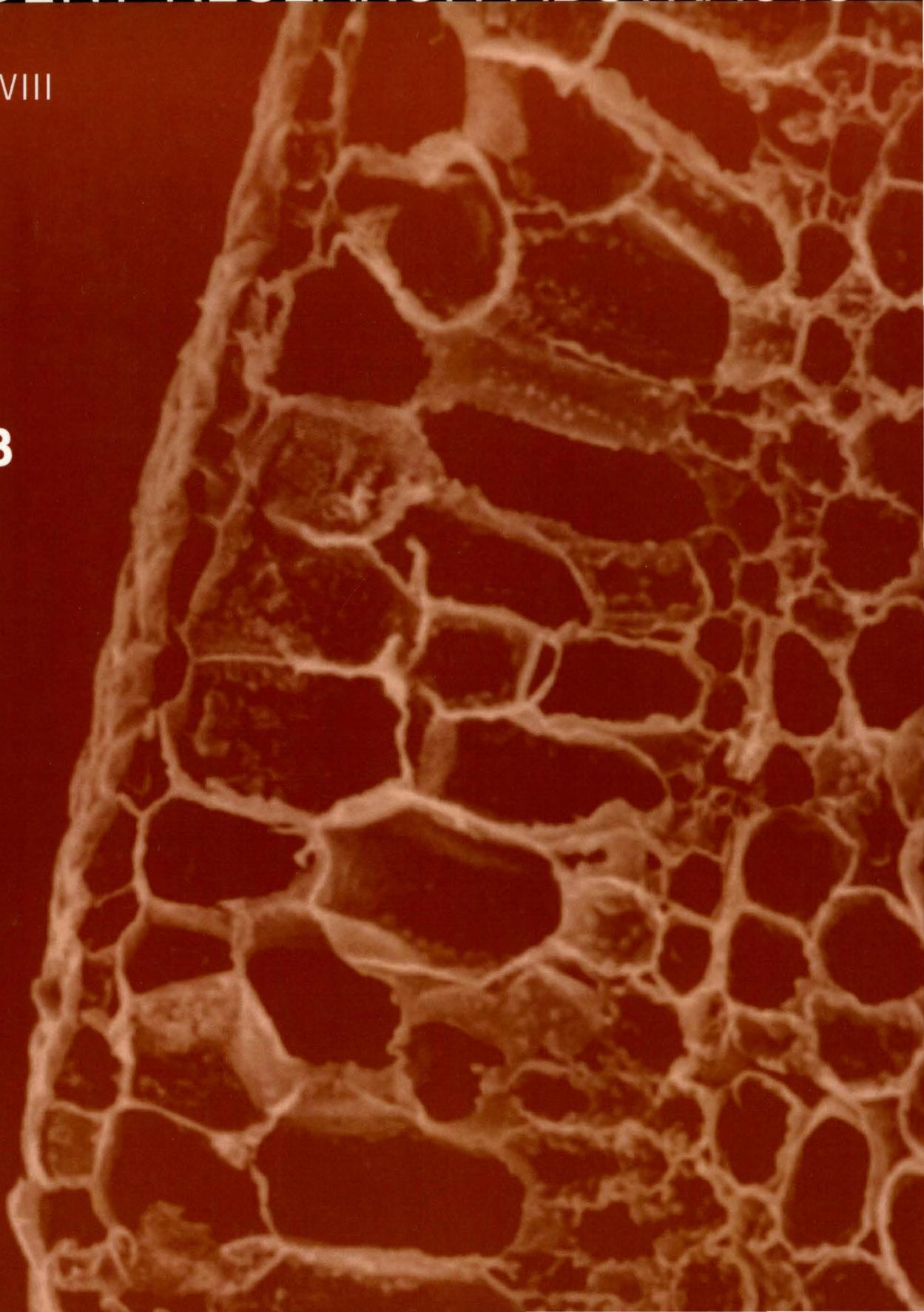


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**2003**



# **JOURNAL of STUDENT RESEARCH ABSTRACTS**

Volume VIII

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Editor  
Steven B. Oppenheimer  
California State University  
Northridge, California



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# JOURNAL OF STUDENT RESEARCH ABSTRACTS

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The journal is intended to provide students and teachers with: (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 hypothesis to be tested, methods, results and conclusion statements, and most important, sufficient numbers of appropriate control and experimental samples and repetitions of experiments. Other abstracts do not display one or more of the principles of perfect science. We do not eliminate abstracts that do not demonstrate perfect science. The editor, however, reviews all abstracts and reserves the right not to publish abstracts that are seriously flawed.

Those abstracts were deleted from this issue. 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 set-up and planning. The journal encourages abstracts on the planning and progress of such projects. 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 the National Science Foundation, Eisenhower program, the other sponsoring agencies, the university or the journal staff.

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Any science teacher may submit student abstracts following the exact format given in the abstracts in this volume. After the title (in caps), followed by student author names and teacher name (teacher), school and school street address, city, state and zip, abstracts should begin (after a 3 space indentation) with the purpose of the study, followed by how it was done, the results and conclusions. All abstracts must be typed neatly, error free. Messy abstracts and those not following proper format will be discarded. The journal is not responsible for any abstracts received or for publication errors. Students and teachers are advised to photocopy abstracts before mailing.

Only teachers may submit their students' abstracts to the journal. They should be mailed along with a cover letter on school letterhead to: Dr. Steven Oppenheimer, Editor, Journal of Student Research Abstracts, Center for Cancer & Developmental Biology, California State University, Northridge, 18111 Nordhoff Street, Northridge, CA 91330-8303. Deadline for receipt of abstracts for each annual volume is February 1. Abstracts received after the deadline or those accepted after the volume fills will be held for consideration for the next annual issue. Supplies permitting, a complimentary copy of the journal will be sent to teachers whose students' abstracts are published in that volume. **If students, parents or principals wish a copy of the journal, a \$25 check per copy, payable to CSUN Foundation, Center for Cancer and Developmental Biology must be mailed along with the abstract.**

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# SUBJECT INDEX

Number refers to abstract number

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# **ABSTRACTS**

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## SOLAR-TERRESTRIAL INTERACTION PROGRAM

Brandon Rosenthal, Jonathan Senescu, Emily Palacios, Felice Amisola, Petros Boyadzhyan, Chris Truong, Vicky Petrovsky, Cynthia Kim, Xin Yang, Sasha Mendez, Magda Iskandaryan, Eric Dindji, Edson Hernandez, Ruslan Guberman, Andrew Hirako, Lyudmilla Kudishevich, Tara TeSlaa (Bob Coutts, Teacher). Van Nuys High School, 6535 Cedros Avenue, Van Nuys, CA 91411.

We investigated the environment between the Sun and the Earth using ACE and SOHO satellite data available on the Internet using the networked computers in our classroom. In our first experiment, we learned how to measure the speed of the solar wind, using a series of time-stamped pictures of one coronal mass ejection. We then monitored live numerical and graphical data sources on the web to observe changes in the speed of solar protons over a three-week period. We found that the speed of the solar wind varies between 300 and 800 kilometers per second. Our second experiment was to observe the Aurora Borealis, an upper atmospheric light production process associated with high-energy particles coming from the Sun, via the solar wind. We were able to see variation in the extent of and the total transmitted power levels of the Aurora Borealis over a two-week period using data tables and pictographs from another web site. We found that the southern edge of the oval moves hundreds of miles Northward and Southward, between central Canada and the Northern United States and that the Auroral oval varied in total power transmitted, between 3 and about 100 giga-watts, in relatively short amounts of time (a week or so). We found sudden shifts of an order of magnitude or more, to be subject for further study. Also, reversal of electron flow rates are of interest. The third experiment this semester is one in which the skills of a database manager were needed. Fortunately, Brandon Rosenthal, a student in the Biotechnology class, was up to the task.

Three classes divided into small Internet research teams, two Honors Physics and one Biotechnology, and gathered photographic data in the form of three different types of pictures of the Sun over a two-day collection period. The file types were: Intensity-grams, Helium II filtered pictures and Iron XII filtered pictures. Each filter reveals its own type of information. We used Brandon's sequential file-naming procedure, so that he could organize seven month's worth of data into a reference library for later research. Nearby JPL has expressed an interest in using our solar image database. Brandon also animated all these photos a month at a time. We will examine them next semester to study dynamic processes on the solar surface and in the Solar Corona as well as simple sun spot information. These animations have been stored on reproducible CDs in our classroom. Example animations have been placed on the classroom web site as a reference source <http://coke.physics.ucla.edu/laptag/VanNuys.dir>

A presentation concerning our project was made to the American Association of Physics Teachers at the fall meeting 2002, at California State University at Northridge, at which time a connection was made with CSUN's Solar Observatory. We are planning a visit in the spring of 2003.

**2850**

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**ION ACOUSTIC WAVES IN A COLD PLASMA**

Ivan Tochitsky, Robert Ransom, Janine Ransom, Jinna Lee, David He, and our teachers Robert Baker and James Ransom. University High School, 11800 Texas Avenue, Los Angeles, CA 90025.

Plasma is the fourth state of matter. It is an ionized gas composed of neutral atoms, electrons and charged atoms. It has different collective properties from those of neutral atoms. We (Ivan Tochitsky, Robert Ransom, Janine Ransom, Jinna Lee, David He, and our teachers Robert Baker and James Ransom) have performed an experiment analyzing some properties of a plasma. The experimental facilities are housed at Dr. W. Gekelman's LAPTAG Plasma Physics Laboratory at UCLA. We bleed argon gas into a spherical chamber. The density of the gas is very low, around  $10^{-5}$  Torr. Next electromagnetic radiation at radio frequencies is added to the gas. This causes a part of the gas to become ionized. In the chamber we now have electrons, ionized argon and neutral argon. The chamber contains an antenna in the shape of a square grid. The grid is pulsed with electromagnetic radiation at a frequency of 10 kHz. This electromagnetic wave travels through the plasma. Using a Langmuir probe, we detect that pulse and determine the speed of the wave in the plasma. This wave is an ion acoustic wave. From the speed of the wave we can determine the amount of ionization and the density of the plasma.

**2851**

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**DO ENVIRONMENTAL CONDITIONS DETERMINE IF A PORTION OF AN AFRICAN VIOLET WILL GROW WHEN SEPARATED FROM ITS MOTHER PLANT ACCORDING TO DIFFERENT WEATHER AND ENVIRONMENTAL CONDITIONS**

Mayra Castaneda, Arpi Arman, Esmeralda Alvarez, Oryla Wiedoeft (teacher), D. Brian Houck and Brenda J. Kanno (CSUN Research Advisors). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

The purpose of our experiment was to determine whether a portion of an African violet would grow independently when separated from its mother plant. To answer our question, we set up an experiment. We hypothesized that there would be a 50% chance for the plants to grow under varying environmental conditions. We proceeded by making cuttings of the desired portion and shape from the plant. When doing so, we had to cut down the stem at a 45 degree angle and reduce the size of the leaves to prevent the newly separated plant from dehydration and dying. Afterwards, we dipped the tips of the stems in a hormonal growth powder that stimulated the stem in order for it to grow roots, therefore allowing it to grow successfully separated from its mother plant. After proceeding from these accommodations, we set up two different environmental conditions to determine the effect of temperature, humidity, and light exposure on plant growth.

One of the conditions was a tropical rain forest environment, which we created by following several procedures. First we placed three cuttings in a small container full of perlite; we put these containers inside a plastic ziplock bag. Then by adding a small amount of water in the closed plastic bag, we created a humid and high pressure surrounding to mimic the high humidity rate in a tropical rain forest. The other environment that we created was dry, hot, and desert like. We followed the same procedure, except in this case we avoided the use of the plastic bag to prevent water accumulation.

We concluded that the rain forest environment allowed ideal growth of an African violet separated from its mother plant. In contrast we also arrived at the conclusion that the desert environment was too dry, which was inadequate for the growth of the African violet plant. We realized the hot, dry environment did not allow the plant to grow successfully separated from its mother plant.

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## 2852

### **HAMSTER FINDINGS**

Denise Pham and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803-3099.

My project "Hamster Findings" tests the senses of my two female hamsters. My two Syrian hamsters are both female but both are not considered "normal"; one has a missing paw so she is considered "abnormal." Nevertheless, I still used her in my project. I built a maze, which has bright colors going through it. I am testing my hamsters' senses and their memory. I am timing their daily runs through the maze and testing to see over a period of 4 weeks if they will improve their run through the maze to find the food, and if colors on the maze affect how quickly they find the food. I predict that over a period of 4 weeks their running time through the maze will improve significantly.

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## 2853

### **WHAT KIND OF BATTERY LASTS LONGER?**

D. Kim and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment tested the difference in duration of different kinds of batteries. The three kinds of batteries that I tested were zinc-carbon battery, alkaline battery, and nickel-cadmium or rechargeable battery. I've tested these batteries on a regular CD player with same setting, CD, place of testing and even the same headphone. The results were that zinc-carbon batteries averaged between 6 to 6½ hours, alkaline batteries averaged between 8 to 8½ hours, and nickel-cadmium batteries averaged 7½ to 8 hours. The results suggested that for power consuming electronics, alkaline batteries are the best choice. For low power consuming electronics, such as remote controllers and clocks, zinc-carbon batteries are the best choice. Nickel-cadmium's

duration on CD player decreased gradually as the experiment was repeated over many times. This suggests that rechargeable batteries will save you lot of money if used in power consuming electronics, instead of buying alkaline batteries, which cost a bit more than cheap zinc-carbon batteries.

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## 2854

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### **WHICH TOOTHPASTE CLEANS COFFEE-STAINED EGGS BETTER?**

V. Shkolnikov and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the cleaning effects of toothpastes such as Colgate Whitening, Aquafresh Whitening, and Crest Whitening on coffee-stained eggshells. The eggshells were stained with coffee for 3 minutes. Each eggshell was brushed with a regular brushing amount of every toothpaste using a Crest toothbrush, and then the eggshells were compared using a whitening guide. The experiment was repeated 3 times. The results showed that Aquafresh Whitening works better than the other brands used in this experiment.

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## 2855

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### **VOLCANO ERUPTIONS**

Guadalupe Espinoza, Tanya Cortez, Isabel Moncada and Jackie Ockene-Fogelman (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

This research focused on the effects of volcanic eruptions. Each group member researched volcanoes and conducted a demonstration to model volcanoes. We found out that lava is extruded from volcanoes during these eruptions. Hills and mountains may form around the vents.

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## 2856

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### **DOES SUGARFREE GUM HAVE AN EFFECT ON YOUR MEMORY?**

Lindsey Schurman (student) and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

For my science project I tested whether or not chewing a piece of gum could change the thought or answer of a question. For the experiment I chose two kinds of Wrigley's gum, the first a sugarfree spearmint and second, a non-sugarfree spearmint. With this I asked three different friends ten questions all the same, some of them about myself, some about the first or last thing we did together. I asked them these questions three times first with no gum, second with sugar-free gum, and then with non-sugarfree gum. I never told them whether they were right or wrong, giving them the ability to change their answer. Out of these questions the time that they were answered most correctly was the non-sugarfree gum by two out of the three friends. One

answered one more question right each time, the other answered one more question right on the third time, rather than the first and second, and the last one got one more right on the second and third rather than the first.

## 2857

### **EXPRESSION OF IL-6 FAMILY OF CYTOKINES MESSENGER RNAS FOR NEURAL CELL ACTIVITY IN EARLY EMBRYO DEVELOPMENT OF BRACHYDANIO RERIO (ZEBRA FISH)**

A. Moshtaghian, M. S. El-Masry, A. Behzadian, D. Borhan, M. Chen, M. Diep, P. E. Foulon, I. Gampel, H. J. Hoang, M. A. Iglesias, B. M. Kim, C. Kim, R. Klibaner, K. Kogan, D. E. Lang, J. J. Lee, K. Y. Lee, L. Lee, M. A. Mendez, C. J. Miller, M. Minassian, E. J. Park, H. J. Park, T. W. Rosenbaum, V. Sangkhae, A. Sarwary, J. S. Saweres, C. Wang, R. Wilkinson, E. W. Wu, S. D. Wu, D. J. Yoon and C. Riley (teacher). El Camino Real High School, 5440 Valley Circle Boulevard, Woodland Hills, CA 91367.

During the early developing stages of a Zebra Fish, our hypothesis is that Interleukin-6 Family of Cytokines induces the nuclei of neural cells to divide by binding to specific high affinity neural cell membrane receptors. Located on or within a neural cell are receptor proteins, each with a three-dimensional shape that fits the shape of a specific signal molecule. When a signal molecule approaches a receptor protein of the right shape, the two can bind. The binding induces a change in the receptor protein's shape, ultimately producing a response in the cell. Hence, a given cell responds to the signal molecules that fit the particular set of receptor proteins it possesses and ignores those for which it lacks receptors. No one else has thought of using receptor-complex regulatory molecules produced early in embryo developing stages to affect nuclei of other cells.

Zebra Fish are purchased from Carolina Biological Supply (Burlington, NC, USA). Total RNA extraction is prepared from a pool of mixed stage embryo tissues. The extraction procedure is by Chromczynski and Sacchi (1987) as modified Gong et al, (1992) for Fish tissue. A deoxyribose thymine oligonucleotide primer mediates the IL-6 cDNA synthesis. Single strands mRNA are separated from total RNA by use of a deoxyribose thymine oligonucleotide cellulose affinity column (Sambrook et al, 1989). The column has a high affinity to bind poly adenine nucleotides located in the tail region of messenger RNA. A single strand messenger RNA sequence is used as a template for IL-6 complementary DNA synthesis. The procedure includes Superscript II RNAase H Reverse Transcriptase (Life Tech Cat. No. 18064-0220).

A technique called the polymerase chain reaction (PCR) is used to quickly make copies of selected IL-6 alleles of Zebra Fish cDNA. With PCR you can produce a billion fold increase in DNA material within a few hours. In PCR, the single-stranded cDNA to be copied and short pieces of artificially-made DNA called primers are added together. The primers bind to places on the cDNA where the copying can begin. DNA polymerase and free nucleotides are added to the mixture. The DNA polymerase extends the cDNA by adding on complementary free nucleotides to the primer. The result is a double strand of DNA that is complementary to each

other and to the original strand. The heating and replication process is repeated over and over again. Every five minutes, the sample of DNA doubles again, resulting in many copies of the cDNA sample in a short amount of time. The amplified double-stranded IL-6 complementary DNA is spliced into fragments with use of NotI and SalI restriction enzymes. The polymerase chain reaction products are analyzed by agarose gel electrophoresis using a 100-bp DNA ladder as molecular marker.

No two IL-6 Family of Cytokines have the same cDNA nucleotide sequence unless the segments are identical because of random mutations and recombinations during sexual reproduction. The places a restriction enzyme can cut depend on the DNA sequence. The DNA fragments that result may differ between IL-6 Family of Cytokines at various developing stages of the embryo. Such fragments of different lengths are called restriction fragment length polymorphisms, or RFLPs.

RFLPs are used to identify IL-6 Family of Cytokines at various developing stages of the embryo and to determine how closely related IL-6 Family of Cytokines is to one another. Besides, an IL-6 DNA fingerprint is predictable. An IL-6 cDNA fingerprint can be observed as a pattern of dark bands on photographic film that is made when an IL-6 Family of Cytokines DNA fragments (RFLPs) are separated by gel electrophoresis, probed, and exposed to an X-ray film. Because restriction enzymes can cut the cDNA fragments from different IL-6 cDNA nucleotide sequences at various developing stages of the embryo into cDNA fragments with different lengths, each IL-6 Family of Cytokines has a unique pattern of banding or DNA fingerprint. The banding patterns from different IL-6 cDNA nucleotide sequences at various developing stages of the embryo are compared to establish whether they are related.

A hybridization reaction is carried out using an allele sequence-specific oligonucleotide in order to characterize and identify complementary allele nucleotide sequences in the tissue of developing stages of the embryo. An IL-6 allele nucleotide sequence-specific DNA oligomer is designed from an IL-6 allele nucleotide sequence-specific loci found in adult Zebra Fish brain and fin tissue. IL-6 DNA allele nucleotide sequence-specific oligomer is synthesized using an Applied Biosystems 3948 DNA synthesis and purification. An RNA primer is attached to the allele nucleotide sequence by polymerase chain reaction. During hybridization, the denatured, amplified cDNA nucleotide sequence binds to the allele specific IL-6 nucleotide sequence bound on nitrocellulose strip. Highly specific washes with a strong base compound (NaPi) and sodium dodecyl sulfate are done to validate that the probe's nucleotide sequence is 100% complementary to IL-6 nucleotide DNA sequence. Finally, ethidium bromide agarose gel electrophoresis, photography and molecular weight standard markers are used to identify and assess messenger RNA expression. The banding patterns from different IL-6 cDNA nucleotide sequences at various developing stages of the embryo are compared to establish the level of mRNA expression.

Results: Our study reveals that IL-6 Family of Cytokines is evident at various developing stages of the Zebra Fish embryo. The research data provided us with tissue specific facts about the IL-6 complementary DNA sequence. The data indicated a high degree of dissimilarity of IL-6 DNA nucleotide sequence up to three hours for developing stage embryo when compared to mixed adult brain tissue of Zebra Fish. Also, a high degree of dissimilarity in IL-6 DNA

nucleotide sequences steadily increased from six to twelve hours for developing stage embryo when compared to the mixed adult brain tissue of Zebra Fish. This evidence implies that embryo cytokines of IL-6 are markedly expressed very early in developing stages of the embryo. In fact, IL-6 complementary DNA gene products that bind the receptor protein of neural cells must play a necessary role for cell activity because the embryo cells are totipotent prior to the gastrula stage of development. Therefore, an IL-6 gene product role is to cause a change in the cell activity rather than to perform a specific role and function.

Conclusion: The IL-6 system we've investigated has enabled us to find out how and when molecules destined to direct nuclear behavior in the earliest stages of differentiation are set in motion. For future investigation, we can obtain Zebra Fish developing stage clone from the EST consortium and complete the DNA sequencing. The clone is about \$50 from IMAGE CONSORTIUM and sequencing can be performed by any number of commercial outfits. Our NSF/Eisenhower study has provided some evidence in that appropriate amounts of receptor-complex regulatory molecules, once they have been identified, may reactivate other cell nuclei to divide. What's more, an untouched area of new research could follow from this lead.

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## 2858

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### FLOWER FOOD

M. Wei and G. C. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment tested whether flower food was effective in keeping a flower in bloom longer. A dozen roses were divided equally and put into two separate vases. The same amount of tap water was added to the two vases. Flower food was added to the water in one of the vases. Then the results were recorded. It turns out that flower food does have a positive effect on flowers. The flowers that didn't receive any flower food, or the control group, bloomed later and didn't completely open. These flowers also wilted sooner. The experiment group, or the flowers with flower food, bloomed sooner and completely opened before wilting. By the time the flowers in the experiment group wilted, the control group flowers had already died and shriveled up.

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## 2859

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### CORRELATION BETWEEN RADON GAS EMISSIONS AND SEISMIC ACTIVITY ALONG THE HAYWARD FAULT, BERKELEY CALIFORNIA

Daniel Holtmann-Rice and Kevin Cuff (mentor). Lawrence Hall of Science, University of California at Berkeley, 1 Centennial Drive, Berkeley, CA 94720.

The purpose of this study was to determine whether or not a correlation exists between radon gas emissions and seismic activity along the Hayward fault. Previous studies have shown

that radon concentrations are higher over fault zones, and if a correlation between seismic activity and radon is established it could lead to more accurate earthquake prediction. This experiment was carried out by placing an alphameter (a device capable of accurately measuring radon concentrations at specified time intervals, usually 15 mins.) in close proximity to a section of the fault (lat/long coordinates 37° 52.689 N 122° 14.766 W). Once a week for two months the daily data collected by the device was downloaded along with earthquake data retrieved from local seismometers. The data from the alphameter was then compared with the seismic data to see if any correlation existed. A general correlation was found: within approximately one week of a peak in outgassing, an earthquake occurred. This could be explained by the fact that stress built up within a particular fault region causes the formation of microfissures, which increase outgassing, leading to a climb in radon readings. Any release of the stress (such as an earthquake) would cause the microfissures to close, and the radon readings to drop as a result. Our data supported the hypothesis that peaks in radon outgassing precede earthquakes, and while we were able to determine that a relationship between outgassing and seismic activity does indeed exist, further research is necessary to determine the exact nature of this relationship.

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## 2860

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### **RADON OUTGASSING IN THE CASA DIABLO REGION, LONG VALLEY CALDERA, CA**

Nipah Adarkwah, Daniel Holtmann-Rice, and Kevin Cuff (mentor). Lawrence Hall of Science, University of California at Berkeley, 1 Centennial Drive, Berkeley, CA 94720.

Long Valley Caldera is an active volcanic region located in east-central California. The purpose of our research was to identify locations where radon gas is emitted in the Casa Diablo area of the caldera. To accomplish this, we buried 35 radon detector cups in the ground, within a 7 x 5 grid with 20 meter spacing between each cup. After five days we removed the detectors and analyzed them in the lab with an instrument specially made for analyzing our radon detectors. After analysis of the detectors, we created a radon outgassing map by using measured radon concentration values along with longitude and latitude values for each sample location. Analysis of the map indicated that radon outgassing trends match those of four small faults in the area that are perpendicular to each other. The highest readings found in our survey were recorded in an area where dead trees are found. Also, steam can be seen rising from this same area early in the morning. We then compared the radon outgassing map we had made with one showing fault lines in the area. We found that the radon gas emissions have the same trends as the faults in the area. This tells us that radon gases are emitted from the faults in the caldera, and that this type of research can be used to find faults that may be buried.

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## 2861

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### **IS FAT A FACTOR IN PEOPLE'S CHOICES OF FOOD?**

Janna LynTakeyama, Mr. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment was to prove why fat affects our intake of certain foods. A taste test was made using Regular and Low Fat Pringles which have a difference of 4 grams of fat. 72 people took the taste test. 37 were male and 35 were female. Results show that both males and females prefer the taste of the regular chips to the low fat ones. The results also show that 2 males and 12 females preferred the taste of the low fat Pringles. This may mean that they are supertasters and the Regular chips are too salty for them. In conclusion I think we have evolved to like foods higher in fat as means of survival because Omega 3 and Omega 6 acids are essential to our diet.

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## 2862

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### **EFFECTS OF CERTAIN DRUGS ON CARASSIUS AURATUS**

Ana Morales, Karla Siguenza, Vaqnessa Morones, Dr. Richard Gilbert (teacher). Valley Alternative High School, 14162 East Lomitas Avenue, La Puente, CA 91746.

As part of National Red Ribbon Day, this experiment was developed to ascertain the effects of certain drugs on the respiration rate of *Carassius auratus*. No specimens died from this experiment, exposure was kept under 5 minutes, all specimens were reintroduced into fresh water and only used once during the series of experiments. The experiment was conducted schoolwide and 3 observers were assigned to each experimental specimen. A single *C. auratus* was placed in 250 ml of fresh water and allowed to acclimate for 3 minutes. Ten specimens were used for each trial for a total of thirty specimens for each stimulant. Thirty drops were placed in each beaker. Respiration measurement was performed via gill slit movement. Gill slit measurements were recorded for 15 seconds at basal, 1, 2 and 3-minute intervals. With 90 proof alcohol the *C. auratus* mean respiration rate decreased from a basal rate of 32, 32 at 1 minute, 29 at 2 minutes and 25 at 3 minutes. A 10% codeine solution produced a mean indeterminate respiration rate of 29, 28, 30 and 26; however, several specimens began to swim sideways after 2 minutes. A 10% caffeine solution produced mean results of 31, 35, 30 and 20 with the respiration rate increasing then rapidly decreasing. A solution was produced from a single cigarette by passing the smoke through a 10 ml water filter. Thirty drops of this filter solution was then introduced into the beaker. This solution produced a mean respiration rate of 27, 35, 34 and 30 in the subjects. The rate immediately increased then began to normalize at a higher rate. These results did support our hypothesis that introduction of foreign drugs into a living system does affect respiratory rates. This experiment does lead to further questions concerning the long-term effects of these drugs on respiration rates based on lengths of exposure and concentration levels and, secondly, on the normalization of respiration rates based on concentrations and exposures.

**2863****THE PREDICTIVE VALUE OF SATELLITE IMAGERY FOR WEATHER INVESTIGATION**

Briana Anter, Raquel Cedar, Natalie Chitayat, Jennifer Esfandi, Arielle Feit, Desiree Golbahar, Stephen Goldsmith, Robert Kanter, Ken Lahav, Lara Leitner, Jessica Levine, Myra Meskin, Neelie Milstein, Stefenie Sarraf, Erin Spiegel, Michal Vardy, Steven Wilen, and Ruben Zweiben. Stephen Cooperman (teacher). Milken Community HS of Stephen S. Wise Temple, 15800 Zeldins' Way, Los Angeles, CA 90049.

Our goal was to predict large-scale weather 48 hours in advance through infrared, enhanced infrared, and water vapor spectral satellite imagery, comparing predictions with actual Los Angeles weather. Our working hypothesis is that—by satellite pictures alone and with no other instrumentation—we can follow large-scale cloud motions and predict local weather like experts do.

We used twelve-hour animation loops from [http://weather.unisys.com/satellite/sat\\_ir\\_west.html](http://weather.unisys.com/satellite/sat_ir_west.html), following clockwise (pressure highs) or counter-clockwise (pressure lows) movements of clouds. Understanding the pressure forces involved, allowed us to predict weather for several upcoming days. Of course, some other times, we were surprised when sudden motions in another direction occurred, possibly due to jet-stream effects not seen in the photos.

For example, on November 18, 2002, we noticed from animated cloud sequences that a part in the clouds (“bifurcation”) several hundred miles to the west (almost a day away) would head North and South over Los Angeles, and we correctly predicted clear skies. Various “controls” we used were other websites (<http://www.weather.com>), the Weather Channel, and other established sources, such as radio and TV weather spots, to which we compared our information.

One of our next steps will be to quantify this more by taking into account the curvature of the Earth and foreshortening effects on cloud speeds. We would also like to obtain “real” weather instruments so that wind speed, temperature, humidity and barometric pressure can be measured throughout a day as the clouds pass.

**2864****WHAT DO YOU PREFER?**

Christina Yeung and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803.

In this experiment, I wanted to find out if mice prefer familiar surroundings, or if between smell and sight, they prefer to rely on one sense more than the other. To test the familiarity preference, I first trained 8 mice to learn a route in a maze for two weeks, after which I allowed them the freedom to use whatever route they want to reach the bait (seed mix and cheese) for a duration of another two weeks. To test their preference of senses, I placed the mice between a piece of foam board, rubbed with cheese and seeds to leave their scent, and a clear, plastic, zip-lock bag containing seeds and cheese so they can be seen but not smelled, and observed which

one the mice went to first. The results: the mice showed no preference for familiar surroundings, but did show a preference for the sense of smell.

## 2865

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### **CANS LEAK METALS INTO H<sub>2</sub>O**

Carrie Ng and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803.

Fish and other types of seafood are part of a very healthy diet, but due to existing contamination of the sea, these sea creatures become increasingly more dangerous to consume. One possible factor for water pollution is the littering of cans and from these cans, I suspect that harmful metals (i.e. lead) are leaked into the environment. The animals that inhabit the area then possibly absorb these toxins into their bloodstreams and if they survive, humans capture and devour them along with the toxins. Although the amount of toxins may be minute, the accumulative result may be extremely damaging!

In this experiment, canned seafood from local markets was tested to see whether they leaked metals into the water. A total of thirteen tanks were used, each with the same amount of conditioned water. The first two tanks were the control, one with no cans and uncontaminated water, and the second with eleven cans of different brands produced in different countries. The remainder of the tanks each contain a different brand of cans. Finally, tests would be performed to measure the level of metal, if any, that leaks into the water in the tanks over a period of one and a half months.

## 2866

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### **WHEN A DROSOPHILA MELANOGASTER FLY HOMOZYGOUS RECESSIVE FOR WHITE EYES IS BRED TO A FLY HOMOZYGOUS RECESSIVE FOR APTEROUS WINGS, ARE THE RESULTS OF F<sub>2</sub> GENERATION CROSSES PREDICTABLE BASED ON MENDELIAN GENETICS?**

Esmeralda Alvarez and Oryla Wiedoef (teacher). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

The purpose of my experiments was to determine the following: If I bred *Drosophila* flies that were homozygous recessive for white eyes with flies homozygous recessive for apterous wings, would the F<sub>2</sub> generation yield double mutant flies, white eyed and apterous, in a 1:16 ratio as predicted by Mendelian genetics. Parent and F<sub>1</sub> breedings were set up to investigate the F<sub>2</sub> offspring. During my breedings I encountered many unexpected phenotypes. My F<sub>1</sub> generation produced a female albino colored fly with wild-type eyes and vestigial looking wings. I set this fly aside for further investigation. My F<sub>2</sub> generation also produced many unexpected results. The predicted phenotypic outcome was 9 wild type: 3 white eyed with wild type wings: 3 apterous with

wild type eyes: 1 white eyes and apterous. However, I found from hatching 71 larvae that the F<sub>2</sub> generation yielded 42 wild type: 13 white eyed with wild type wings: 14 apterous with wild type eyes: 1 white eyed and apterous. In addition to the predicted phenotypes, the F<sub>2</sub> generation also yielded 2 wild type looking flies, but with wings that were longer than vestigial and shorter than normal and pointed down towards the ground and looked wet. These flies could not fly. I also observed 1 albino vestigial winged fly.

In conclusion, my experimental results did not align to Mendelian predicted 9:3:3:1 outcomes. My results were different in numeric ratio as well as predicted phenotypic outcomes. I am in the process of repeating this experiment to see if I get similar results. Additionally, I am running experiments to trace the cause of the two strange phenotypes that I found.

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## 2867

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### **WHAT CAUSES MULTIPLE VARIATIONS ON PREDICTED PHENOTYPES WHEN FRUIT FLIES HOMOZYGOUS RECESSIVE FOR WHITE EYES ARE CROSSED WITH DROSOPHILA HOMOZYGOUS RECESSIVE FOR APTEROUS WINGS?**

Esmeralda Alvarez and Oryla Wiedoef (teacher). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

In previous experiments, we found that when *Drosophila melanogaster* flies homozygous recessive for white eyes were crossed with flies homozygous recessive for apterous wings the outcome could not accurately be predicted using Mendelian genetics. The predicted four phenotypes and ratios from this cross are 9 wild type: 3 white eyed with wild type wings: 3 apterous with wild type eyes: 1 white eyed and apterous. Instead my F<sub>2</sub> generation produced two unexpected results, 1 albino vestigial winged fly, and 2 wild type looking flies, but with wings that were longer than vestigial, and shorter than normal, and pointed down towards the ground, and looked wet.

The goal of my current experiments is to determine the cause of the phenotypic variations found in my previous set of experiments. My hypothesis is that there is a gene creating pleiotrophic (different) effects, thereby yielding the flies with 'wet' looking wings and albino flies with vestigial wings. In order to investigate this, I have set up crosses and back crosses using the 4 unusual flies that I observed with the double mutant from my F generation, and 3 different members of my F<sub>1</sub> and F<sub>2</sub> generation.

I believe that I need to continue with the planned test crosses before any conclusions are drawn. However, through conducting these experiments, I hope to either determine the cause of the two variations in predicted phenotype, or be lead to questions that will refine my search for the answer.

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## 2868

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### 20,000 LEAGUES UNDER THE SEA

Therese Bataclan and Aulikki Flagan (teacher). Ramona Convent Secondary High School, 1701 West Ramona Road, Alhambra, CA 91803.

The scientific experiment I performed consists of warm seawater algae and certain poisonous elements; all store-bought. The algae was obtained from waters surrounding Florida. Once the algae arrived they were equally separated and placed in three plastic containers (rectangular in shape). Since the water that came with the algae was not adequate enough to fill up the entire tank, sea water collected from Catalina Island was placed in them as well. Over the next few weeks two of the three tanks were tested with either oil or pesticide. Equal amounts of each element was placed in its respective tank, while the control tank was left on its own. The objective was to see which poison, if any, affected the algae the most. TLC's were also performed at the end of the experiment in order to find out which poison had the most damage on the algae. The main goal of this experiment was to show others how oil and pesticide affect algae and other such vegetation in the ocean, and to make them aware of the many poisons that end up in the sea, accidentally or otherwise.

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## 2869

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### EFFECTS OF MAGNESIUM CHLORIDE ON SEA URCHIN FERTILIZATION

Brian Hernandez and William Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This study examined the question of possible magnesium chloride involvement in sperm-egg interaction in the sea urchin, *S. Purpuratus*. A .125 mL solution of sea urchin eggs was placed on a depression slide, then 12.5 uL of magnesium chloride was placed on the solution of the eggs. There were four different concentrations used in this lab, they were .1 M, .01 M, .001 M, .0001 M. After placing magnesium chloride on the eggs, sperm was then placed on it and the reaction would either cause fertilization or non-fertilization. For the amounts of .1, . and .01M of magnesium chloride, no fertilization was seen to occur among the eggs. For the molarities of .001 M, .0001 M of magnesium there was a small amount of fertilization that occurred, which was  $8\pm 1\%$  of the 50 eggs that were originally used. These were compared to a control of just sperm added to the egg solutions, which was  $93\pm 2\%$  fertilization. The results demonstrate that magnesium chloride in high concentrations stops fertilization, but magnesium chloride in lower molarities significantly decreases sperm-egg interaction in *S. Purpuratus*.

**2870****DO THE SAME FAMILIES OF COLLEMBOLA POPULATE THE LEAF LITTER AND THE SOIL?**

J. Aguirre, L. Alikhani, S. Bergman, M. Buchsbaum, J. Burkett, A. Canales, K. Caplan, K. Chan, L. Crittle, S. Dampf, B. De Los Santos, K. Deporter, A. Derse, G. Di Crosta, J. Edwards, L. Feldman, M. Field, J. Garcia, S. Ghasemi, I. Glen-Lambert, R. Gomez, S. Graham, K. Grossman, Z. Guzman, J. Hunter, J. Hutchings, R. Jauberty, K. Johnson, C. Khoury, T. Koch, A. Kim, M. Kossarian, M. Lopez, S. Loranger, J. Lowe, A. Mahjoubi, N. Maisonnave, A. Martinez, N. Matthews, A. Membreno, C. Morgan, N. Naczinski, D. Nedelcu, C. Newell, A. Orbin, C. Pages, F. Parsai, A. Partida, A. Perez, S. Player, A. Rogenstein, A. Rogero, L. Ruimy, V. Schieffer, A. Serban, S. Shevach, S. Soroudi, B. Starr, K. Stanfield, A. Stephenson-Wenn, R. Stern, A. Toxtle, I. Vasquez, S. Voragen, C. Wallace, P. Wardlow, A. Washington, S. Wilson, J. Woerner, E. Woolf, L. Yoshizuka, P. Zak, T. Miller (teacher). Parkman Middle School, 20800 Burbank Boulevard, Woodland Hills, CA 91367.

The purpose of our study was to see if different families of collembola prefer living in leaf litter as opposed to soil habitats. We believe some families of collembola are better adapted to higher environmental temperatures. Therefore, we also believe different families of collembola prefer living in either leaf litter or soil habitats. Collembola are microscopic, wingless, hexapods with a special appendage called a furcula, which is used for jumping. Leaf litter and soil samples were collected from eighteen sites in the Parkman Middle School Garden. Tullgren funnels were used to separate the collembola from the leaf litter. The soil samples were placed in water and the collembola were collected using a small wire loop. All collembola were identified to the family level by using stereomicroscopes. Collembola from the families Onychuridae, Isotomidae, Entomobryidae, Sminthuridae and Hypogastruridae were identified and collected. Our data clearly shows that the Onychuridae family prefers living in the soil. The Entomobryidae and Isotomidae families prefer living in the leaf litter. Not enough collembola from the Hypogastruridae and Sminthuridae families were identified to make a clear conclusion as to where they are most comfortable living. Our results proved our hypothesis was correct. Different families of collembola do prefer living in different environments.

**2871****WHAT COOKING INGREDIENT KILLS BUGS THE BEST?**

Stacy Lambert, Ingrid Valencia and Nandita Pal (teacher). Robert Fulton Middle School, 7477 Kester Avenue, Van Nuys, CA 91405.

In our experiment we used different types of cooking ingredients on bugs to see which ingredient killed which type of bug the fastest. We found our answer by collecting, researching and experimenting on bugs. We chose 3 different species of bugs (pill bugs, earwigs and millipedes) and 4 different ingredients (Vanilla, Vinegar, Soy Sauce and Tabasco Sauce). We put bugs in separate cups and added the ingredients. We timed and recorded our results and came to a con-

clusion. From our results we concluded that Tabasco Sauce is the main killer of all the bugs we experimented on. We also researched our main killer ingredient Tabasco Sauce to find that it is safe for most plant types.

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## 2872

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### WHICH LAUNDRY DETERGENT WORKS THE BEST?

Shelea Krivis and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment was to figure out which liquid laundry detergent works the best on a variety of stains. 6 equal circles were drawn on 7 plain, white shirts. Then 6 different stains filled each circle. Ketchup, soy sauce, nail polish, lipstick, pen ink, and a grass stain. Each shirt was washed with one of these 7 liquid detergents: Planet, All, Cheer, Tide, Surf, Sun Free, and Gain. Each one was washed, along with two towels, on the setting of color, warm/warm for 10 minutes. The two towels represented the rest of "your laundry" to make the results more accurate to your daily uses. Each one was then dried in the dryer for 30 minutes, then compared. The results showed that Tide, a name brand, worked best overall on all the stains.

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## 2873

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### EFFECTS OF DRANO ON SEA URCHIN FERTILIZATION

H. D. Hardy, J. C. Hecker and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This experiment examined the effects of Drano on the sperm-egg interaction of sea urchins, *S. purpuratus*. In the control experiment the eggs and sperm were allowed to fertilize without any interference. The result was a  $93\% \pm 2\%$  fertilization rate. A solution of one percent Drano was placed on a collection of a few hundred eggs. When sperm were added, only three eggs were fertilized. Most of the sperm died before they had a chance to fertilize. The next solution was 0.1 percent Drano. The average of the three trials of 0.1% Drano was 17.3 percent fertilization of the sea urchin eggs. The results suggest that the chemicals in Drano kill sperm and inhibit fertilization.

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## 2874

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### DOES THE PERIOD OF MOTION OF A PENDULUM DEPEND ON ITS WEIGHT, AMPLITUDE, OR LENGTH?

Sunny Gill, Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment was done to determine if changes in the weight, amplitude, or length affect the period of motion of a pendulum. A period is one whole swing. The pendulum was made and

connected with a bottle. Different variables were used for weight while the average length and amplitude was used. The same was done when different variables were being used with length and amplitude. The average length used was 12 inches, while the average amplitude was 40 degrees, and the average weight was 8 ounces. Each variable was timed and repeated 3 times. The time then for the three trials was averaged. A 4-inch string took an average of 1.15 seconds to complete a cycle while a 24-inch string took 1.86 seconds. When the weight was 3 ounces the time of the period took 1.35 seconds, and the time at 19 ounces was 1.51 seconds. And finally when the amplitude was at 10 degrees the period didn't take as long as it did at 90 degrees. These results all suggest that the period of motion does depend on the weight, amplitude and length.

## 2875

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### **EXPLAINING LOW CLASSROOM SUCCESS OF THE MICROBIAL LAVA LAMP FROM ALGINATE/YEAST BEAD DENSITY MEASUREMENTS**

T. Fernando, D. Nazari-Cohen, S. Rai and D. Gaughen (teacher). Taft High School, 5461 Winnetka Avenue, Woodland Hills, CA 91346.

We conducted the standard Microbial Lava Lamp (MLL) protocol. We color coded the glass/alginate/yeast beads to reflect the sugar concentrations of six 2 liter plastic bottles. The solutions ranged from 5% to 30%. We found no correlation between sugar concentration and successful beads (those which rose to water surface level, fell, and rose again) and the CO<sub>2</sub> bubble count in the fermentors attached to the top of each bottle. The low success rate (less than 2%) prompted us to explore the dimensionality of the successful, floating, and bottom-dwelling beads. We assumed a spherical shape for each category of beads and measured their average mass and diameter. We were then able to compute average bead density for each category and compare it to the sugar adjusted density of each solution. All bead densities were greater than their sugar solutions. This finding coupled with the low bubble count caused us to infer that bottom dwellers were not generating sufficient CO<sub>2</sub> to lift these beads and floaters may be blocking successful beads from reaching the surface to release the CO<sub>2</sub> gas. Floaters constituted at least one half of all beads in the six bottles tested.

## 2876

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### **THE EFFECTS OF GRAVITATIONAL FORCE ON EGGS**

Yi-ling Jennifer Leng and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment focused on the effects of gravitational force on eggs, or more specifically, what happens when eggs are dropped to the ground. Two eggs were taken, one hard-boiled, and one raw egg. They were both dropped from a height of approximately 5 feet 7 inches. This experiment was repeated several times. Different results were recorded for each egg. The hard-

boiled egg experienced some damage upon impact, but this was limited to some minor cracking of the shell and partial impairment to the solidified egg white. The raw egg, however, suffered extensive damage, including the obliteration of the majority of the eggshell, the destruction of the egg yolk, and its subsequent mixture with the liquid egg white. The results suggest that gravitational force has a more destructive effect on raw eggs than hard-boiled eggs.

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## 2877

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### **EFFECTS OF GLASS CLEANER ON SEA URCHIN FERTILIZATION**

L. M. Jones, L. M. Vandermark and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus CA 91350.

This study examined the question of the possible effects of glass cleaner in the sperm-egg interaction in the sea urchin, *S. purpuratus*. Windex glass cleaner was chosen to demonstrate possible results of water soluble household cleaning chemicals on the sea urchins. Solutions of 1/10% glass cleaner, 1/100% glass cleaner and 1/1000% glass cleaner were prepared by diluting the cleaner with water and was added to the sea urchin eggs prior to the addition of sea urchin sperm. The fertilization rate for the 1/10% solution was 8%. The fertilization rate of the 1/100% solution was 10%. The fertilization rate for the 1/1000% solution was 16%. Each experiment was repeated three times. The control rate was  $93 \pm 3\%$  without the addition of the Windex. The results indicate that the addition of household cleaning products to the eggs and sperm of sea urchins reduces their fertilization rate.

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## 2878

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### **THE EFFECT OF PRESSURE-TREATED WOOD AND PACKING MATERIALS ON TADPOLES**

Anne Sanglimsuwan, Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803-3099.

In the world we live in today there are numerous possible objects that may pose hazards to our environment, even if they come with the label that indicates it is environmentally safe. This experiment tests two of the possible hazards: pressure-treated wood and starch packing pellets. I prepared and tested environments that contained pressure-treated wood and starch packing pellets on young tadpoles, and recorded any changes in these tadpoles. Tadpoles in the pressure-treated wood environment died within a few days, and those in the starch packing pellets environment had not only changes in their eating habits but also died after a few weeks, supporting the fact that it is only under certain conditions that these environmentally friendly and safe materials are what they are said to be.

**2879**

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**EFFECT OF TEMPERATURE ON SEA URCHIN FERTILIZATION**

Jesus Aguilar, Alejandro Bermudez, Amar Billoo, Ana Canchola, Karla Carranza, Armando Castillo, Victoria Chavez, Jose Chinchilla, Brian Coronado, Anthony Diaz, Ely Dorantes, Joanna Flores, Celerino Garcia, Ivonne Garcia, Meribeth Garcia, Lizette Gomez, Benjamin Gonzalez, Roberto Gutierrez, Vanessa Hermoso, Georgios Koren, J. B. Lopez, Nestor Marmolejo, Arturo Martinez, Jose Medina, Hope Milazzo, Lanphi Nguyen, Nancy Norasethapron, Hilda Obispo, Santiel Patino, Jerson Rivas, Jaime Rodriguez, John Samson, Kim Sandoval, Nelson Solares, Kevin Truong, Richard Vasquez and Nandita Pal (teacher). Robert Fulton Middle School, 7477 Kester Avenue, Van Nuys, CA 91405.

Weather changes can alter the temperature of ocean waters. We wanted to find out whether sea urchin fertilization is affected by temperature changes. We collected eggs and sperm from *Strongylocentrotus purpuratus* sea urchins. We maintained artificial sea water (ASW) pH 8.0 at 0–4°C, 15°C and 24°C. We added 9 ml of ASW maintained at 0–4°C to a petri dish and then added a small drop of concentrated eggs to the petri dish and observed the eggs under the microscope. Immediately we added a drop of diluted sperm to the petri dish and noted the time required for fertilization. Similar studies were done with ASW at different temperatures. At 0–4°C the fertilization started within 1.5 to 2 minutes and all the eggs in our field were fertilized within 4 minutes. At 15–17°C the first fertilization was observed at 2–4 minutes and completed within 5–7 minutes. At 22–24°C fertilization started at 3–4 minutes and was completed within 6–8 minutes. Our results indicate that the shortest time required for sea urchin fertilization is at cooler temperatures.

**2880**

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**EARTHQUAKES**

Perla Corona and Charisma Ramirez, and Jackie Ockene-Fogelman (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

In this investigation, we researched the causes of earthquakes. First, we learned what occurs to Earth's crust during an earthquake. Second, we learned that Earth's crust is composed of plates. These plates rub against each other, causing pressure to build below the crust. Finally, the plates slip past each other causing shock waves through Earth's crust and mantle. This is what causes an earthquake.

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## 2881

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### **WHAT ARE PLANTS THIRSTY FOR?**

Erika Stern and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study tested whether different liquids would affect a plant's growth. Six marigold seeds and six partly grown petunias at 2.5 inches had to be purchased. The liquids used to water the plants were tap water, bottled water, tap water with sugar, tap water with salt, orange juice and lastly Coke. The plants were watered every three days. In the end the Coke and sugar water plants were about to die at two inches. The orange juice and salt-water plants had died. Lastly the bottled and the tap water plants grew very well. Tap water plants grew to 5 inches while bottled water plants grew to 4.8 inches. The only two marigolds that grew were the tap water seed at 1 inch and the bottled water seed at 0.8 inches. In the end, water was the main healthy source that gave plants a better chance to grow.

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## 2882

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### **THE EFFECTS LIQUIDS HAVE ON PLANT GROWTH**

J. M. Howerton and G. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this study was to find out in which liquid do Sugar Snap Pea plants grow the best: water, juice or soda. I used Coke for soda and White Grape Juice for the juice. To do this, I used already-grown sugar snap peas. There were 6 plants per liquid and I watered regularly. Since the plants were already grown, I tied bamboo sticks loosely to them so the plants had some type of structure to grow on. The juice plants were the first plants to die, most likely because of the citric acid in the juice. Also, the soda plants died because of the carbonation in the soda. The soda plants died a few days after the juice plants. The result of this experiment is that the water plants did not die but instead grew rapidly. The result of this experiment concludes that water helps plants grow the best. I guess that's why we call water the source of life.

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## 2883

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### **HOW MUCH OF AN EFFECT DOES PLANT FOOD HAVE ON BEAN PLANTS?**

Derek Wang and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment is to test how big of an effect plant food has on bean plants' growth. Forty Burpeeana Early Pea seeds were used. Twenty pea seeds were planted and grew with plant food in their soil. The other twenty pea seeds were planted and grew without plant food in their soil. The Pea plants were kept outside in the same area. They received the same

water, air, and sunlight as the rest of the pea plants. Adding plant food to the pea plants "diet" did help the pea plants grow larger and greener. After ten weeks of growth the average pea plant that did not receive extra nutrients from plant food grew 12.675 centimeters tall. After ten weeks of growth the average pea plant that did receive extra nutrients from plant food grew 13.42 centimeters tall. There is a way to graph this, but the pea plants that received plant food did look greener, healthier, and more appealing to the eye. Results show that adding plant food to a pea plant's diet does help it grow a little larger and helps the plant look greener and healthier.

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## 2884

### **HOW DOES TEMPERATURE AFFECT THE STRENGTH AND ELASTICITY OF RUBBER BANDS?**

Bret Bumerts and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment is to test the elasticity and strength of rubber bands treated at different temperatures. Sixty size thirty-two rubber bands were obtained. Twenty rubber bands were heated for five hours at 250°F. Twenty were frozen in a household freezer for three weeks, and twenty were left at room temperature. An apparatus was designed and built to test the rubber bands. A 4.48 kg. weight was attached to each rubber band, and the length the rubber band had stretched and the amount of time it took to break were recorded. The average time to break the rubber bands was: heated = 30 seconds, frozen = 233 seconds, control = 250 seconds. The average stretch length was: heated = 43 cm., frozen = 50 cm., control = 50 cm. The results suggest that heated rubber bands are weaker and less elastic than frozen or untreated rubber bands. Freezing weakened the rubber bands, but did not affect elasticity. The heated rubber bands had much less elasticity and tensile strength due to their oxidation.

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## 2885

### **QUANTIFICATION OF YEAST/CONCAVALIN A BEAD BINDING**

Esmeralda Alvarez, Arpi Arman, Oryla Wiedoeft (teacher), Dr. Steven Oppenheimer (CSUN research advisor). San Fernando High, 11133 O'Melveny Avenue, San Fernando CA 91340.

An assay was developed in this laboratory that has been used for several years to learn about the surface properties of cells by using beads derivatized with many different types of molecules. In our study we began work to attempt to quantify the binding of cells to beads. We used yeast cells and a typical bead to which yeast is known to bind, namely beads derivatized with sugar binding lectin concanavalin-A.

The process in which we attempted to combine and quantify the binding of yeast cells to beads follows. We washed the beads and yeast with distilled water in separate tubes. Next, we mixed the beads and yeast cells and we stirred the mixture by using a toothpick, therefore allow-

ing an even distribution in the water suspension. We observed the yeast/bead mixture under a microscope. We attempted to count the yeast binding to the beads. Finding it difficult to determine the number, we began to experiment with methods that perhaps would make the counting more visible and accurate.

By conducting this experiment we arrived at the conclusion that in order to establish an accurate method to count the number of yeast cells binding to beads, we need to continue developing other methods and conduct several experiments until we arrive at the ideal method.

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## 2886

### THE ACQUISITION OF LABORATORY SKILLS IN MOLECULAR BIOLOGY

Esmeralda Alvarez, Arpi Arman, Mayra Castaneda, Oryla Wiedoef (teacher), Dr. Stan Metzberg and Pavel Leib (CSUN Research Advisors). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

Proficiency with basic laboratory skills is crucial for a great outcome in any science experiment. Therefore, we carried out a training program to learn how to use laboratory equipment such as balances, pipettes, gel boxes, power sources and UV light boxes.

We learned how to make solutions of different molarities. In the process we learned to calculate the molecular weights of the constituents, then used stoichiometry to determine how much of the constituents to add to make the solution the desired molarity. In addition to learning how to make the calculations, we also learned how to use a balance and microbalance, graduated cylinders, stir plates, and pipettes ranging from 10 micro liters to 1 milliliter.

We became acquainted with agarose gel electrophoresis to analyze small samples of DNA. We poured and ran agarose gels, stained our DNA, and visualized our gel on a UV light box. We learned how to determine the size of DNA bands by using molecular weight markers.

We spent time in the DNA Sequencing lab where Pavel Lieb showed us how to use the thermocycler to amplify DNA samples, and to pour and load sequencing gels. After the DNA was run on the sequencing gels, we learned how to read chromatographs in order to determine the sequence of the DNA sample.

In conclusion, our experience helped us become familiar with many laboratory skills and their applications in molecular biology research.

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## 2887

### THE DIETARY EFFECT ON MICE

Sally Truong and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment was done to show which diet would be most beneficial for the memory. Eight (8) female mice from the pet store were placed into different groups of two (two for each

of the 4 food groups). The diets needed to feed the different groups would be a protein diet (dog biscuits, dog food), a fat diet (sunflower seeds, peanuts), a carbohydrate group (corn, dried fruits), and one balanced group. Before feeding the mice their special diets, the mice should have to run the maze once. Twice a day each group of mice should be fed about a teaspoon of their diet. Mice need about two weeks to adjust to a new diet. Therefore, after two weeks of feeding them, the mice were ready to run the same maze again. Every day for a week the mice should be put into the maze and their times should be recorded. After that last week, the average times showed that the fat group ran the maze the fastest of all, followed by the protein, balanced, and carbohydrate group. Perhaps the reason why the mice in the fat group were the fastest was because their diet provided them with the energy that allowed them to complete the maze faster than any others.

## 2888

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### **WHICH EVERYDAY LIQUID STAINS TEETH THE MOST?**

Katrina Landeta and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This lab uses egg shells to simulate the effects of different liquids on teeth over a period of time. As part of the procedure, half egg shells, which were cleaned before their use in this lab, were placed in small cups. Each cup contained 1 tablespoon of one of thirteen various liquids. The liquids used in this lab were orange juice, soy sauce, Sprite, iced tea, apple cider vinegar, teriyaki sauce, lemon juice, apple juice, Dr. Pepper, Coca Cola, cranberry grape juice, chocolate milk, and coffee. The thirteen cups were then left in one area at room temperature for three weeks. When checked, after four days, it turned out with the results of the cranberry grape juice egg to be stained the most. Also, at the time, the Sprite egg was stained the least. But, after three weeks, when the experiment had been completed, the coffee egg was stained the most and the Sprite egg remained to be the one that had been stained the least. In conclusion, I saw that the liquids with the darkest colors had stained the most. The liquids of lighter colors or no color, did not stain the eggshells very much.

## 2889

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### **DO ALL TYPES OF APPLES HAVE THE SAME AMOUNT OF SEEDS IN THEM?**

Mashal Rahmati and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

I wanted to find out if different types of apples had the same amount of seeds in them, or if it varied with the kind of apple itself. I took nine (9) different kinds of apples: 1. Red Delicious Apple, 2. Jonagold Apple, 3. Rome Apple, 4. Fuji Apple, 5. Gala Apple, 6. Golden Delicious Apple, 7. Pink Lady Apple, 8. Braeburn Apple, and 9. Canadian Macintosh Apple. I then cut each one in half and counted the number of seeds in each apple, then I wrote those down in tally

marks. I then graphed those all into a bar graph and my conclusion was, that all apples do not have the same amount of seeds in them and that it is completely random.

## 2890

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### **WHICH BRAND OF SOAP CLEANS KETCHUP STAINS THE BEST?**

Philip Lee and Gregory Zem (Teacher) Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment is to test which brand of soap would remove ketchup stains the best. Five brands of soap were used in this experiment, which are Dial, Olay, Zest, Caress, and Ivory. They all were tested by having a wash cloth with 3 droplets of ketchup for each. I used the soap to see how long it would take to remove the ketchup stain. The results of the experiment are Caress with an average of 1:22, Dial with a average of 1:11, Ivory with an average of 1:25, Olay with an average of 1:09, and Zest with an average of 1:20. The results suggest there is not much difference in which soap removes ketchup stains the best because of the difference of several seconds. Each soap brand would work pretty much the same as other brands.

## 2891

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### **EFFECTS OF OVER-FERTILIZATION ON HOUSEPLANTS**

J. Bleifer, S. Yetasook and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This study examined the effects of over-fertilization using Miracle-Gro on the plants *Hypoestes phyllostachya* 'Splash Select White'. Three plants were not fertilized, as part of the control group, and for the experimental variable, three plants were fertilized with one teaspoon of undiluted Miracle-Gro on the second day of study. The experiment was repeated three times. The suggested plant care tips for houseplants from the Miracle-Gro box was to use one teaspoon per one gallon of water and to feed once every two weeks. All plants were kept at 72°F, room temperature, with moderate sunlight for 8 hours a day. All plants were given 2 tablespoons of water every day at the same time. Miracle-Gro reduced the height of the experimental plants by  $\frac{1}{4}$  inch, from  $3\frac{1}{2}$  inches to  $3\frac{3}{4}$  inches, and made these plants wilt and die, while the control values' height grew  $\frac{3}{4}$  inch, from  $3\frac{1}{2}$  inches to  $4\frac{1}{4}$  inches, during a two-week study. The results suggest that the over-fertilization of houseplants using an extremely large quantity of Miracle-Gro is most likely to kill the houseplants *Hypoestes phyllostachya* 'Splash Select White'.

## 2892

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### **WHICH DETERGENT GETS STAINS OUT THE BEST (IN ONLY ONE WASH)?**

A. Silver, and G. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the question of which cleaner got stains out the best. White pieces of fabric were stained with nine different substances. There were three swatches of each substance so that each could be washed in a separate cleaner. I then took each substance-stained fabric and washed one swatch of each substance in one of the cleaners. The substances used to stain the fabric were butter, wine, lipstick, tomato sauce, mustard, grass, soy sauce, purple ketchup, and mud. The cleaners that were used to wash these fabric pieces were All, Clorox 2, and Tide. They were washed on a four-minute regular cycle in a standard washing machine and then hung to dry. The results showed that it was harder to get out the substances with more dye and color such as the lipstick, tomato sauce, mustard, and grass. The results also showed that Tide and All had the same outcome and both worked a little better than the Clorox 2. Tide and All each got four of the nine stains out completely and Clorox 2 got only three out completely.

## 2893

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### **DO *PSEUDOSINELLA VIOLENTA*, AN EYELESS SPECIES OF COLLEMBOLA, PREFER EATING RED COLORED YEAST AS OPPOSED TO YEAST IN ITS NATURAL BEIGE COLOR?**

L. Alikhani, M. Buchsbaum, K. Kaplan, S. Dampf, B. De Los Santos, A. Derse, J. Edwards, R. Gomez, Z. Guzman, J. Hunter, J. Hutchings, K. Johnson, C. Khoury, T. Koch, M. Kossarian, M. Lopez, S. Loranger, N. Maisonnave, A. Martinez, A. Membreno, A. Orbin, F. Parsai, A. Partida, A. Perez, A. Rogero, L. Ruimy, V. Schieffer, S. Soroudi, K. Stanfield, A. Stephenson-Wenn, A. Toxtle, C. Wallace, P. Wardlow, S. Wilson, L. Yoshizuka, T. Miller (teacher) and T. Smith (advisor). Parkman Middle School, 20800 Burbank Boulevard, Woodland Hills, CA 91367.

The purpose of this experiment was to see if an eyeless species of collembola prefer eating red yeast or yeast in its natural beige color. It has been discovered in previous studies that eyeless species of collembola can detect ultra-violet light. It is our hypothesis that, *Pseudosinella violenta*, will not make a food selection based on food color. Collembola are microscopic hexapods that eat mold. Habitats for the experiment were created by placing a mixture of water, charcoal and plaster of Paris in nine petri dishes. The mixture was stirred and allowed to dry. Water was added to the dried base to provide a moist environment for the collembola. Dried yeast was moistened by placing two drops of red food coloring in a microcentrifuge tube with the dried yeast and two drops of water in a different microcentrifuge tube with the dried yeast. Five grains of each color of yeast was placed on opposite sides of each of the petri dishes. Ten to fifteen collembola were placed in each of the nine petri dishes. Using a stereomicroscope, data was collected eight different days by counting the number of collembola eating each color of yeast.

Collembola with a red gut were also counted into the data. By almost a two to one ratio the collembola preferred the beige colored yeast. Our hypothesis was incorrect as the collembola showed a preference for the beige colored yeast. We believe this experiment should be repeated and more data collected.

The purpose of this study was to determine whether *Onychiruidae encarpatus*, an eyeless species of collembola prefer to eat purple or green colored yeast as opposed to yeast in its natural beige color. It has been discovered that collembola can detect ultraviolet light. It was my hypothesis that this species of collembola will not make a food selection based on color. Collembola, or springtails as they are commonly known, are microscopic hexopods that generally live in leaf litter and soil habitats. They are important to the habitats in which they live because they eat mold which can harm the structures of plants. For the experiment, approximately 100 collembola were placed in 10 containers with a charcoal/plaster of Paris matrix for a base. I colored active dry yeast by placing powdered cake dyes into microcentrifuge tubes with yeast and then shaking them vigorously. I then placed 5 grains of the colored yeast and 5 grains of the natural colored yeast on opposite ends of the container. Looking through a stereomicroscope, I collected the data by counting the number of collembola eating each color of yeast. I also counted the collembola with a purple gut as eating the purple yeast. The data clearly showed the species *Onychiruidae encarpatus* had no preference to the color of yeast they were eating, as almost equal amounts of the collembola were found eating the different yeasts.

## 2894

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### ION ACOUSTIC WAVES

Kevin Fakheri, Tracy Fox, Kim Ridley, Tatiana Segrist, Rebecca Wetzel and Richard Buck (teacher). Louisville High School, 22300 Mulholland Drive, Woodland Hills, CA 91364

An experiment designed and built by The Los Angeles Physics Teachers Alliance Group (LAPTAG) makes it possible for high school students to learn about the properties and behavior of plasma. The experiment took place at the lab of Dr. Walter Gekelman of UCLA, the Principal Investigator for this experiment. One of the first experiments we performed was to create pulsed ion acoustic waves in argon plasma. We measured the wavelength and frequency of the wave pulses and thereby calculated the velocity of the wave. An antenna pulsed by a function generator is immersed in the argon plasma and creates the waves. Position versus Time measurements of the wave are made using a Langmuir probe and read out on a computerized oscilloscope program. From this information we calculated values such as the temperature of the plasma, the plasma density and percent ionization of the plasma. In order to do these experiments we had to understand what plasma is, how plasma can be created using a helicon source, how to use an oscilloscope and how to use a wave analysis program called PV Wave.

## 2895

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### DIETARY PREFERENCE OF *RHYPAROBIA MADERA* COCKROACHES

Camille Williams, Andrea Amurao, Monica Cruz, Stephanie Mireles and Sandor Lin (teacher).  
Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803.

Previous studies have demonstrated a cockroach's dietary preference to sucrose; the purpose of this experiment is to determine if this preference is the same when lipid is introduced to the selection. Prior to this experiment, *Rhyparobia madera* nymphs were normalized to the diet and placed in an incubator of 26°C with a 12:12 light:dark cycle for one week. The nymphs were placed into separate petri dishes, each containing water and dried lyophilized pellets of sucrose, lipid, and casein. Each pellet was weighed and measured prior to the experiment. The cockroaches were again placed in 26°C incubator with the 12:12 light:dark cycle. After one week, each pellet was then dried in a 60°C oven for 48 hours and weighed to determine the amount consumed by the cockroaches. After several trials, the results of the experiment show that of the total amount of food eaten were 76.1% sucrose, 16.2% casein, and 7.7% lipid. Even when given a wider range of dietary choices, sucrose was still preferred among cockroaches. Nevertheless, the amount of lipids consumed shows promising possibilities for further investigations into the efficacy of diet selection.

## 2896

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### SOLAR OVEN

B. Sanchez, S. Medina, V. De Luna and A. Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803.

The purpose of this experiment was to be able to build a solar oven that would bake cookies with the only energy coming from the sun. We built a wooden oven and topped it off with clear wrap and glass. We also inserted tinfoil on the bottom of the oven to attract the sun and there was insulation under the tinfoil in order to keep the heat inside. The outside of the oven was painted black. We then prepared cookies to place in the oven and test it out. We put the cookies in and put the oven on a hill where the sun would hit it all day long. It was a hot day and so the cookies absorbed a lot of heat from the sun and were cooked fairly well. We were also able to test our oven by placing a flask filled with 30 milliliters of water in a black flask and measuring the temperature to which it could attain with just the heat of the sun. The temperature of the water rose from 24 degrees of Celsius to 58 degrees of Celsius in 20 minutes. We were successful in building a solar oven that actually worked. Our oven baked cookies and raised the temperature of water. So our oven was a success but it was not as good as a real oven that was powered with electricity or gas.

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**2897**

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**THE TREND OF RADON EMISSION VALUES IN RELATION TO THE SAN ANDREAS FAULT AT POINT REYES, CA**

Jane Louie, Nipah Adarkwah, Daniel Holtmann-Rice, and Kevin Cuff (mentor). Lawrence Hall of Science, University of California at Berkeley, 1 Centennial Drive, Berkeley, CA 94720.

The goal of this study was to determine the trend of radon emission values in relation to an important earthquake fault. The study was conducted on the Earthquake Trail and in Olema Valley of Point Reyes, California. Both sites are near the San Andreas Fault. Forty-nine radon detector cups were buried in a predetermined grid, each cup spaced approximately ten meters apart. After one week, the cups were collected and the detectors analyzed. The location of each cup and its radon emission value were mapped, each location being determined either by using a Global Positioning System (GPS) receiver or by its position on the grid. The maps were then analyzed. In the Olema Valley study, a Northwest trend was found, similar to the trend of the San Andreas Fault. In the Earthquake Trail study, the highest radon values also followed the fault's trend. However, there were deviations that seemed to indicate the presence of fault splinters, minor branches of the main one. The study showed that the highest radon readings are along the San Andreas Fault. Splinters of the fault account for deviations of radon values.

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**2898**

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**EFFECTS OF AJAX ON SEA FERTILIZATION**

J. S. Hwang, A. N. Miller and W. P. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91359.

This study examined the possibilities of Ajax, a disinfecting cleaning powder, affecting the sperm-egg interaction of the *Strongylocentrotus purpuratus* sea urchin. First, 1/10 g. of Ajax was added to 100,000 ml. of distilled water. Next, 12.5 ml. of this solution was added to .125 ml. of egg suspension on a slide. Sperm was placed into the solution with a toothpick, and the percent of fertilization was recorded. The average fertilization was 87.3% after the three trials. The control rate was  $93 \pm 2\%$ , without Ajax added. The results indicate that this concentration of Ajax has a small effect on the sperm-egg interaction at this concentration.

## 2899

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### THE EROSION OF ROCKS AND FOSSILS

Michael Puente and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

Fossils are rare and we have very few of them. We know fossils can break but can liquid matter physically change them? Most fossils are found in limestone, sandstone, and shale. I took these rocks and submerged them into different pH levels of water. These liquids are filtered water, salt water, acid water, basic water, bottled water, and distilled water. The results were that in the course of a week, when these rocks were submerged in filtered water (pH 5) this is what changed. Limestone (L) went from 38g to 37.50g. While sandstone (S) went from 35g to 34g. Shale (SH) changed from 35g to 35.50g. The rocks in vinegar (pH 3) were (L) 45g–44g, (S) 44g–44g, and (SH) 35g–35.50g. These rocks in distilled water (pH 5) were (L) 45–44g, (S) 30–28g, and (SH) 36–35g. These rocks in salt water (pH 4) were (L) 54–54g, (S) 35–35g, and (SH) 32–33. These rocks in baking soda water (pH 8) were (L) 50–50g, (S) 34–33g, and (SH) 35–33.50. Finally these rocks in bleach water (pH 11) were (L) 40–39.95, (S) 39–34g, and (SH) 39–41.50. In this experiment bleach and other water changed pH. This experiment shows some signs of erosion and some signs of weight gain. This will help us protect these fossils.

## 2900

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### HOW STRONG IS YOUR NYLON?

Ali Del Rio and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803

I have completed a project in which I used different solvents in the polymerization of nylon, then found which solvent works to produce the best form of nylon. A condensation reaction can be created through the mixture of hexamethylenediamine/sodium hydroxide solution plus adipoyl chloride, producing the polymer of nylon 66. Before mixing, the adipoyl chloride must be dissolved. Various solvents can be used to dissolve the adipoyl chloride, each of them producing a different strength of nylon. Possible solvents include methylene chloride, hexane, and cyclohexane. By producing amounts of nylon using each of these solvents, then using the comparisons of weight, texture, and price, the best solvent to use for the production of nylon 66 can be determined.

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## 2901

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### HOW DOES THE CONCENTRATION OF A SOLUTION AFFECT CRYSTAL GROWTH?

Mayra Cabrera, Yesica Cortes, Grace Kredell and Kristin Fontilea (teacher). Grant High School, 13000 Oxnard Street, Valley Glen, CA 91401.

An experiment was developed to test how the concentration of a solution affects crystal growth. The nature of the crystal growth to be examined is size, shape and abundance. Three different solutions of aluminum ammonium sulfate ( $\text{AlNH}_3(\text{SO}_4)_2$ ), copper (II) sulfate ( $\text{CuSO}_4$ ), and sugar ( $\text{C}_6\text{H}_{12}\text{O}_6$ ), were prepared, in varying concentrations, for crystal growth. The different concentrations (1.0 M, 2.0 M and 3.0 M) of solutions were prepared in beakers, and placed in the sun so that crystal formation could be observed. String was hung attached to a pencil resting on the top of the beaker. A paper clip was fastened at the end of the string to weigh the string down and enable the crystal to attach themselves to a medium. Care was taken to make sure that plastic covered paper clips were used in the aluminum ammonium sulfate and copper (II) sulfate solutions so that the metal would not react and interfere with the results. So far, the results would conclude that higher concentrations of solutions yield faster growing crystals. The final size and shape of the crystals produced is still unknown, as the experiment is still in progress.

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## 2902

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### SOLAR-TERRESTRIAL INTERACTION PROJECT (SECOND YEAR)

Brandon Rosenthal, Jonathan Senescu, Emily Palacios, Felice Amisola, Petros Boyadzhyan, Chris Truong, Vicky Petrovsky, Cynthia Kim, Xin Yang, Sasha Mendez, Magda Iskandaryan, Eric Dindji, Edson Hernandez, Ruslan Guberman, Andrew Hirako, Lyudmilla Kudishevich, Tara TeSlaa and Bob Coutts (teacher). Van Nuys High School, 6535 Cedros Avenue, Van Nuys, CA 91411

Our second year of exploring the properties of the Earth-Sun environment has brought a great deal more involvement on the part of students and much more depth of coverage in our investigation. Two Honors Physics classes and one Biotechnology class spent considerable time gathering and analyzing data, as well as producing a new reference library of solar images of three different types. Enthusiasm and involvement have escalated and productivity of new information increased. We discovered this year that the speed of the solar wind varies from 50 to 500 km/s with occasional departures from this range. We found that the southern edge of the Auroral Oval can be as far North as Barrow, Alaska and as far South as lower Michigan. Next semester will tell us what we will find in the dynamic properties of the Solar surface and corona, when we begin study of our own seven-month digital library of solar animations in the Iron II, Helium II and the intensity gram wavelengths. The future is bright and the present exciting.

## 2903

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### **EFFECT OF ALCOHOL ON CRICKETS**

Celerino Garcia, Brian Coronado and Nandita Pal (teacher). Robert Fulton Middle School, 7477 Kester Avenue, Van Nuys, CA 91405.

We were interested in studying the effects of alcohol on crickets. We wanted to find out whether alcohol would cause imbalance in crickets the same way as it does in humans. We took 45 crickets and put them into three equal groups. Group A was put on a paper towel moistened with 8 drops of water for 15 minutes in a petri dish; Group B was put on a paper towel moistened with 8 drops of 95% alcohol for 5 minutes in a petri dish and Group C was put on a paper towel moistened with 8 drops of 95% alcohol for 15 minutes in a petri dish. After exposure to alcohol the crickets were put in a long tube and timed to see how long it takes them to climb up the tube. The crickets in Group A (controls) took 52 seconds to 10 minutes to climb up the tube. The experimental Groups B and C took 12 to 18 minutes and 15 to 29 minutes respectively. Four crickets died in Group B and 6 crickets died in Group C. Our results indicate that alcohol is toxic for crickets and causes them to lose their balance.

## 2904

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### **DIGITAL ASTROPHOTOGRAPHY OF THE MOON AND PLANETS: REMOVING THE EFFECT OF ATMOSPHERIC TURBULENCE BY STACKING SINGLE IMAGES FROM A STILL CAMERA OR WEB CAM**

Matthew Bruno, Danielle Fattal, Jaclyn Friedenthal, Adam Hollander, Michael Kianmahd, Andrea Kramar, Jonathan Lemor, Daniel Orlik, Yonatan Peleg, Lisa Schlesinger, Abby Sherkow, Brett Simenhoff, Rachel Warner and Stephen Cooperman (teacher). Milken Community HS of Stephen S. Wise Temple, 15800 Zeldins' Way, Los Angeles, CA 90049.

We are investigating a form of adaptive optics by taking digital photographs of the Moon and planets, selecting frames showing the least atmospheric turbulence, and "stacking" them with image processing techniques to bring out details present in all of them and to remove random noise present in single pixels. We are testing two cameras and several software programs.

We image with an 8" Meade LX-200 GPS Schmidt-Cassegrain telescope mounted in Altitude-Azimuth mode. All photos are 8 seconds or less, so field rotation is negligible during tracking. The digital camera is an Olympus C2000Z 2.1 megapixel (CCD) camera, and the video web cam tested is a CMOS Creative WebCam Pro. Both are IR sensitive (tested with a Wratten 89 filter). We used "afocal projection" (camera attached to eyepiece) for both.

The camera photographed the Moon and Saturn with a 26mm Meade Plossl lens attached to a Televue 2x Barlow, achieving a magnification of approximately 150x. The WebCam was linked to Pentium III 1 GHz Dell laptop computer with 256 Mb RAM, which recorded digital video. File sizes were as large as 450 Mb, containing 500 frames. When the frames were rated

in order of statistical quality and then the best were stacked, we were able to bring out small-scale detail on the lunar surface as well as large cloud features in Jupiter's and Saturn's atmospheres. Saturn's ring divisions are also at the edge of our current resolution.

There are several freeware, shareware, and commercial programs that are helping with the further analysis and stacking of our images, and they are mentioned at our website, as are some of the first results: <http://www.mchschoool.org/~scooperman/telescope/astrophoto.htm>

Our next steps will be to collimate the telescope for better resolution and to continue refining our abilities to select good frames.

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## 2905

### **WHAT DO MEALWORMS (*TENEBRIO MOLITOR*) EAT?**

Isabel Morales and Wendy Mayea (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

The purpose of the experiment was to find out what mealworms prefer to eat when they are given the choices of chile, ice cream, or potatoes. The hypothesis was that if the mealworms were given the choices of chile, ice cream, or potatoes then they would prefer to eat the potato. The materials that were used were chile, ice cream, potatoes and little containers to put the food in. The procedure was to first put the food in equal distances apart from each other so the mealworms would not just go to one particular food because the food was the closest. Then the mealworms choose whatever food the mealworms wanted. The result from the experiment were that 50% of the mealworms ate chile, 5% ate potatoes, 35% ate ice cream, and 10% ate nothing. The conclusion was that the results don't support the hypothesis because the hypothesis was that most mealworms would eat potatoes, but most of the mealworms ate chile. The mealworms probably liked the chile better because chile was new to the mealworms and had tomatoes, spices, beans, and meat. Mealworms might need the ingredients and nutrients in the chile to stay healthy.

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## 2906

### **SOUND EFFECTS**

Taylor Trakin and Gregory Zem (teacher) Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This project was meant to determine the best material for insulating sound between cellulose, attic fiber-glass insulation and acoustical foam. First, I used the dB meter to measure sound from the cardboard box by itself with no covering, as a control. Then, one at a time, I put each material all the way around the box and measured the sound of 440MHz from a speaker placed in the center of the box. I tested how loud the sound was with a dB reader situated at a set distance outside the box. The results:

- 1) The control sound, with nothing covering the box, registered  $-4$  dB.
- 2) The cellulose insulation material, made up of recycled newspapers, cardboard and other pulp materials, registered at  $-10$ dB.
- 3) The insulation, the fiber-glass material that people line their attics with, for heating and cooling, registered  $-8$  dB.
- 4) The acoustic foam, which is made out of polyurethane, registered  $-9$ dB.

Conclusion: At  $-10$ dB, cellulose was the best insulation material of the three, the most effective at blocking out the sound.

## 2907

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### **MAN VS. NATURE—EFFECTS OF DIFFERENT COLORED LIGHT ON PLANT GROWTH AND EFFECT OF ARTIFICIAL LIGHT OVER TRADITIONAL SUNLIGHT**

Michael Sivan Ghalchi and Gregory Zem (teacher). Lawrence Gifted/Highly Gifted Magnet Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the questions of the possibility of artificial light being better than sunlight, and if different color lights have an effect on plant growth. Two seeds (snap peas) were planted in cups across from one another. One cup was for a primary light (red), one cup was for a secondary light (green), and one cup for natural light (sunlight). The seeds were planted  $\frac{1}{2}$  an inch below the surface and put under its designated light. The artificial light was placed in dark areas so that no other light was able to reach the plant. After a three-week period of giving water and caring for the plants, the plant under the primary light (red) grew to be 32.35 cm, the plant under the secondary light (green) grew to be 28.4 cm, and the plant under sunlight grew to be 31.6 cm. Although the plant under sunlight came in second according to height it seemed to be much healthier with larger leaves, a thicker stem, and more durable roots. The results suggest that natural sunlight is much better for a plant.

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**2908**

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## **USING A PORTABLE COSMIC RAY DETECTOR TO LOOK FOR CORRELATIONS BETWEEN COSMIC RAY “MUON” FLUX AND THE STATE OF THE SOLAR WIND**

Aneliese Bernard, Josh Cohen, Natalie Hakakian, Benjamin Heins, Thais Miller, Shawn Salemnia, Jared Silver, Morani Stelmach, Grant Wallensky, Yoav Weiss, Justin Yashouafar and Stephen Cooperman (teacher). Milken Community HS of Stephen S. Wise Temple, 15800 Zeldins' Way, Los Angeles, CA 90049.

We used a portable Cosmic Ray (muon) detector from UCI's QuarkNet program (<http://hep.ps.uci.edu/quarknet>) based on a Lawrence Berkeley Lab design (<http://www.lbl.gov/abc/cosmic>). The CHICOS program (<http://www.chicos.caltech.edu>) will place two high-energy Cosmic Ray detectors in each of 80 Southern California schools. Our data can support that program with lower energy results which measure directional fluxes to determine sources.

We hypothesized that since some cosmic rays come from the Sun, when the solar wind speeds or densities were high, there would be greater penetration of those particles into the upper atmosphere, providing a greater source of secondary cosmic rays that we could detect. Data indicated an opposite trend: the higher the density or speed, the lower the muon counts usually were.

[www.spaceweather.com](http://www.spaceweather.com) showed solar wind speed and density graphically over the previous day, updated every 10 minutes. Average solar wind density varied from 1.5–5.0 protons/cm<sup>3</sup>, but peaks reached as high as 22. Velocities varied from 300–600 km/s.

Data was collected from November until mid-December 2002, in one or two sessions each, with three one-minute counts. Vertical counts were about 340 muons/minute, most often between 300 and 400 counts/minute.

Counts at Van Nuys High School (VNHS) were 25% higher than at Milken, perhaps because of an upper floor location at VNHS. One run placed radioactive sources on the lower scintillator paddle, counting an additional 25% from extra triggering. We have not accounted for the altitude of Milken being about 160 meters higher than VNHS.

Future tests include testing the altitude dependence of muon flux, including a free atmospheric reading at the school. Further, SOHO satellite data are about one hour ahead of their arrival near the Earth, so we have to properly coordinate them with our *in situ* measurements. We would have to take our ground-based observations at a different time. Our results will be posted to the site <http://www.mchschoo.org/~scooperman/cosmic-ray>.

## 2909

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### **THE COOLING AND HEATING EFFECTS ON BUILDING MATERIALS**

Linda Thai and Aulikki Flagan (teacher). Ramona Convent Secondary School, 701 W. Ramona Road, Alhambra, CA 91803.

This experiment is to test to see which type of building material is best when heated and cooled. The building materials that were tested were brick, sand, plaster, stucco, and gravel. This project consists of two basic parts. The first part of the experiment was the heating portion. To do this part of the experiment, I first set the hot plate at a specific temperature setting. Then I placed the material onto the hot plate for a constant rate of 10 minutes. Every ten minutes I would change the temperature setting. I recorded each of the temperatures. I did this for all five of the materials. In the second part of the experiment, I put each of the materials in the freezer overnight and then took the temperatures to see how long it would take for the materials to get to room temperature.

## 2910

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### **HOW THE SUN AFFECTS WOOD**

S. Thomatis and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment questioned whether the sun affected wood over a period of time. Three different types of wood were laid out in the sun facing south so it would be a controlled experiment. The three slabs of wood were in the sun for a total of twenty days. Each piece of wood had five three-inch portions. The wood was covered by a sheet of metal. Every three days, the metal was moved down one portion for all three pieces of wood. The first portion received all twenty days of exposure to the sun. The second, sixteen, the third, twelve, the fourth, eight, and finally, the last portion did not receive any exposure to the sun at all. In conclusion, the sun affected the color of the wood. One of the three slabs of wood had stain and finish, so the sun stripped the color off, while the sun made the other two slabs of wood darker.

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## 2911

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### **THE EFFECTS OF EXOGENOUSLY ADDED AMINO ACIDS ON THE BINDING CAPACITY OF CONCAVALIN A TO YEAST CELLS**

A. Avenisyan, R. Ayon, A. Beltran, J. Cruz, A. De La Cruz, J. Dinh, J. Foust, C. Gramajo, E. Gutierrez, K. Hendifar, K. Hughes, T. Jones, A. Kelley, B. Knight, S. Lindsay, M. Santizo, S. Marroquin, R. Mendoza, N. Moreno, S. Morente, W. Morris, B. Moz, A. Rahimi, R. Ramirez, C. Rosales and Urenia Astrid Hernandez (teacher). Mulholland Middle School, 17120 Vanowen Street Van Nuys, CA 91406.

The purpose of this experiment was to find out if the amino acids lysine and L-arginine have any effect on the binding ability of Concanavalin A derivatized agarose beads to yeast cells. It is known that the protein Concanavalin A binds to the non-reducing sugars D-glucose and D-mannose present on the cell membrane of the yeast cells. Therefore, the usefulness of Concanavalin A lies in its specific binding action with certain carbohydrate-containing receptors on the surface of cells. The experiment was carried out in distilled water and the amino acid concentration was 50mM. The experiment was repeated three times for each respective amino acid. It was determined that the control group had more yeast cells bound to the Concanavalin A derivatized beads than the experimental group. These results suggest that exogenously added amino acids may be able to interfere with the coming together of Concanavalin A and yeast cells. This study enhances our understanding of sugar-protein interactions in relation to other biological molecules such as amino acids that may be present inside or outside cells.

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## 2912

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### **NO MORE TANS: THE ADDITION OF SOLUTIONS AND THE DEPRIVATION OF AIR TO PREVENT THE BROWNING OF FRUITS**

Michelle Toapanta and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803.

The cycle of life works in a continuous and ongoing cycle. Every living object is born into this world, grows, adapts to its environment, eventually dies, decomposes and the cycle continues all over again. Focusing in on the decomposition of life, it is normal to wonder what causes certain living objects to decompose at a faster rate than others. Of course size and weight are two important factors that should not be overlooked, but the effect of air, radiation, and acid-base solutions should be acknowledged as variables, which either speed up or slow down the process of decomposition.

For years, people all over the world have had to deal with the problem of eating sliced fruit for lunch that had already begun browning. The problem faced by many every day is the consumption of fruit that has lost its fresh, flavorful taste. The conducted experiment concentrated on the decomposition and browning process of fruit in the search to find a way to slow down the browning process of fruits.

The purposes of the experiment are to determine the effects of pH, temperature, radiation and air on the fruit slices, and to find the combination of the factors tested that can best preserve the fruit's original white color. Apples, bananas, and pears were used, and one control was maintained for each fruit used in the experiment.

In order to record the effects of pH on the fruits, various liquids of different pH levels were used to slow down or speed up the browning process. In order to observe the effects of room temperature, fruit was placed in either extremely cold or hot environments. The use of a microwave was used as another variable to observe the effect of radiation on the browning process.

In conclusion, I found that sealing fruit was effective in the prevention of browning and that the addition of lemon juice or a crushed Vitamin C solution prevented oxidation successfully.

## 2913

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### **THE EFFECTS OF STEER MANURE AND AMMONIUM SULFATE ON DECOMPOSITION OF LAWN CLIPPINGS**

M. A. Richards and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

Previous theorists have suggested that the rate of a plant's decomposition depends on the characteristics of its surroundings. Recently, they have proposed that ammonium sulfate, specifically, may play a role in determining decomposition rates. My study was designed to determine if this claim is true and how the effects of ammonium sulfate may be mediated by the presence of steer manure during the decomposition of grass clippings. The importance of these two factors will be determined using several conditions, one with just ammonium sulfate and grass clippings, one with just steer manure and grass clippings, one with both substances and grass clippings, and one with just grass clippings. Measuring the volume of materials still intact at the end of a 5-week period will be used to assess the degree of decomposition. Results indicated that the greatest reduction in bulk occurred in the grass clippings only group, followed by the grass clippings and steer manure group, followed by the grass clippings, steer manure and ammonium sulfate group with the grass clippings and ammonium sulfate group coming in last. The greatest level of visual decomposition occurred in the two groups with steer manure.

## 2914

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### **THE RATE OF DIFFUSION AT DIFFERENT TEMPERATURES**

D. Anderson, A. Camara, A. Khanbabaei, J. Kim, J. Marin, M. Minoofar, B. Shahvali, S. Zarrabi, C. Sams (teacher). University High School, 11800 Texas Avenue, Los Angeles, CA 90025.

Our group wanted to find out if the temperature of water affects the rate of diffusion. In order to find out our group had to devise an experiment which would prove our hypothesis, that

temperature does affect the rate of diffusion. Our equipment was gathered before we started, we had a burner, a beaker, a lighter, food coloring, and three different containers for the water. We needed to get water at three different temperatures: cold water, hot water, and room temperature water. We used ice to cool the water and we boiled the water in the beaker for the hot water, and we dropped two drops of food coloring into each container of water. The food coloring diffused more freely as the water was warmer. The experiment resulted as expected, but we had to redo the experiment to reduce the possibility of error. We redid the experiment and our results were very similar to our first trial. We found out that temperature does play a role in the rate of diffusion. In our first trial the rate of diffusion was three minutes and six seconds for hot water. In our second trial it took 4 minutes and 5 seconds for the cold water, 2 minutes 31 seconds for the water in the room temperature, and 56.7 seconds for the hot water. Our hypothesis was proven; we concluded that in warmer H<sub>2</sub>O, the particles had more kinetic energy. So diffusion was more rapid.

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## 2915

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### **HYALINE: CLADISPORIUM OR NOT?**

Lisa Tran, Philip Taylor (mentor), and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803

Cladophialophora, also known as Cladisorium, is a species of fungi that commonly triggers allergies and asthma. A smaller kind of spore known as hyaline appears to be Cladisorium although it is not recorded in books on spore identification. Cladisorium tends to be elliptical with sharp edges, but the hyaline spores are smaller and elliptical without the sharp edges. By gathering many more spore collections from the air in Pasadena, California, it is evident that these hyaline spores should definitely be categorized under Cladisorium. Thus, Cladisorium in the air is under-counted. A spore trap placed at the California Institute of Technology in Pasadena is used to capture the spores that are prevalent in the air. The trap is changed once a week on Mondays at 4:00 pm and the fungi on the trap are observed under a microscope. The hyaline spores are most common during heavy rainfall, most likely because the force of rain droplets hitting the leaves disperses the spores. Since these spores are only five micron long and three micron across, they can remain airborne even during the heavy rainfall. The hyaline spores tend to be present on flowers and are likely to be on sensing leaves. Many of the common trees of Pasadena have been introduced from other temperature climates and have not adapted to the different climate; leaves that would normally drop from the trees in the fall are retained for months, such as those of the Sycamore trees. These aging leaves are readily colonized by fungi such as Cladisorium. Moist conditions during the winter, especially in the early morning, can promote growth of fungi, particularly of the hyaline spores. The high winds can easily help to disperse these spores and contribute to the high fungal counts observed in the winter.

## 2916

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### **IN WHICH ENVIRONMENT DO PLANTS GROW BEST?**

Andrew Hong and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment will show which common environments for plants grow best. Four different groups were formed. Each group had a letter to represent the group. Group A was grown in an open area on soil outside. Group B was grown in pots in a outdoor environment. Group C is grown indoors and in pots. Their location is near a window which is open most of the day. Group D is grown in a dark room indoors and in pots. This location simulates someone who grew plants and didn't know anything about them. I feed each group water daily and record observations daily. I do a detailed observation weekly. I continue this process for 21 days. I have recorded the average growth of a single plant per group. Group A average was 1.6 inches at the end of the experiment. Group B averaged 1.9 inches. Group C also averaged 1.9 inches. Group D didn't grow at all and averaged 0 inches. Group D was the worst environment due to lack of fresh air and sunlight. Group B and C both seemed to do very well. Group B had bigger plants. However Group C had more plants survive the experiment. Group C's location is a safer environment, but Group B's location has more plentiful resources. Location B also had more dangers like animals or weather. The house that Group C is in protects it. The pots however give Group B some protection. Group A which is also outdoors had no protection at all. It was in a wide open space. Group B and C tied for best environment.

## 2917

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### **ELECTROPLATING PENNIES**

Ahmad Paden and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311

This study determined whether the cleanliness or age affected the way a copper penny was plated by zinc. This project was done by dissolving zinc in vinegar for a 24 hour period. Zinc was added to a penny connected to a wire and mixed in a solution of vinegar, Epsom salts and table sugar. The results indicate that older pennies plated thoroughly in 10 minutes. The new pennies were shiny and did not plate or were not measurable.

## 2918

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### WHICH CONDUCTS ELECTRICITY BEST?

Joshua Aberman and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of the project was to determine which solution would conduct electricity best among tap water, salt water, baking soda water, vinegar water, and sugar water. Results indicate the tap water was the best conductor of electricity and then salt water. The least capable of conducting electricity was sugar water.

## 2919

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### CAN MEALWORMS (*TENEBRIO MOLITOR*) SWIM IN WATER?

Christopher Melgar and Wendy Mayea (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

The purpose of this experiment was to see if mealworm larvae can swim in 0 ml, 5 ml, and 15 milliliters of clean water. The hypothesis is that mealworm larvae cannot swim in 0, 5, and 15 milliliters of clean water. The materials that were used for this experiment were petri dishes, 3 mealworms, 25 milliliters of clean water, a graduated cylinder, a cup, and a paper towel. First, the water was poured into the petri dishes. Second, the mealworms were put into the petri dishes for 20 seconds. Third, the mealworms were taken out and dried off with a paper towel. The control group had no water. In the control group, the mealworms did not swim. Experimental group #1 had 5 ml of water. 29% percent of the mealworms swam in this group. Experimental group #2 had 15 ml of water. 49% percent swam in this group. The results were that most of the mealworms did not swim in either group. The mealworms that did not swim would float. Results supported the hypothesis because the data shows that mainly mealworms cannot swim. Mealworms may not be adapted to swimming because mealworms live in an environment where there is no water big enough to swim. In a mealworm's natural environment water is usually available in succulent plants and fruits and not in the form of ponds, puddles, pools, rivers, and lakes.

## 2920

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### THE COLOR OF CRICKETS

Devin Arias and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 West Ramona Road Alhambra, CA 91803.

My experiment is on whether or not crickets are able to survive under different environments and conditions. I observed both the male and female crickets each under different types of light colors. In the end, I concluded which light color they were able to survive in the longest.

I also observed whether or not the crickets were able to reproduce under the given conditions. All in all, I wanted to see whether or not the light and the different colored lights would have a major effect on the crickets and their life cycles. My hypothesis in this experiment is that I think the crickets under the 25-Watt light (regular light bulb) will be able to survive longer than the crickets under the other different colored light bulbs. I also think that the male crickets will be more dominant, stronger, and more aggressive than the female crickets.

## 2921

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### **ONION GROWTH**

Marilyn Aguillon, Denise Cortes, Raquel Gonzales and Aulikki Flagan, (teacher). Ramona Convent Secondary School, 1701 West Ramona Road, Alhambra, CA 91803

The main purpose of the onion experiment was to test if some chemicals can retard or help better the growth and health of an onion. We chose 5 chemicals: vinegar, iodine, alcohol, oil and bleach for experimental group and water for control. We filled 6 test tubes with the various chemicals and water. Then we placed small onion bulbs on top of the test tubes, making sure that the bottom of the onion was touching the surface of the liquid. We observed the onions daily and recorded the root growth.

The first day we found no sign of growth. The second day, tiny sprouts were seen on iodine, bleach, and water. By the tenth day, the iodine and water onions showed great signs of health and root growth. The roots grown in water were the longest. Alcohol, oil, bleach and vinegar showed no sign of health or growth for that matter.

## 2922

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### **THE EFFECTS OF THE HORMONE GIBBERELLINS ON THE BABY BINGO LAVENDER BLUE PLANT**

T. Marashlian and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

I conducted this experiment to test the effects of the hormone Gibberellins on the Baby Bingo Lavender Blue plant. I ran the experiment three times with the same conditions. For one set, six flowers, I gave them only water. For the second set, six flowers, I had water and applied the hormone Gibberellins in paste form from Carolina Biological. The hormone was administered to the leaves and stems by using a Q-tip. Within two days, the set with hormones grew at a faster rate. Within a week, they were an inch taller than the set without the hormone. In addition, the controlled set produced three or four flowers for each plant while the set without hormones had one or no flowers in total. At the end of the three-week test period, in average, the plants with hormones were an inch and a fourth taller than the plants without the hormone.

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**2923**

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## **WILL THE SAME WEIGHT OF DIFFERENT SEEDS ABSORB THE SAME AMOUNT OF WATER?**

Sheema Gaffar and Gregory Zem (teacher). Ernest Lawrence Gifted/Highly Gifted Magnet, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment examined if the same weight of different seeds absorbed the same amount of water. The materials used were: Harvard Trip pan balance, weighing boats, graduated cylinder (100 ml capacity), and seeds. Twelve seeds were used: Brown Fava Beans (large), Raw Almonds (large), Large Limas (large), Garbanzo Beans (medium), Kidney Beans (medium), Black Eye Beans (medium), Yellow Popcorn (small), Mong Beans (small), Green Lentils Eston (small), Whole Wheat (small), and Linaza Flax seeds (small). Measurements of 10 g dry weight were taken, with each set of seeds containing six copies. Then, the number of seeds in every set was counted and recorded. Each set was placed in a labeled weighing boat. Then, 50 ml of water was added to each boat containing seeds. All of the seeds were submerged under the water. After 24 hrs, seeds were taken out of each weighing boat, blotted of excess water, and weighed. After recording the weight, the seeds were transferred back to their boats. If the water was not enough, additional water was added to ensure that the seeds were completely submerged. On days 1, 2, 3, 4, and 6, this procedure was followed in order to take the weights of the seeds. Observations in size, color of seeds, color of water, smell of seeds, hardness, softness, skin condition, germination, and other features were recorded. Pictures were taken simultaneously. The weight of the weighing boat (2.5 g) was subtracted from the wet weights of the seeds to obtain the actual weight of the wet seeds. To get the weight of the water absorbed, the dry weight of the seeds (10 g) was subtracted from the wet weight. The average weight was calculated by dividing the sum of the six copies by six. A line graph was plotted using the averages of the amount of water gained (y-axis) versus the days (x-axis). The results show that the absorption of the Brown Fava beans, Garbanzo beans, Kidney beans, Large Limas, Black Eye beans, and Green Lentils Eston, was at least 100% of their dry weight (10 g) within 24 hrs. In the later days of the experiment, these seeds' absorption was not as significant as the first day. The absorption of the Raw Almonds, Yellow Popcorn, Mong beans, Whole Wheat, and Mustard Seed increased gradually. The Linaza Flax seeds became jelly within 24 hrs, hence it was impossible to take an accurate reading of the weight. Therefore, it was not weighed. Even though the seeds had the same dry weight, they did not absorb the same amount of water. In addition, some seeds absorbed faster than others. All of this had nothing to do with the size of the seed. Some seeds absorbed water gradually instead of rapidly. From these results, more everyday conclusions were derived. When you eat anything that contains wheat or popcorn, you will feel thirsty, no matter how much you drink. The reason is that these seeds absorb water slowly, but steadily. So, drinking more water at one time won't help quenching your thirst, as these seeds absorb water slowly. The Linaza Flax seeds turned to jelly, as previously mentioned. The slimy texture of these flax seeds aids and relieves the colon in expelling any unwanted material that it cannot get rid of alone (constipation). The bloated feeling that one experiences after eating Large Limas

is due to its large absorbing capacity. When provided with water, these seeds triple in size, leading to a bloated feeling. In conclusion, the size or type of seeds does not matter in terms of absorption of water. It is the rate of absorption that matters.

## 2924

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### **THE EFFECTS OF STATIC FRICTION ON EVERYDAY SURFACES**

Alison Bernet and Gregory Zem (teacher). Lawrence Middle School, Gifted Magnet, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment demonstrated the effect of static friction on a variety of surfaces that are found in daily life. A sled was attached to a pulley system which allowed weight to be added using pennies, until motion began on the sled. The weight of the pennies was weighed on an accurate gram scale. Each measurement was performed 3 times, then an average was taken. A second measurement was taken with a sled exactly half the surface area of the larger sled to demonstrate that a different surface area of contact results in the same force necessary to overcome friction. The results were listed in increasing order, fresh leaf with the most friction and a ziplock bag with the least friction. An explanation was made for the variance of the results.

## 2925

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### **WHEN A FRUIT FLY HOMOZYGOUS RECESSIVE FOR WHITE EYES IS BRED TO A FLY HOMOZYGOUS RECESSIVE FOR HELD OUT WINGS, ARE THE RESULTS OF F<sub>2</sub> GENERATION CROSSES PREDICTABLE BASED ON MENDELIAN GENETICS?**

Mayra Castaneda and Oryla Wiedoef (teacher). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

This experiment was conducted in order to answer the following question. If I breed *Drosophila* flies that are homozygous for two different single mutations, will the F<sub>2</sub> generation yield double mutant flies, white eyed and wings held out, in a 1:16 ratio as predicted by Mendelian genetics? Parent and F<sub>1</sub> breedings were set up to investigate the F<sub>2</sub> offspring. The predicted phenotypic outcome of the F<sub>2</sub> generation was 9 wild type: 3 white eyed with wild type wings: 3 wild type eyes with held out wings: 1 white eyed and held out wings.

In order to test my experimental results against the Mendelian prediction, I took 16 chrysalises that would soon hatch into my F<sub>2</sub> generation and separated them into individual fly culture tubes. The phenotypic ratio of my results was 6 wild type: 3 held out with wild type eyes: 3 white eyed with wild type wings: 2 with white eyes and held out wings. In addition to the 16 flies, in the tube with all other F<sub>2</sub> generation flies I noticed that in the remaining group of F<sub>2</sub> generation flies, I found one albino fly with held out long wings and red (wild type) eyes.

In conclusion, my experimental results were closely in line with my predictions based on Mendelian genetics. In future experiments I plan to investigate the cause of the albino fly with held out wings and red (wild type) eyes, and the effects of temperature variation on phenotypic outcomes of fly breeding.

## 2926

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### **SEARCHING FOR THE ONE—THE EFFECTS OF SIMULATED ACID RAIN AND UV-A RADIATION ON TADPOLES**

Anna Tran and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803.

Since the mid-1990s, people have observed many malformed frogs, which may be one of the reasons why the amphibian population is declining; malformed frogs usually don't grow into their adult stage. Scientists have determined possible factors for these problems, including chemical pollution, parasites, predation and ultraviolet radiation. There have also been conducted experiments testing for how great a chance each factor can cause malformations. Instead of testing the effects of parasites and predation on the tadpoles, I chose to test the effects of a certain kind of chemical pollution (acid rain) and the result of ultraviolet-A radiation. Many scientists don't test UV-A radiation because it supposedly doesn't pose any harmful threats to animals or on humans; therefore, they test the effects of UV-B. However, current studies show that UV-A *do* pose harmful threats to eyes, skin, etc.

In the experiment, 5 groups were created: control group, 3.0 pH group, 6.3 pH group, UV exposure only during daylight hours, and UV exposure 24 hours per day for 14 days. The tadpoles in the control group were not exposed to direct or constant UV radiation nor were they developing in pond water contaminated with sulfuric acid. To form acid rain, sulfuric acid was used to lower the pH of pond water to 3.0 and 6.3. Florescent lamps were used as UV lamps; they exert UV-A rays. Each group consisted of 5 tadpoles and the experiment lasted for nearly two weeks. Afterwards, the experiment was repeated.

The purpose of this experiment was to test the effects of UV-A radiation and sulfuric acid solution, or acid rain. From this, I can learn to be more aware of their possible effects on humans by observing the changes in tadpoles; tadpoles are sensitive to environmental changes, so if there is anything wrong with them, we should be more aware of the environment.

## 2927

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### CHICKEN EXPERIMENT

Joanna Chao and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803.

The first part of the experiment is to feed the two control chicks with ordinary chicken food bought from the pet shop and to feed the two experimental chicks with cereals, rice, and bread. The purpose is to see which of the chicks would grow faster. Research says that protein is the key to the growth of chicks. Therefore, if the protein in the ordinary chicken food is enough for the chicks to grow faster, then the control group should grow faster than the experimental group because there are more varieties of nutrients and food in it. However, if the control group grows faster, it'll prove that in the varieties of nutrients, some of them may be omitted to reduce the price of chicken food and to reduce the work of mixing varieties of nutrients to make a bag of chicken food.

The second part of the experiment is to test the memory of the chicks by putting them into the same maze for a week and see which group has the better memory of finding the exit of the maze.

The third part of the experiment is to test if the chicken poop that consists of ordinary chicken food would be better than the one that consists of the experimental chicken food. To do that, I'll have to plant with the chicken poop used as fertilizer and measure the growth of the plants; in this case, I'm using radish seeds because they grow the fastest.

## 2928

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### GREENHOUSE AND POLLUTION

Kathleen Teves, Lisa Del Castillo, Kristinne Alvero, and Aulikki Flagan (teacher). Ramona Convent Secondary School 1701 West Ramona Road, Alhambra, CA 91803.

The purpose of this experiment was to see the affect of various air pollutants on different plants. First we cut PVC pipes to desired lengths in order to build two greenhouses. We used elbows, tees, and crosses to connect the pieces together. Then we chose the plants that we would use in the experiment. We planted the seeds in six-pack trays. After a few weeks, the plants were ready for transplanting and the greenhouses were finished. We cleared a spot in the ground big enough for two greenhouses. Then we added potting soil and fertilizer and mixed with the existing soil. We placed the greenhouses on the top and replanted the plants. We set up a drip irrigation system into the greenhouses in order to provide our plants with sufficient amounts of water. After that we covered both greenhouses with plastic. One greenhouse was the control and the other was experimental and was used to find out the effect of cigarette pollution on the plant growth.

For a while both sets of plants were growing at a reasonable rate, but after a few weeks many plants began to die from both polluted and clean greenhouses. However, in the greenhouse

that we polluted with cigarette smoke, fungus began to grow and some of the plants grew weaker. Both of the greenhouses were invaded by various species of insects. Although in both greenhouses the plants grew, the plants in the polluted greenhouse seemed unhealthier than the plants in the clean greenhouse.

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## 2929

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### WHAT ARE THE EFFECTS OF ELECTRODE TYPE, ELECTRODE SIZE, VOLTAGE, SOLUTE, AND SOLUTE CONCENTRATION ON THE RATE OF ELECTROLYSIS?

John Herr and Claudia Moreland (teacher). Valley Presbyterian School, 9200 N. Haskell Avenue, North Hills, CA 91343.

Electrolysis is a process in which an electric current is passed through a liquid, causing it to decompose into its components. The electrolysis of water produces pure hydrogen and oxygen, both of which are needed to power fuel cells. These non-polluting, electricity-producing devices are being developed to power spacecraft, submarines, bicycles, busses and cars. The goal of this study was to determine the effects of electrode type, electrode size, voltage, solute, and solute concentration on the rate of electrolysis. With this information, one can maximize the production of hydrogen and oxygen for fuel cells and related technologies. I tested the rate of electrolysis by measuring the amount of hydrogen and oxygen produced per second. I captured the hydrogen and the oxygen by the displacement of water in both a Hoffmann and my home-made electrolysis device. The oxygen collected at the anode and the hydrogen collected at the cathode. I learned that zinc is the best producer of hydrogen and oxygen, although it dissolves rapidly. In terms of hydrogen production, the next best electrode is brass, followed by iron, copper, nickel, stainless steel, and lead. Aluminum produced virtually no hydrogen. In terms of oxygen production, the best electrodes after zinc were iron, nickel, lead, and stainless steel. Aluminum, copper and brass electrodes produced virtually no hydrogen and oxygen. I determined that electrode size doesn't make much difference in the rate of hydrogen and oxygen production. I also discovered that the most hydrogen was produced in hydrochloric acid, followed by sulfuric acid, sodium chloride (table salt), sodium bicarbonate (baking soda), and sodium sulfate. In terms of oxygen production, the best solute was sulfuric acid followed by sodium bicarbonate, hydrochloric acid, sodium sulfate, and sodium chloride. I learned that the rate of hydrogen and oxygen production increased steadily as the voltage was increased. I also discovered that the two-to-one ratio of hydrogen and oxygen production stayed constant from 1 to 5 normal sulfuric acid, but this relationship changed when the solution had a concentration above five normal. The highest hydrogen production was at 10 normal, although the highest oxygen production was at 5 normal. **Summary:** To get the greatest rate of electrolysis, use a stainless steel or platinum electrode of any size, in a five normal solution of sulfuric acid, at a potential of seventeen volts or greater.

**2930**

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**THE DIFFERENCE IN STRENGTH OF DIFFERENT GLUES THAT STUDENTS WOULD USE IN SCHOOL**

J. Manuel Urrutia, II, and Gregory Zem (teacher). Lawrence Gifted/Highly Gifted Magnet Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the strength that is found in glues that would be commonly used in a school. The glues that were used were common white glue, wood glue, and tacky glue. Popsicle sticks were glued together in an X fashion. After five minutes of waiting, they were suspended in the air via two structures made out of Duplo<sup>®</sup> building blocks. A net was attached and different weights were added. Each experiment was repeated five times using all three glues. The wood glue ended up holding more weight and outlasting both of the other glues in an endurance test. The white and tacky glues did not do as well as the wood glue because they were not performing the tasks for which they were designed to do. As such, the wood glue was doing the things that it was meant to do.

**2931**

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**DO *ONYCHIURIDAE ENCARPATUS*, AN EYELESS SPECIES OF COLLEMBOLA, PREFER EATING RED COLORED YEAST AS OPPOSED TO YEAST IN ITS NATURAL BEIGE COLOR?**

J. Aguirre, S. Bergman, J. Burkett, A. Canales, K. Chan, L. Crittle, K. Deporter, G. Di Crosta, L. Feldman, M. Field, J. Garcia, S. Ghasemi, I. Glen-Lambert, S. Graham, K. Grossman, R. Jauberty, A. Kim, J. Lowe, A. Mahjoubi, N. Matthews, C. Morgan, N. Naczinski, D. Nedelcu, C. Newell, C. Pages, S. Player, A. Rogenstein, A. Serban, S. Shevach, B. Starr, R. Stern, I. Vasquez, S. Voragen, A. Washington, J. Woerner, E. Woolf, P. Zak and T. Miller (teacher). Parkman Middle School, 20800 Burbank Boulevard, Woodland Hills, CA 91367.

This experiment was performed to see if the eyeless species of collembola, *Onychiuridae encarpatus*, prefer eating red colored yeast or yeast in its natural beige color. Previous collembola experiments have proved that collembola can detect ultra-violet light. We believe *Onychiuridae encarpatus* will not make a food selection based on color. Collembola are microscopic arthropods that have six legs. They also have a furcula which allows them to jump large distances for their tiny size. This experiment was performed by nine different groups. Ten to fifteen collembola were placed in nine petri dishes. The petri dishes had been previously prepared with charcoal, plaster of Paris, and water dried base. Dried yeast was moistened with red food coloring or water. Five grains of the red yeast were placed on one side of each petri dish and five grains of natural colored yeast were placed on the other side of the petri dish. Water was added to the ground level of the petri dish to make a damp environment for the collembola. Using a stereomicroscope, the collembola were observed eight times in eight school days. We collected data

by carefully counting the number of collembola eating the beige colored yeast and the collembola eating the red colored yeast. Collembola that had an obvious red gut were also counted as eating the red colored yeast. Our data showed that the collembola have no preference as to the color of their food. Our hypothesis was correct.

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## 2932

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### EFFECTS OF DIFFERENT LIQUIDS OF MARIGOLDS

K. Vanderburg and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

In this experiment I studied the results of different liquids on marigolds. For each marigold I put in a different liquid and recorded the growth rate for four weeks. The liquids I added were water, milk, orange juice, Gatorade, and Pepsi. The marigold grown with water increased one half centimeter a week totaling two centimeters. The marigold that was raised on milk stayed the same for three weeks and then grew one half centimeter. The marigold that fed on orange juice remained the same for two weeks and decreased one half centimeter each week after that equaling one centimeter. The marigold that was given Pepsi reduced in size one half centimeter a week making two centimeters. The marigold with Gatorade decreased one centimeter a week for two weeks, stayed the same the following week and decreased one half centimeter the next week totaling two and one half centimeters. This experiment proved water is the best liquid for plants to be grown in and Gatorade is the worst.

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## 2933

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### EFFECTS OF TIN CHLORIDE ON SEA URCHIN FERTILIZATION

E. Imperial, B. Carroll and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This study assessed the effects of tin chloride on the fertilization of the sea urchin, *S. purpuratus*. Eggs and sperm were exposed to various amounts of tin chloride diluted in distilled water. The solutions of tin chloride were as follows: .1M, .01M, .001M, and .00001M. Eggs were placed on each slide and one of the solutions of chloride were added. The sea urchin sperm was then placed on the slide, and observed. The amount of fertilized eggs was then counted. This procedure was repeated three times, for each solution of the tin chloride. For one of the slides, no tin chloride was placed on the slide with the eggs. This served as the control for the experiment to see what the normal rate of fertilization for sea urchins, which was  $93\% \pm 2\%$ . For the least concentrated solution, .0001M, about fifteen out of fifty eggs, or 30%, were fertilized. For both the .001M and the .01 solutions, nine out of fifty eggs, about 18%, were fertilized, and none of the eggs were fertilized in a .1M solution of the tin chloride. This shows that the tin chloride causes the rate of fertilization to decrease.

## 2934

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### **POLLINATING IN THE RAIN**

Taru Flagan and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803

Recent observations that pollen from grasses and trees rupture when immersed in water raised an important question: What happens to the pollen when rain, fog, or dew wets the flower? This project explores the behavior of many types of pollen in water. I began by collecting several plant samples and transferred the pollen from the plants onto a concave well on a microscope slide. I then proceeded to add water to the slide using an eye-dropper. I photographed the pollen at various time intervals until the time of explosion. The pollen from all of the different plants ruptured when immersed in water. Some of the samples formed tubes before rupturing, while others just exploded. Different flowers took different amounts of time to explode. Some took as little as ten seconds, while others took as long as a few days.

## 2935

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### **WHAT LIQUID WILL BEST FEED LIMA BEANS?**

David Aaron Weisbach and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth CA 91311.

The purpose of this experiment was to find out what liquids worked best as a feed for lima beans and furthermore, to find out what vitamins, minerals, or substances in the drinks made it best. For my experiment I planted lima beans in 4" pots and fed them either Gatorade, Pepsi, caffeine-free Pepsi, orange juice, V8 vegetable juice, or water. I fed two ounces of each drink to two plants every other day for about two weeks. I then dug out the seeds and placed them on a ruler and photographed them with a macro lens on a camera which was on a tripod for stability. The results suggested we should "stick with the real deal" and feed our lima bean good old-fashioned H<sub>2</sub>O.

## 2936

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### **CUI—CRICKETS UNDER THE INFLUENCE**

Jennifer Pillow and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803.

The purpose of this experiment was to observe the normal chirping and other habits of store-bought house crickets (*Acheta domesticus*) under control conditions, and to see if these habits would vary if I altered these conditions. In order to answer this, I bought two dozen crickets and four cages, kept one group of crickets as the control group, divided the rest of the crickets into three other cages, and observed them daily. Each group in the three latter cages had a different

ratio of males to females than the control, and the other factors I altered were temperatures, levels of light, and diets. In order to test the temperature factor, I observed the crickets in the classroom at room temperature, in a heated room, and outdoors at night. To see what reactions the crickets would have to different levels of light, I observed them in the classroom, in a room with brighter light, and in a darkened room. Reactions to three different diets were also tested: 1) carrots and Cheerios®, 2) corn and oats, and 3) Fluker's® Cricket Feed and Cricket Quencher. After a few months of observation, I discovered that, in general, crickets are more active and chirp more often in moderate temperatures, in brighter light, and in communities with more females. I also found that crickets prefer dry, powdered grains in addition to a good water source.

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## 2937

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### WHAT OBJECTS CAN CONDUCT ELECTRICITY?

J. Teng and G. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This project was to test objects to see which ones are able to conduct electricity. Objects used in testing were: a paper clip, bobby pin, screw, aluminum foil, bottle cap, button, popsicle stick, rubber band, paper and coins. Electricity needs to flow down a path, which is called a circuit. To make this experiment possible, a circuit has been setup. This circuit includes a 6 volt battery, 3 coated wires with alligator clips, a light bulb, and a light bulb holder. The several different objects will be put between two wires, which will bring the electricity to the light bulb. Since electricity cannot flow through everything, this experiment will show which objects can or cannot conduct electricity. After testing repeatedly, the objects were separated into two groups, conductors and insulators. Conductors allow electricity to flow easily through them. Insulators block the flow of electricity. The results after this experiment were that the aluminum, bottle cap, coins, bobby pin, screw and the paper clip were all conductors. The popsicle stick, rubber band, button, and paper were not able to conduct electricity which showed that they were insulators. The conclusion to this experiment is that all metal conducts electricity.

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## 2938

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### A STUDY OF LEAD IN SOIL IN NORTHWEST SAN FERNANDO VALLEY, CA

Jaclyn H. Ferber and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study consisted of an environmental investigation on concentrations of total lead in soil located in the residential, commercial, industrial, and public freeway areas of the Northwest San Fernando Valley, California. The hypothesis of the study was that the industrial and commercial parts of northwest San Fernando Valley contain more total lead in soil than the soil in residential areas, and that some older areas and busier traffic areas have a higher level of total lead. Fifteen soil samples were collected and submitted to an analytical laboratory using a proper

chain of custody document. Using rubber gloves to protect the skin, the soil was scooped up into the glass jar and the cap was screwed on. The cap was then sealed to the jar with a chain of custody seal and delivered to the analytical laboratory. The soil samples were analyzed for total lead using U.S. EPA method 7240. The total lead levels in the industrial soil samples ranged from 75 mg/kg to 170 mg/kg. The total lead levels in the commercial soil samples ranged from 2.5 mg/kg to 100 mg/kg. The total lead levels in the freeway soil ranged from 45 mg/kg to 50 mg/kg. The total lead levels in residential soil ranged from <1 mg/kg to 39 mg/kg. None of the soil samples taken exceeded over the U.S. EPA Preliminary Remediation Goals for lead in industrial and residential soils. In addition, none of the lead in the soil samples exceeded over the California Total Threshold Limit Concentration of 1,000 mg/kg for lead in soil and therefore are not hazardous wastes. The results from the soil study for lead support the hypothesis that that the industrial and commercial parts of northwest San Fernando Valley contain more total lead in soil than the soil in residential areas, and that some older areas and busier traffic areas have a higher level of total lead.

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**2939**

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**A NOVEL APPROACH TO DETERMINE PERIODIC NECTONIC DIVERSITY  
IN SUB-TIDAL ENVIRONS**

R. McInerney, A. Jahanbin, et al. and D. M. McDonnell (teacher). Sherman Oaks Center for Enriched Studies, 18605 Erwin Street, Sherman Oaks, CA 91335.

The purpose of this study is to determine a correlation between tidal depth and the density or diversity of nektonic species that populate the sub-tidal environs found in the waters at Leo Carrillo State Beach. Leo Carrillo State Beach is located at latitude 34.02.73, longitude 118.56.61. While still in the first year, the project focus has been to develop novel protocols used to collect, analyze and collaborate data. Data was collected using underwater digital video, then analyzed at the school site using digital editing software. Four semi-permanent observation stations were mounted onto the seafloor and their position mapped using GPS. Sixty-minute sequences were filmed on the former and latter side of day light tidal ebbs. These methods allowed the engagement of students from various classes for participation in the identification and confirmation of data. Analysis of early data has shown that training with a variety of control images is critical for species identification. Data collection is limited to late summer and early fall due to water clarity in the local waters, and may also show a correlation due to seasonal variability.

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## 2940

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### EFFECTS OF COKE ON BLEACHED AND UNBLEACHED TEETH

B. V. Low and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment examined the possibility of stains and decay in teeth bleached with 15% carbamide peroxide and unbleached teeth in a coke environment. Bleached and unbleached teeth, coated with saliva, were kept in separate containers of coke (pH 2.5) and examined every hour. The bleached teeth didn't stain as fast as the unbleached teeth initially. After four hours, the bleached teeth had darker stains covering about 40% of the enamel surface area. The unbleached teeth had lighter stains that covered about 52% of the enamel surface area. Throughout the investigation, there was no significant decalcification/decay in the enamel in both groups. These results show no distinct difference in the potential of decay between the two groups. Also, it was noted that bleached teeth stained slower initially but after 4 hours stained darker on a smaller surface area.

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## 2941

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### EFFECTS OF VARYING SALINITY UPON SEA URCHIN FERTILIZATION

J. D. White and W. P. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

The experiment was intended to determine the effect of various salinities upon the fertilization of *S. Purpuratus* eggs by sperm. As a control group, the sea urchin's sperm was allowed to fertilize the eggs in a solution of water with the same specific gravity as that which would be found in the ocean, 1.022. This slide was allowed ten minutes at room temperature to fertilize, it produced a fertilization rate of  $97\% \pm 3\%$ . The specific gravity of the second group was 1.017. Incubation was attempted three times in water with a specific gravity of 1.017. The resulting percentage was  $90\% \pm 2\%$ . The final variant had a specific gravity of 1.027. All three slides were observed to have a fertilization rate of 0%. The results to this experiment indicate that fertilization of sea urchin eggs by sperm may take place effectively in a lower salinity than is found in many places in the ocean, but that this sperm-egg interaction is interrupted by a higher salinity.

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## 2942

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### EFFECTS OF COLORED LIGHT ON THE GROWTH OF RADISHES

J. T. Zuk and G. C. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment studied the effects of different colored lights on radishes. The radish seeds were planted in trays and then placed under normal, blue, red, or green fluorescent light for eight hours

every night for three weeks. Measurements were taken throughout the three-week period. The blue light resulted in the largest amount of growth. The normal light had the second largest growth rate. The color with the least growth was the green light. This is because green grows well under normal light and changing the color of the light will not result in greater plants, such as radishes, which cannot accept much green light because they are green. The green color in plants is caused by chlorophyll in the leaves.

## 2943

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### **EFFECTS OF VARIOUS HOUSEHOLD SUBSTANCES ON STAINED COTTON**

Andrew Chung and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment was designed to see which household substances (hand soap, lemon juice, baking soda paste, and toothpaste) would best clean 2-inch squares of cotton fabric that have been stained with various substances found around the house (ketchup, raspberry kiwi juice, tea, marker, and soy sauce). A stainer was applied onto five cotton squares. Of these five, one was set aside as a control for the experiment. The other four were cleaned with the four cleaners, one for each square. The process was repeated for the other four stainers, and the results were photographed. The experiment was repeated two times, and the results were compiled. The results showed that hand soap was the best at getting out the stains, followed by toothpaste, baking soda paste, and finally lemon juice. In conclusion, if an article of cotton clothing was to be stained with something, hand soap or any other kind of detergent should be used to remove the stain for best results.

## 2944

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### **THE EFFECTS OF AJAX SOAP ON SEA URCHIN FERTILIZATION**

Allysa Wilson and William Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This study examined whether Ajax soap would affect the fertilization of the sea urchin *S. purpuratus*. We used three different dilutions of the solution. First we made a 1% solution which was made of 1 ml of Ajax soap and 99 ml of water. When we tested this one on the sea urchin eggs, all the sperm died so there was no sperm-egg fertilization. The next solution was a 1/100% solution. This was made by taking 1 ml of the 1% solution and combining it with 99 ml of water. When this solution was applied to the eggs we counted 50 eggs. Out of those 50 eggs there were 8 that had been fertilized by the sperm and 2 cells had burst. Then we tried one more diluted formula, a 1/10,000% solution. This was made by taking 1 ml of the 1/100% solution and combining it with 99 ml of water. With this solution there were 10 eggs that were fertilized and 3 cells that burst out of 50 eggs. We had to repeat this three times to see if our results were accurate. The fertilization rate was between 16% and 20%. The fertilization rate increased as the solution

became more dilute. These were compared to a control of just sperm added to the egg solution which produced a  $93\% \pm 2\%$  fertilization rate. We found, in conclusion, that fertilization for sea urchin eggs can still occur when Ajax soap is applied at lower concentrations.

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## 2945

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### HOW AND WHY VOLCANOES EXPLODE

Jeanette Lopez, Janette Lopez, Stephanie Ventura and Jackie Ockene-Fogelman (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

In this investigation, we wanted to know the cause of volcanoes and how lava forms. In order to find this information, we researched our topic. We found out that volcanoes erupt when the heat and pressure from the earth's inner mantle layer escapes through an opening in earth's crust during an eruption. Trapped rocks in the mouths of volcanoes may block escaping lava causing bigger and more violent volcanic eruptions. This lava forms when rock inside the earth's crust is heated and put under pressure.

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## 2946

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### WHY DOES HOT AIR RISE?

Jennifer Harris and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the question on why hot air rises. The materials I used in this experiment were: a large heat resistant bowl, an empty glass bottle, a balloon, a rubber band, ice and hot water. I put the glass bottle in the cold water for 5 minutes, then I put the balloon over the top and secured it with the rubber band. I then emptied out the cold water and replaced it with boiling hot water. I then set the glass bottle back in the bowl without removing the balloon and all the heat pressure made the balloon rise showing that hot air rises. I did this experiment twice and the results were the same.

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## 2947

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### THE EFFECTS OF VINEGAR ON ACTIVE YEAST

K. J. Letzo and W. Van Duzee (teacher). Saugus High School, 21900 W. Centurion Way, Saugus, CA 91350.

This study examined the question of the effects of household vinegar on yeast activity. One-fourth of an ounce of active dry yeast was dissolved in  $\frac{1}{4}$  C. warm water ( $100^{\circ}$ – $110^{\circ}$ F). To proof the yeast, one teaspoon sugar was added and stirred into the test tube. As the yeast activated  $\text{CO}_2$  was released. Two hundred twenty-five  $\text{CO}_2$  bubbles were released through a tube within the first 2 minutes of the controlled reaction. In the experimental trial  $\frac{1}{2}$  t. of vinegar (acid) was

added to the yeast. The number of CO<sub>2</sub> bubbles in the first run decreased to 123, while the initial reaction rate was immediate. This experiment was repeated three times and the average number of bubbles was approximately 123. This experiment showed that the effect of this amount of vinegar was to slow the rate of fermentation.

## 2948

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### **THE COLD RACE:**

#### **WHICH SOLUTION OF SUGAR, SALT, AND BAKING SODA FREEZES THE FASTEST IN WATER?**

R. Morales, R. McBride, J. Han, J. Huey and C. Sams (teacher). University High School, 11800 Texas Avenue, Los Angeles, CA 90025.

If you expose water to elements such as sugar, salt, and baking soda, which of these three elements will freeze fastest and why? When salt is added to water the freezing rate increases because it dissolves into the liquid. We placed one teaspoon of sugar, salt and baking soda into separate cups of water containing one cup of the liquid. We stirred the substances for five seconds and placed them in the freezer. At twenty-minute intervals we checked on the substances and watched out for the solution that froze the fastest until one was completely frozen. Contrary to our initial presumption, sugar was the substance that froze the fastest of the three substances. In order to double check the results we re-did our entire experiment and the result failed to change. The rate at which a solute dissolves is influenced by agitation, temperature, and particle size. All of the solutions were stirred for five seconds before being placed in the freezer in order to bring the fresh solvent into contact with the solute. When stirred, the sugar sank to the bottom of the container, whereas the salt and baking soda both dissolved into the water. Sugar is thus a less soluble substance. Baking soda is smaller than sugar therefore it dissolves faster. Water molecules are in continuous motion causing sugar to obtain the strongest reaction. Sugar has larger particles, produces more energy as temperature decreases and does not dissolve like the other two substances. Thus, among the three solutions, sugar-water freezes the fastest, beating the other two substances by nearly 9%.

## 2949

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### **ANALYZING PROTEINS THAT MAY BIND TO CRITICAL SITES ON CD4+ T-CELLS IN ORDER TO PREVENT ENTRY OF HIV-1 AND HIV-2 INTO CELLS**

Lela Clark, Raul Estevante, Oswaldo Gallendo, Roberto Medina and Oryla Wiedoeft (teacher). Dr. Stan Metzenberg (CSUN research advisor). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

Progression of human immunodeficiency virus (HIV) in humans is associated with the destruction of CD4+ T-cell populations, leading to acquired immune deficiency syndrome

(AIDS). The long term goal of the research is to discover specific proteins that will bind the CD4 region of helper T-cells and block binding and entry of HIV into cells. The goal of our experiments was to analyze the sequences of small proteins expressed on bacteriophage that had been found in previous experiments to bind to the receptor on the CD4 region of helper T-cells.

To carry out our experiments, we grew *E.coli* colonies and infected them with phage viruses that expressed our sequence of interest on their surfaces. We precipitated the phage from the solution in which they were grown, and used PCR to amplify the protein expressed on the surface of the phage. We then prepared the amplified regions for sequencing and submitted them to the CSUN sequencing facility. Pavel Leib, who runs the sequencing facility showed us how DNA was sequenced. The DNA is loaded into the top of a long, wide, and extremely thin gel. An electric current causes the DNA to run from one end of the gel to the other, and is separated during the process, such that one can look at the gel and determine the order of bases in the DNA. We learned that a chromatograph is then generated, and the DNA sequence can then be easily read.

Unfortunately, our experiments were not clean enough to give a good reading after sequencing. However, we learned how to read chromatographs from other sequencing gels that had been run in the past.

## 2950

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### **DO *PSEUDOSINELLA VIOLENTA*, AN EYELESS SPECIES OF COLLEMBOLA, PREFER EATING RED COLORED YEAST AS OPPOSED TO YEAST IN ITS NATURAL BEIGE COLOR?**

L. Alikhani, M. Buchsbaum, K. Caplan, S. Dampf, B. De Los Santos, A. Derse, J. Edwards, R. Gomez, Z. Guzman, J. Hunter, J. Hutchings, K. Johnson, C. Khoury, T. Koch, M. Kossarian, M. Lopez, S. Loranger, N. Maisonnave, A. Martinez, A. Membreno, A. Orbin, F. Parsai, A. Partida, A. Perez, A. Rogero, L. Ruimy, V. Schieffer, S. Soroudi, K. Stanfield, A. Stephenson-Wenn, A. Toxtle, C. Wallace, P. Wardlow, S. Wilson, L. Yoshizuka and T. Miller (teacher), T. Smith (advisor). Parkman Middle School, 20800 Burbank Boulevard, Woodland Hills, CA 91367.

The purpose of this experiment was to see if an eyeless species of collembola prefer eating red yeast or yeast in its natural beige color. It has been discovered in previous studies that eyeless species of collembola can detect ultra-violet light. It is our hypothesis that, *Pseudosinella violenta*, will not make a food selection based on food color. Collembola are microscopic hexapods that eat mold. Habitats for the experiment were created by placing a mixture of water, charcoal and plaster of Paris in nine petri dishes. The mixture was stirred and allowed to dry. Water was added to the dried base to provide a moist environment for the collembola. Dried yeast was moistened by placing two drops of red food coloring in a microcentrifuge tube with the dried yeast and two drops of water in a different microcentrifuge tube with the dried yeast. Five grains of each color of yeast were placed on opposite sides of each of the petri dishes. Ten to fifteen collembola were placed in each of the nine petri dishes. Using a stereomicroscope, data was collected eight different days by counting the number of collembola eating each color of yeast. Collembola with red gut were also counted into the data. By almost a two to one ratio the collembola preferred the beige

colored yeast. Our hypothesis was incorrect as the collembola showed a preference for the beige colored yeast. We believe this experiment should be repeated and more data collected.

## 2951

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### **DO DIFFERENT FAMILIES OF COLLEMBOLA PREFER DIFFERENT TYPES OF FOOD?**

Kiara John-Charles and T. Miller (teacher). Parkman Middle School, 20800 Burbank Boulevard, Woodland Hills, CA 91367.

The purpose of this study was to see if different families of collembola prefer different types of food. My hypothesis was that different collembola would prefer different types of food. Collembola are microscopic hexapods. I used collembola from the Isotomidae and Onichuridae families. Artificial habitats were made by using small jars with a charcoal, plaster of Paris, and water ground level. Using a floating method, I placed five collembola in each of the ten jars using a small wire loop. Five collembola were from the Onichuridae family and five were from the Isotomidae family. I fed the collembola three or four times a week. I recorded how much the collembola had eaten. The collembola of the Isotomidae family ate eight grains of Red Star yeast and twelve grains of Fleischmann's yeast. The collembola of the Onichuridae family ate twenty-three grains of Red Star yeast and nineteen grains of Fleischmann's yeast. After collecting all my data, I concluded that my hypothesis was correct, the Onichuridae preferred Red Star Yeast and the Isotomidae preferred the Fleischmann's Yeast.

## 2952

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### **WHICH DETERGENT WORKS THE BEST?**

Chad Diep and Gregory Zem (teacher). Ernest Lawrence Middle School 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this science project was to figure out which commercial detergent (Tide, Cheer, or Gain) worked the best on ketchup, mud, grass, and wine stains. The cloths were rubbed or soaked with the stain substance and after a few hours, were cleaned with the different detergents and toothbrushes. The process was repeated a few times. The cleaned cloths were then compared to color panels which had the different shades of the stain color. The darker the stain was the more stain points it received and vice-versa. The results were that Tide performed the best overall and got the least amount of stain points for every type of stain. Gain was second and the detergent with the most stain points and performed the worst overall was Cheer.

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## 2953

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### **CAN CABBAGE JUICE BE USED TO DETERMINE THE pH OF SUBSTANCES?**

Ivonne Garcia and Nandita Pal (teacher). Robert Fulton Middle School, 7477 Kester Avenue, Van Nuys, CA 91405.

It is well known that when you add cabbage juice to different solutions, the color changes. We were interested to find out whether cabbage juice could be used as an indicator of the pH of the solutions. We used the juice from a purple cabbage. We added the strained juice to different household items such as 7-Up, baking soda, lemon juice, vinegar, detergent, milk and water and noted the color change. We used a hand held pH meter and pH paper to note the pH of these solutions. We observed that at pH lower than 4.5 the color ranged from pink to red. The colors were shades of blue in the pH range of 6 to 9.0, whereas at higher pH greater than 9 the color was green to yellow. Our results indicated that cabbage juice could be used as an indicator to determine pH ranges in solutions.

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## 2954

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### **ARE PHENOTYPES OF BREEDING DROSOPHILA COLONIES WITH SINGLE MUTANT TRAITS AFFECTED BY VARIATIONS IN TEMPERATURE?**

Mayra Castaneda and Oryla Wiedoeft (teacher). San Fernando High, 11133 O'Melveny Avenue, San Fernando, CA 91340.

Based on previous experimental results obtained by a lab partner, we theorize that when *Drosophila melanogaster* flies with a single mutation are crossed with flies with a different single mutation and maintained in lower than room temperature conditions, they produce phenotypes unlike flies undergoing the same genetic cross grown at warmer than room temperature. To investigate our hypothesis I have set up a series of experiments. To maintain constant temperature, I am raising my fly colonies in two different incubators set at 22 degrees Celsius, and 29 degrees Celsius, respectively. I am crossing *Drosophila* that have the homozygous recessive trait for white eyes with flies that are homozygous recessive for held out wings. In previous experiments, white eyed flies crossed with flies exhibiting held out wings produced minimal variations in the predicted phenotypes of the F<sub>2</sub> generation. I am also crossing flies homozygous recessive for white eyes with flies homozygous recessive for held out wings. In prior experiments, we found that white eyed flies crossed with held out winged flies, produced six different phenotypes. This finding was in contrast to the four phenotypes of F<sub>2</sub> generation flies that Mendelian genetics would predict.

By carrying out these experiments I hope to determine that temperature does have an effect on the phenotypes of F<sub>2</sub> generation flies. However, if temperature variation does not create any phenotypic variation it would lead us to believe that apterous mutation is creating a pleiotrophic effect in our F<sub>2</sub> generation flies.

## 2955

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### **CAN WORDS AFFECT THE WAY PLANTS GROW?**

Maasa Kono and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

In this experiment, I found that positive words affect the way flowers grow (although in my case I didn't have much time so I didn't get as good a result as I wanted).

You may have heard that classical music or kind words affected animals or water crystals. Well, it was basically the same idea except that I used flowers. I bought a bunch of flowers (two of each kind which looked very similar to each other) and separated them into two groups (a "bad" group and a "good" group). I made sure that all the flowers got (about) the same amount of water and sunshine. After that, all I had to do was say mean and ugly words to the "bad" group and kind beautiful words to the "good" group. Then I'd note the changes that occurred (if any).

Because of the small amount of time I had to do this (in my case), there wasn't a really big difference between the two groups. But I did notice little differences, like some of the flowers on the "bad" side wilted while the "good" side stayed normal. I believe that words *can* affect all living animals including flowers and other plants.

## 2956

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### **THE EFFECT OF HEAT SHOCK ON THE GERMINATION OF BRASSICA RAPA**

B. Amerson, M. Cordova, S. Fuller, H. Khachatrain, D. Lewis, T. Mai, S. Manzanares, G. Mendoza Ortez, O. Smith, V. Rivera and J. Moché (teacher). Van Nuys Middle School, 5435 Vesper Avenue, Sherman Oaks, CA 91411.

The purpose of this investigation was to examine the effect of heat shock on the germination rate of Brassica rapa. 42 wild type Brassica rapa seeds were planted in a mixture of 50% Perlite™ and 50% sphagnum peat moss. Half the seeds were incubated at 50°C for 18 hours beginning 5 hours after planting. The remaining seeds were left at 22°C (room temperature). A second group of 42 seeds were prepared in the same fashion, with half being incubated at 40°C. Preliminary results show a significant difference between the control group and the group incubated at 50°C. The number of germinated seeds observed in the control group 24, 48, and 72 hours after planting was twice the number of germinated seeds in the group incubated at 50°C. By contrast, there were no significant differences between the control group and the group incubated at 40°C. We concluded that subjecting newly-planted Brassica rapa seeds to heat shock has a significant effect on germination rate. Additional studies will be conducted to determine if further development is hindered by heat shock.

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**2957**

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**DO DIFFERENT TYPES OF WATER AFFECT THE GROWTH OF TADPOLES?**

Elessa Dominguez, Ivonne Mayer, Michael Ylag and Melissa Ornelas (teacher). Olive Vista Middle School, 14600 Tyler Street, Sylmar, CA 91342.

The purpose of this project was to test the effects of water on the development of tadpoles. In this experiment we hypothesized that healthier tadpoles would develop when reared in bottled water (Arrowhead), than those reared in dechlorinated tap water. In the experiment sixty tadpoles were randomly divided between the two groups. Each tadpole was housed individually in eight ounces of water. Water changes and feedings were done twice a week for all tadpoles in the experiment. The tail length, tail width, and body length were measured twice a week with calipers. Weekly data was averaged and compared between the two groups. We found our hypothesis to be inconclusive because little difference in measurement was found between the tadpoles.

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**2958**

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**ALCOHOL TESTING ON MICE**

Nicole Thurstan and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803.

To test the effects of alcohol, I have given four out of the eight mice red or white wine, using them as my experimental group. I used the other four mice as my control group. After feeding the mice the wine, I ran them through a maze to see exactly how much the alcohol affected their thinking ability and physical movement. To observe the results of the experiment, I compared the amount of time it took the mice to run through the maze with alcohol in their system and without alcohol in their system. I also compared those times with those of the mice who were never given any alcohol at all.

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**2959**

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**THE SENSITIVITY OF THE AS-1 PERSONAL SEISMOMETER IN COMPARISON WITH PROFESSIONAL SOUTHERN CALIFORNIA SEISMOLOGICAL NETWORKS**

Michal Bick, Sabrina Faramazi, Michael Goldsmith, Josh Greenberg, Steven Gurvitz, Omer Hadad, Jordan Hollander, Nadav Itzkowitz, Stephen Kahan, Sara Maghen, Bahar Minoo, Daniella Namvar, Rebecca Nourmand, Jay Rockman, Matthew Rubinstein, Michael Schulman, Elie Tawil, Natalie Torkan and Stephen Cooperman (teacher). Milken Community HS of Stephen S. Wise Temple, 15800 Zeldins' Way, Los Angeles, CA 90049

We are testing the sensitivity of an AS-1 Personal Seismometer from UCLA's Los Angeles Physics Teachers' Alliance Group (LAPTAG: <http://coke.physics.ucla.edu/laptag>) to determine how

well it detects local earthquakes. The seismometer is located under a computer table in our classroom, "earthquake puttied" to the floor to sense vibrations of many different frequencies. Our classroom is in the center building of Milken Community High School, approximately at 34.126° N. and 118.478° W., at an altitude of approximately 350m. The monitoring program is a DOS-based application, running on a stand-alone 486-clone under DOS 6.2. The seismometer and computer are interfaced by an RS-232 plug and a telephone jack.

We have examined seismometer sensitivity by events it records: from students walking nearby to events which shake the building. Comparing with <http://www.scecdc.scec.org/recenteqs/index.html>, real seismic events record a peak intensity near 5 Hz, trailing off to lower amplitudes at higher frequencies. Spurious, unexplained peaks exist at 12, 15, 17, and 22 Hz. Further research will decide what causes those vibrations and how we might eliminate them.

Due to non-seismic vibrations, we have decreased the seismometer's sensitivity level (increased the instrument's trigger level). As a result, we are currently unable to detect any earthquake below a magnitude 2.6 unless it is very close, and we are often unable to sense one as strong as a magnitude 4.0 on the Richter Scale, even if it occurred as close as Palm Springs.

Our next step will be to plot earthquake magnitudes and their distances from us to show the likelihood of detecting an earthquake of a certain magnitude if it is closer than a certain distance away. Results will be posted at <http://www.mchs.school.org/~scooperman/earthquake>.

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## 2960

### **WILL POPCORN GROW IF IT IS POPPED?**

### **WILL POPCORN GROW IF IT IS NOT POPPED?**

Brandy O'Hagen, Arnol Munoz, John Ramirez, Dayana Sandoval, Marcelino Cortez, Maricruz Augusto, Treva Dillard, Charlothy Pernillo, Perla Gonzalez, Pedro Armito, Mercedes Gavidia, Johnathan Gavidia, Martin Miranda, Karla Rodas, Karen Perez, Jonathan Gavidia, Daniela Moreno, Angelica Tolis and Linda Slater (teacher), Maria Elena Zavala, Ph.D. (CSUN). 24th Street School, LAUSD, 2055 West 24th Street, Los Angeles, CA 90018.

We are learning how to think like botanists which are plant scientists. We have lots of questions but we chose a question that we could find out the answer to ourselves. We really like to eat popcorn and we really like to grow vegetables. So we thought that we could find out if popcorn that we use to eat in our class (we have our own popcorn popper!) could be grown into popcorn plants. Then we wondered if we could also grow the popped popcorn plants.

We began by learning a lot about plants in our science textbook called "Harcourt Science, California Edition." Then we learned a lot about how to grow vegetables from our teacher, who is the Garden Teacher at our school. Then we had a visitor come from the Los Angeles Environmental Affairs Department. She helped us start a lot of other kinds of seeds to grow and we got to look at different kinds of plants. When we decided to find out more about popcorn seeds, we studied diagrams of the inside of a corn seed. We asked a lot of questions about it. We com-

pared it to other kinds of babies and we learned that corn seeds are just like little tiny babies waiting to grow.

We really love popcorn so we would like it if we could grow our own. But we have questions about whether it will grow (the kind right from the bag of popcorn). We are also not sure if popped popcorn will grow. Most of us think it will. Only 1 student does not think that popped corn will not grow.

Here is how we did our research. First we each wrote down what we thought would happen to the seeds. We discussed our ideas and why we had them. Then each student got baggies and clean paper towels. We wet the paper towels with water. Then we put 5 unpopped corn seeds in one baggie and we put 5 popped popcorn seeds in another one. So we had a lot of baggies on our science observation table. Then we took a picture of what they looked like. We wrote in our journals what we did, so we could do it again, just the same. Then we observed the seeds for 7 days. We took pictures after 7 days to document the results. Then we had a discussion about the results and we wrote about the results in our science journals. Last, we threw away the seeds that did not grow and we took the germinated seeds to our raised bed vegetable garden. We planted the seedlings in the soil. Of the 63 seedlings that we planted, 6 have begun to produce mature leaves.

Results:

Number of experiments: 1

Number of Samples: 30

Controls: 15

Conclusions: None of the popped corn seeds grew. Of the 15 baggies with 5 corn seeds in each, 63 of the plants began growing. Of the 63 seedlings planted in our raised bed garden, 6 have matured into plants.

Our conclusion is that unpopped popcorn plants will grow if they have water and air. Popped corn will not grow. It will get soggy and grow mold.

We do not know the result of the rest of the experiment, because our corn has not been growing in our raised bed vegetable garden long enough to produce fruits.

We have begun replicating this experiment for a second round and are excited about adding more questions to our project.

## 2961

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### WHAT LIQUID SUBSTANCES ARE BETTER CONDUCTORS OF ELECTRICITY?

Charn Jivaphaiboonskdi and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311

My hypothesis is that I believe that the carbonated liquids would produce a brighter light than the non-carbonated liquids. The procedure is to tape the 3 "D" cell batteries together with the positive end touching the negative end of the other batteries. You tape the batteries together

with the duct tape. You cut several strips of aluminum foil 4 inches wide by 12 inches long. You put different solutions in the cereal bowl (cleaning out the cereal bowl and drying thoroughly after each different solution). You stand the batteries in the cereal bowl with the negative end touching the bowl. You wrap one end of a strip of aluminum foil around the metal base of the flashlight bulb and you lay the free end of the aluminum foil strip in the solution which has been placed in the cereal bowl. The result is that the flashlight bulb glows at a different rate depending upon the solution used. The exception was the root beer. The root beer solution did not create any electric current to make the flashlight bulb glow. The salt/distilled water solution caused the flashlight bulb to glow at a very low light. The milk solution caused the flashlight bulb to glow just a little brighter. The Coca-Cola and the tap water solutions cause the flashlight bulb to glow a brighter light than the milk solution. The brightest results came from the orange juice, sugar /distilled water and non-alcoholic wine beverage solutions.

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## 2962

### **POWERS OF THE MAGNETIC FORCE**

Clifford P. Mao and Gregory C. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

The purpose of this experiment is to see the strength of the magnetic force in different statuses. My hypothesis is that the more solenoid coils there are, the electromagnet has a stronger influence on the compass. My hypothesis is influence will get weaker at some point with more solenoid coils, the solenoid coils with a metal core will influence the compass better than one without, and higher voltage makes the electromagnet stronger. A 3cm distance was established between the bottle and the actual compass, the wire, switch, batteries in battery holder, and alligator clips were connected in a parallel connection. Solenoid coils were put in front of the bottle with the bottle facing north. Do the same when the pipe is inside the bottle. A similar experiment is conducted, but with different distances. Another experiment is conducted, but with changes in the voltage. The results were that the more solenoid coils the higher the influence on the compass is until a certain point where the field starts to become weaker. When there were 14 coils it influences the compass  $178^\circ$ , 16 coils cause  $182^\circ$  movement, and 18 coils cause  $168^\circ$  movement in the compass. If the bottle has a metal core inside, it makes the field stronger and affects the compass more. The longer the distance the less influence the electromagnet has on the compass. The higher the voltage the stronger the electromagnet is, this shows that voltage, solenoid coils, and distance affects the magnetic force's power.

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**2963**

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**WATER QUALITY STUDIES OF THE MALIBU WATERSHED OVER TIME**

O. Archila, L. Avina, L. Casarez, J. Cruz, J. De Leon, L. Dorado, L. Gomez, G. Grover, C. Guiterrez, M. Higuera, L. Lopez, M. Lopez, W. Martinez, L. Molina, A. Podzharyy, J. Rivera, E. Rojo, R. Romero, J. Salgado, M. Samsonidze, A. Velazquez, G. Bethancourt, Pablo Cuellar, J. Bustamante, V. Mariscal, A. Figueroa, A. Agosto, S. Aguilar, H. Auguiano, E. Argueta, J. Becerra, S. Cabrera, C. Cienfuegos, C. Contreras, J. Cueva, L. Dermendjian, N. Garcia, A. Gonzalez, D. Goodwin, I. Hernandez, A. Herrera, S. Kharimian, K. Merlin, K. Olmedo, J. Pena, H. Perea, H. Rodriguez, L. Romero, A. Sandoval, A. Springstead, N. Stricklen, E. Vasquez, L. Velasquez, K. Lacey, J. Session, L. Banuelos, G. Sanchez, J. Sanchez, R. De Barge, E. Akram, J. Alfonzo, C. Andrade, H. Arteaga, E. Baek, L. Backwell, V. Bustamante, V. Castro, M. Cordova, De La Torre, O. Garcia, L. Garza, Lailson, N. Martinez, M. Medina, M. Medrano, M. Molina, B. Navarro, K. Nunez, D. Pacheco, C. Paz, A. Rios, E. Roma, A. Silva, R. Taylor, J. Velazquez, V. Manuel, G. Marquez, H. Gordillo, H. Solorzano, C. Cervantes, F. Marroquin, F. Avila, L. Castillo, D. Contreras, J. Cruz, J.J. Sione, H. Gordon, P. Guardado, L. Hayrapetyan, M. Lopez, K. Mazariegos, M. Patterson, J. Placencia, H. Puma, A. Quintero, D. Robledo, J. Rodas, L. Rodriguez, E. Romero, J. Salazar, R. Saldivar, C. Sire, S. Smith, E. Thomas, B. Trejo, V. Trinidad, J. Valdivia, J. Vinueza, S. Yadiidi, O. Morse, S. Gallegos and Monica J. Tully (teacher). Mulholland Middle School, 17120 Vanowen Street, Van Nuys, CA 91406.

The objective of this project is to allow middle school students, grades 6–8, to perform water quality studies on the Malibu watershed. Our present study investigates the water quality in three specific areas which make up the Malibu watershed: The Malibu Creek which drains into the Malibu Lagoon (a natural estuary), and the Malibu Beach area. The students and I performed chemical analyses on the water from these three areas in order to detect seasonal changes and levels of pollution and toxicity of this watershed system over time, which threaten the development of plant, vertebrate and invertebrate species living in the Malibu Creek, Malibu Lagoon and the Malibu Beach areas. We found that the water quality of the Malibu watershed does indeed change over time. The levels of chemical toxicity, including pH and nitrite concentration, progressively decrease in the fall and early winter months. The levels of calcium and dissolved oxygen also decrease. This study heightened the students' awareness and understanding of the factors which impact our local watersheds, such as the Malibu watershed, and our responsibility in keeping our watersheds, estuaries, and oceans free from pollution and contamination.

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**2964**

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**WHAT FRUITS OR VEGETABLES CONDUCT ELECTRICITY?**

B. Kim and G. Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth CA 91311.

This experiment tested the electric conductivity or lack thereof in the fruits and vegetables that had been chosen. The fruits and vegetables were: apple, orange, banana, strawberries, kiwi, melon, pear, grapefruit, pineapple, grapes, cabbage, potato, carrot, asparagus, broccoli, avocado,

celery, onion, garlic, and cucumber. A complete circuit was made using a 6v. battery, car light socket, a light bulb, and copper wire. A hole was made in the circuit and the fruits and vegetables were placed inside the hole in between two copper wires and then tested to see if there was a current being completed. All of the fruits and vegetables that were tested came out negative and they all are insulators because they all stopped the current from flowing. The results suggest that none of the fruits and vegetables worked because there were no metals inside of them, and that metals might be the only thing that conduct electricity.

## 2965

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### **SEASONAL AFFECTIVE DISORDER (S.A.D.) AND ITS EFFECT ON PEOPLE LIVING IN SOUTHERN CALIFORNIA**

Stacy Medof and Gregory Zem (teacher). Ernest Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study examined the question of whether people living in Southern California are affected by S.A.D. (Seasonal Affective Disorder). Questionnaires were distributed to adults, both over and under the age of 18. They were asked to answer such questions as months of least energy and worst mood. A sample questionnaire is attached to my project. My results are based on 100 subjects, sorted by age group. Findings suggest that S.A.D. is not a significant problem in the climate of Southern California, but that people might be affected by winter depression due to shorter daylight hours.

## 2966

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### **DO SEEDS REALLY NEED SUNLIGHT TO GERMINATE?**

Angelica Delgado, Jasmin Martinez and Aulikki Flagan (teacher). Ramona Convent Secondary School, 1701 W. Ramona Road, Alhambra, CA 91803.

We did an experiment to prove whether or not seeds need sunlight to germinate. Our hypothesis was that seeds need light to germinate. We placed moist paper towel into two petri dishes. Then we placed 10 lettuce seeds on both dishes. After that we put lids on the dishes, taped them together and placed one of the dishes outside in the sunlight and the other container inside in a dark drawer. Lastly, after two weeks we observed the seed germination.

Our hypothesis was wrong. This experiment showed that plants do not need sunlight to germinate. The seeds that were placed in the dark germinated but the stems and the leaves were yellow in color. The plants didn't look too healthy. The seeds that were placed outside grew strongly. The leaves and the stems were green and healthy.

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**2967**

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**DOES COLOR AFFECT HEAT ABSORPTION?**

Brittany Soash and Gregory Zem (teacher). Ernest Lawrence Middle School Highly Gifted Magnet, 10100 Variel Avenue, Chatsworth, CA 91311.

This experiment was questioning whether or not color affects heat absorption. For this experiment you need ten different colors of the same material, ten outdoor thermometers, and the sun. It was thought that the color of a material would affect the amount of heat absorption, and it was also thought that the warmest color would be black. The colors red, orange, yellow, green, light blue, dark blue, purple, pink, black, and white were placed in the sun side by side. Then one outdoor thermometer was placed inside each piece of material and left in the sun for thirty minutes. After thirty minutes each thermometer was checked and the results were recorded. The color red was ninety-six degrees Fahrenheit, orange was ninety-three degrees Fahrenheit, yellow was ninety-one degrees Fahrenheit, green was ninety-seven degrees Fahrenheit, light blue was ninety-five degrees Fahrenheit, dark blue was ninety-eight degrees Fahrenheit, purple was ninety-five degrees Fahrenheit, pink was ninety-three degrees Fahrenheit, black was one hundred-three degrees Fahrenheit, and white was eighty-eight degrees Fahrenheit. The difference between the lowest temperature and the highest temperature was fifteen degrees Fahrenheit. White had the lowest temperature. This shows that color does in fact affect heat absorption and the darkest color, black, absorbed the most heat.

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**2968**

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**DOES PROCESSING AND PACKAGING AFFECT THE ASCORBIC ACID (VITAMIN C) CONTENT OF SOME JUICES?**

R. Cuevas, S. Palafox, L. Gutierrez, R. Garcia, J. Landa, C. Pruitt, N. Soto, S. Galvez, M. Alvarado, T. Artiga, E. Garmendez, E. Infante, G. Pino, G. Rubio, E. Vivar, W. Archila, E. Cerda, D. Rangel, M. Madison, N. Aparicio, I. Jackson, J. Herrera, J. Freeman, V. Mckamie, J. Williams, V. Avila and I. Odunze (teacher). Bethune Middle School, 155 W. 69th Street, Los Angeles, CA 90003.

The purpose of the investigation was to find out what processing and packaging does to the ascorbic acid content of some juices (orange, lemon, lime, and grapefruit). Our hypothesis was that the ascorbic acid content decreases during processing and packaging. Freshly squeezed juice from orange, lime, lemon, and grapefruit was used and these were compared with the processed form of the same types of juices in one-gallon cartons. The ascorbic acid content was determined by counting the number of drops of each juice required to turn the blue color of 10ml of the indophenol colorless. Each set of experiments was conducted three times for accuracy and water served as the control. Our finding showed that for the orange, lemon, and lime the amount of ascorbic acid was less in the processed form because more drops of indophenol was needed for the color change to take place. However, in grapefruit the opposite was the case,

the processed and packaged form had a lot more ascorbic acid than the freshly squeezed juice. We concluded that the manufacturer of the juice might have added some ascorbic acid as a supplement. Further research is needed to determine if the same result will be obtained if juices from different manufacturers are used for comparison.

## 2969

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### **WHICH TYPE OF SOIL PRODUCES THE BEST RADISHES?**

Daniel Simmons and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This study began with the question of which type of soil will produce the best radishes. It is common knowledge that grow mulches and fertilizers enhance and enrich the soil. Many people don't know which soil will be the best for each type of fruit or vegetable. The study was conducted with two groups to make the experiment accurate. There were four groups, Chicken manure with 50% of natural soil, Steer manure with 50% of natural soil, Grow mulch with 50% natural soil, and natural soil. Cherry Belle Radishes were the radish of choice; other radishes may vary in reaction. A journal was kept on each of two groups and was written in daily. Watering, plant-growth, and weather were the main topics of the journals. The results of this experiment turned out that Chicken had the largest and strongest plants, Grow mulch had strong plants, but weren't as strong as chicken, Natural soil had average radishes, and Steer manure had the weakest plants.

## 2970

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### **EFFECTS OF GASOLINE ON SEA URCHIN FERTILIZATION**

G. T. Brown S. J. Adams and W. Van Duzee (teacher). Saugus High School, 2900 W. Centurion Way, Saugus, CA 91350.

This study examined and questioned the possible effects of gasoline in the sperm-egg interaction in the sea urchin *S. Purpuratus*. The sperm was inserted onto slides containing sea urchin eggs and different concentrations of gasoline, .01%, .001% and .0001% respectively. This was compared to a slide containing sea urchin eggs and sperm only. The experiment was replicated several times; the control value found was  $80\% \pm 2\%$ . After the experiment was replicated 4 times the experimental value for the fertilization of the sea urchin sperm with different concentrations of gasoline was found to be  $75\% \pm 5\%$  for all the 3 concentrations. Due to the insolubility of gasoline with a water solution, the gasoline on the slide did not mix with the eggs or sperm and seemed to form a layer on top of the slide.

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**2971**

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**WHICH SUBSTANCE CLEANS A PENNY THE BEST IN TWO DAYS?**

Rachel Howerton and Gregory Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

In this experiment, I was trying to find which is the best substance to use to clean pennies by soaking them for two days. The substances I used were Coke, lemon juice, salt water, soap and water mixed together, and a mixture of crumbles of aluminum foil with vinegar and baking soda. I put a  $\frac{1}{4}$  of a cup of each of these substances into different cups and then added the dirty pennies. Then I let them sit for exactly two days untouched. My hypothesis for this experiment was that the lemon juice would clean it best because its main substance is citric acid. The actual one to clean the penny the best was Coke. However in the process it did dissolve some of the penny. The baking soda mix did not do anything except fizz and the soap water just sat there doing nothing. Lemon juice cleaned the penny second best and the salt water looked like it corroded the penny with all the salt that was attached to it. I think that part of the reason that my results turned out like this is because somewhere in the mid-1980s the US Mint stopped making pennies solid copper and changed it to zinc plated with copper. All of the pennies in my experiment were made after the mid-1980's so they were zinc plated copper. If I had used just plain copper pennies then the results might have been different. Basically though, my results of the experiment were that Coke is the best substance to use to soak and clean pennies in two days time.

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**2972**

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**DO COLLEMBOLA MAKE FOOD CHOICES BASED ON ODOR?**

B. Amerson, H. Azatyan, G. Donley-Kraft, J. Godoy, A. Guyumdzhyan, D. Lewis, Z. Llamas, M. Manoukian, J. Park, R. Scott, S. Skeen, R. Wang and J. Moché (teacher). Van Nuys Middle School, 5435 Vesper Avenue, Sherman Oaks, CA 91411.

Previous research has indicated that food choice among Collembola is unaffected by color. The purpose of this investigation was to determine if food odor has an effect on choice. Collembola were collected from an area of the garden at Van Nuys Middle School found to contain large number of onychiurids. Soil was collected and floated in water. Onychiurids were transferred with inoculating loops to petri dishes containing a medium of activated charcoal and plaster of Paris. 2 mL of diced garlic was added to a centrifuge tube and covered with Brewer's yeast. 2 mL of diced onion was added to a second tube and covered with Brewer's yeast. The tubes were sealed and allowed to remain sealed over a weekend. Five grains of onion-treated Brewer's yeast was added to one side of a Petri dish and five grains of untreated yeast were added to the opposite side. This procedure was repeated with garlic-treated yeast. A third dish was prepared with only untreated yeast and a fourth was prepared with garlic-treated and onion-treated yeast. It was noted that when food was introduced, the onychiurids initially

moved toward the odorized yeast. Results indicate that onychiurids prefer odorized yeast. When given the choice between odorized yeast and non-odorized yeast, onychiurids eat the odorized yeast at a faster rate. When given the choice between onion-treated yeast and garlic-treated yeast, onychiurids prefer garlic-treated yeast. We plan to repeat this experiment using different families of Collembola.

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## 2973

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### **ELECTROMAGNETIC ATTRACTION ACCELERATOR COULD BE USED AS A LEVITATION DEVICE OR AN OXIDANT DELIVERY SYSTEM**

Matthew Hielscher and Arthur Altshiller (teacher). Van Nuys High School, 6535 Cedros Avenue, Van Nuys, CA 91411

Strong magnetic fields, such as those created by a solenoid, attract matter that is ferromagnetic, such as iron and steel. A model electromagnetic attraction accelerator ("Coilgun") uses currents in upwards of 100, or even 1000 amps created by current from charged capacitors to rapidly attract a steel slug. The RLC reaction between the capacitors, the solenoid, and the resistance of the wire creates a nearly sinusoidal pulse rising from 0 amps to maximum current in less than a millisecond. At the peak, all the energy that was contained in the capacitors is now in the magnetic field surrounding the solenoid. A diode in reverse-parallel to the coil discharges the energy back through the coil, in order to protect the capacitors from back-emf. This quick discharge of the magnetic field prevents the projectile from being pulled back into the coil. Maximum efficiency (the ratio of kinetic energy of the projectile to total initial energy in the capacitors) is attained when the projectile is the same length as the coil, and the tip of the projectile is just past the entrance to the coil at peak current.

An application of this model is as a levitation device for ferromagnetic objects. A ball bearing or any small iron object could be levitated along the axis of a wide solenoid parallel to the ground with constant current. This could be useful for noiseless levitating fans or motors. Resistance could be adjusted manually to achieve maximum efficiency or to release the levitating object.

Another application is as a delivery system for liquid oxygen in a low-oxygen environment, such as outer space. Oxygen is paramagnetic, and magnetic fields of the strength produced by this device could provide enough kinetic energy to liquid oxygen, "pellets," to rapidly enter a combustion chamber. This could lead to an engine analogous to an internal combustion engine that is functional in low-pressure, low-oxygen environments.

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## 2974

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### WHAT COLOR *COLLEMBOLA* WILL WE FIND THE MOST IN OUR SOIL SAMPLE?

Joseph Ferrero, Giovanni Fiorani, Jasmine Grimes, Jason Gutierrez, Gabriella Jacobson, Christina Reynoso, Jason Strong, Arun Suresh, Maureen Tee, Danne Villalobos and C. F. Hajdu (teacher), Joaquin Miller High School, 8218 Vanalden Avenue, Reseda, CA 91335.

*Collembola* are microscopic arthropods that are found in abundance all over the world in a variety of habitats such as soil, leaf litter, seashores, and in the snowcaps on mountaintops. *Collembola* are small, ranging typically from 1mm–3mm in length, and microscopes are needed to see them. The purpose of this experiment was to find out what color of *Collembola* we will find the most in a soil sample collected from our school garden. One-half cup of soil was collected from our school garden. We first looked at the soil sample without using a microscope and each of us guessed (made hypotheses) what color *Collembola* we would find in our soil. Four of us guessed that we would find mostly white *Collembola*. Two of us guessed that we would find mostly purple *Collembola*. The remaining four of us guessed that we would find mostly yellow *Collembola*. To perform our experiment we divided the soil sample into 3 containers. Water was poured into each container until the water surface was one-half inch above the soil surface. Then we stirred the soil-water mixture and waited for 30 minutes. We used a dissecting microscope to see what color *Collembola* had floated to the top of the water surface. All the *Collembola* that we saw on the water surfaces of our soil samples were white (*Folsomi candida*). Our experimental results supported four of our hypotheses which guessed that we would find mostly white *Collembola* in our soil sample.

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## 2975

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### ANALYSIS ON WHETHER MICE CAN GET QUICKER IN A STABLE MAZE

S. Yun and G. Zem (teacher). Lawrence Middle School, 10100 Variel Avenue, Chatsworth, CA 91311.

This science project contemplated the idea that mice could develop and learn to get faster times in a maze. There were five different mice, three females and two males. They were each given five trials, or runs, in the maze to see what time they got from start to finish. Their motivation in this experiment was some cheese and food at the end, which I thought would add an aroma stimulant to speed the mice up. After times were all recorded I made a general average, a graph, and a table to display how the mice all proved my hypothesis in completing the maze quicker after every trial. The results of this experiment with the mice and maze were successful and confirmed my belief that mice can adapt and develop to new environments. During this project I viewed the way both animals and humans can adjust and adapt to suit their surroundings.

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### **REACTIONS OF THE BINDING BETWEEN CONCAVALIN A BEADS AND YEAST WHEN MIXED WITH AMINO ACIDS.**

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When mixed together, Concanavalin A (Con A) beads bind promptly with yeast (*Saccharomyces cerevisiae*). This study was performed to discover which amino acids affected the interaction between yeast and Con A beads. This experiment will also help to better understand the characteristics of the bead form of Con A. The experiment was performed as in *The Journal of Student Research Abstracts* 2002 Vol. VII 2826. The molar concentrations used were 0.17M and 0.05M. With the concentration of 0.17M, four inhibitory acids were found. They were L-Alanine5824, L-Arginine5949, L-Glutamic Acid 2128, and L-Lysine5501. No promotional amino acids were found. The acids that caused little or no effect were L-Leucine 5625, L-Proline8849, L-Serine5511, L-Valine0500, and DL-Serine4375. With the concentration of 0.05M, two inhibitory acids were found. They were L-Arginine5949 and L-Lysine5501. Three promotional acids were found. They were L-Leucine5625, L-Methionine6039, and L-Serine5511. The amino acids that caused no change were L-Alanine5824, L-Glutamic Acid 2128, Glycine2879, L-Arginine3909, L-Arginine5006. Amino acids were obtained from SIGMA Chem. Co., St. Louis, MO. Numbers given are Sigma Catalog numbers. Supported by NSF, ESIE, and Eisenhower Program.

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### **WHICH BEVERAGE STAINS TEETH MOST?**

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This project was to research to determine which beverage stains human teeth enamel most. Some background research proved that the closest substitute for teeth are eggshells, because of their similarities in composition. Both have large amounts of calcium. To test this purpose six eggshells were left in different cups. Each one contained a different experimental variable. The six beverages tested were coffee, tea, red wine, cranberry juice, grape juice and Coca Cola. After being left for five hours in their corresponding beverages, the results showed up clearly on the eggshells. The red wine definitely left the biggest stain. Then (in decreasing order) came the coffee, the Coca Cola and the tea. Lastly came the cranberry juice and the grape juice. The results weren't surprising. The grape juice and cranberry juice were the healthiest choices on the testing list. It was unlikely that something healthy for the rest of the body would be unhealthy for the teeth enamel.

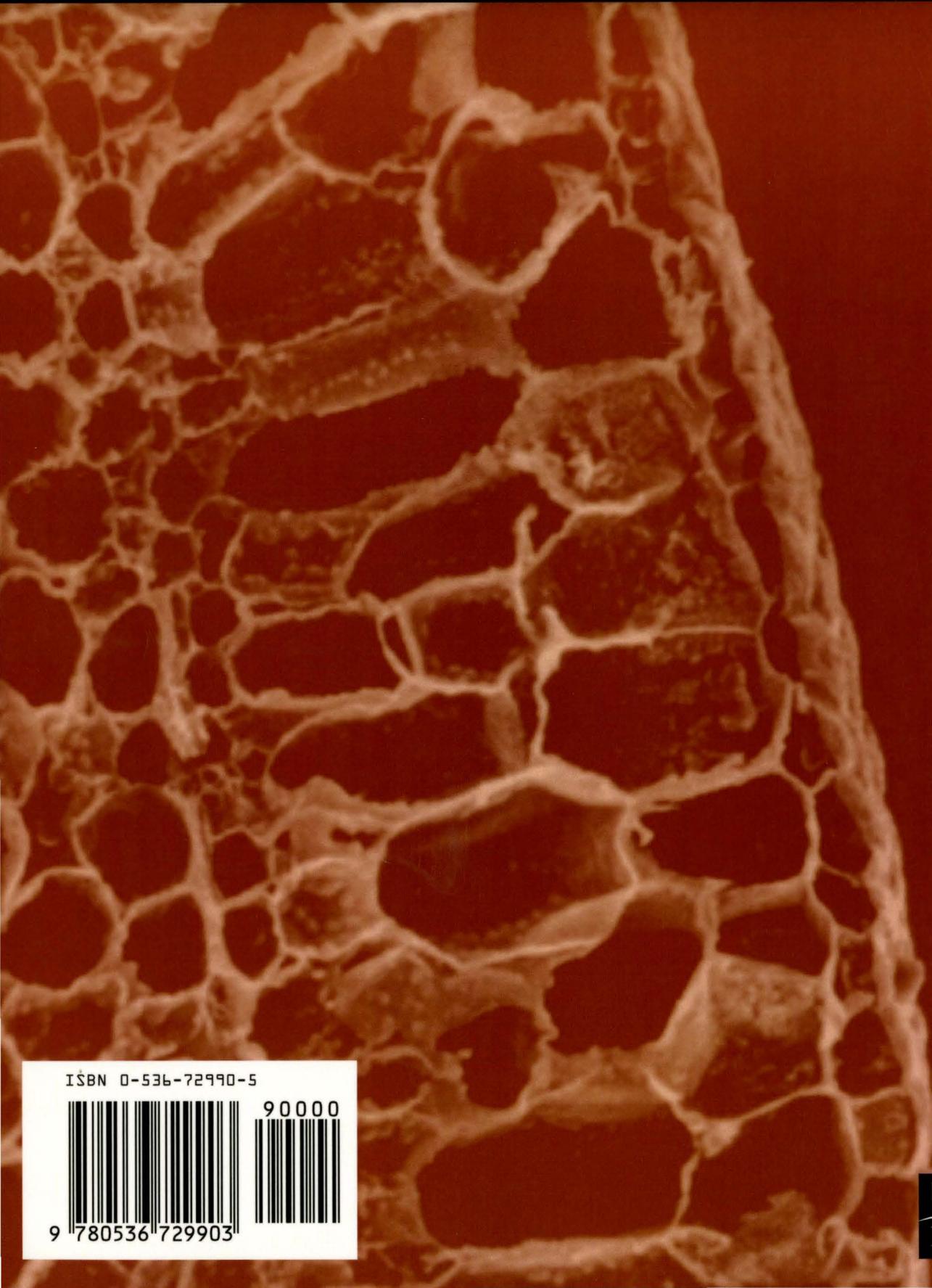
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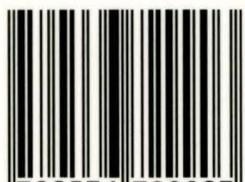
**KEEPING TEETH WHITE**

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I set out on my experiment to find the answer to this question: Of these substances, water, Listerine (mouthwash), Colgate (toothpaste), and baking soda, which works best at keeping teeth white? My experiment consisted of sixteen teeth. Each tooth was placed into a jar filled with coffee, lemon juice, sugar water, or water, depending on the label of the jar. I made four groups, each containing only one jar with lemon juice, one with coffee, one with sugar water and one with water, the control group being the water group. Each group would be cleaned the same amount of time, but by a different product. The four cleaning products were Listerine, Colgate, baking soda, and water. After being cleaned every four days for four weeks I stopped the experiment and looked at the results. My results were only judged by the human eye, and that is how they are judged in life. I found that baking soda is best at removing stains and keeping teeth white, followed by the Colgate toothpaste. The Listerine and water didn't noticeably remove stains.



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