Abstracts for the 30th Annual Loudoun County Regional Science and Engineering Fair

March 17, 2011
Woodgrove High School

Sponsored by Orbital Sciences Corporation

Orbital

Loudoun RSEF Categories

100 Animal Sciences
200 Behavioral & Social Sciences
300 Biochemistry
400 Cellular & Molecular Biology
500 Chemistry
600 Computer Science
700 Earth & Planetary Science
800 Engineering: Electrical & Mechanical
900 Engineering: Materials & Bioengineering
1000 Energy & Transportation
1100 Environmental Management
1200 Environmental Sciences
1300 Mathematical Sciences
1400 Medicine & Health Sciences
1500 Microbiology
1600 Physics & Astronomy
1700 Plant Sciences

For detailed category descriptions visit the ISEF website at:
http://www.societyforscience.org/isef/project_categories

Project Numbering

For exhibition, all projects are given a number. The first series of numbers indicates the category & project number. The letter represents the school. The last numbers indicate the student's grade.

Last Name, First Name	Project No.	Project Title
Ahmad, Mohammad	1701V10	Chemical Crops!
Ahn, Mina	601F09	The Effect of the Number of Collections on Searching Time
Albarracin, Jocelyn	1702V10	How Does the Environment of the Plant Affect its Growth
Alexander, Christine	301H10	What is the Effect of Various Stages of Ripeness on the Amount of Extractable DNA from Strawberries?
Alexandre, Marie Bernadette	1501C10	Effect of a Pepper's Capsaicin Amount and Order of Plating/Incubation on its Antimicrobial Properties
Allen, Melissa	302G10	The Relationship Between Iodine and Common Cooking Oils
Alliss, Emily	201C09	The Impact of Divorce on Children: A Parent's Perspective
Anderson, Ryan	1401D12	The Creation and Detection of an Injectable Viscoelastic Ophthalmic Gel
Atkinson, Tracey	501W12	Electrospinning Blended Nanofibers to Mimic the Tensile Properties of Spider Silk
Ayoub, Jarrod	801W12	Hover Craft
Basso, Leah	701W10	Scientific Kites
Batista, Daphne	1502W10	Which Contact Lens Solution Sterilizes Bacteria the Best?
Bigalbal, Alayna	901H10	The Effect of Different Shaped Parachutes on the Rate of Descent
Bishop, Katelyn	1402F10	The Effect of Familial Relationships of the Percentage of Matching Fingerprints
Blackley, Nicholas	1601H09	The Effect of Magnet Spacing on Launch Velocity
Booth, Molly	1101W12	Observing the Effect of Human Disturbance on Low Trophic Level Biodiversity
Bose, Ipshita	1201T09	Effect of Chemicals on the Rate of Biodegradation of Oil and Impact on Toxicity in Seawater
Bowen, Genna	602H12	Building and Displaying Character Location in ArcGIS
Bowers, Kyle	603C10	Correlation Between Video Game Colors and Their Ratings
Bowers, Richard	1301V10	How Does Birthrate Affect Lifespan?
Branch, Michaela	1202C09	The Effects of Homemade and Chemical Cleaning Products on the Lifespan of Brine Shrimp
Brito, Priya	1602P10	The Effect of Clear Coated Glass Refraction on the Luminous Flux of Reflected Light Particles
Bryan, Meghan	1603W10	The Effect of Guitar String Brand on Accuracy of Pitch and Amplification of a Guitar
Buehler, Kevin	1403P10	The Effect of Sports Drinks On Teeth
Canavra, Matei	1001P10	Cost efficiency and Practicality of Charging a Battery with a Solar Powered Charger Versus a Normal Charger
Carver, Bailey	902G10	Storm Water Runoff
Cascio, Kevin	1102S09	The Efficiency Of Oil-eating Bacteria On Different Types Of Oil
Casimiro, Alyssa	502L10	The Effect of Alcohol on the Duration of Perfume’s Scent
Castelli, Maximilian	202L10	The Impact of Texting on the Amount of Objects Seen
Cauley, Forrest	903G10	The Effect of Ultraviolet Rays on the Efficiency of Fire Retardent Fabrics
Cawi, Eric	1002S12	Analyzing the Optimal Location of Solar Farms in the Northeast Corridor of the United States

Last Name, First Name	Project No.	Project Title
Channer, Connor	1503S09	The Effect Of Photoreactivating Light Exposure On Reverting UVB Induced DNA Damage And The Survival Rate Of Saccharomyces cerevisieae Cells
Chlanda, Joseph	904W12	The Effect Snowmaking at Different Wet-bulb Temperatures has on Snowboarding and Skiing Conditions the Next Day
Clark, Ross	802C10	The Attenuation Ability of Different Metallic Films on WiFi Signal Strength
Cline, Julia	1604T09	How the Anodization of Titanium Rods Affect Their Ability To Conduct Electricity?
Cogley, Alexis	303B10	The Effect of Artificial Memories on the Brain of Drosophila melanogaster
Conway, Zachary	1203D12	The Impact of Crude Oil and Dispersant on Filtration and Molecular Integrity of DNA in Crassostrea virginica
Coombs, Ian	101V10	Canine Ability to Recognize Spoken Words
Crisp, Emily	304W12	Determination of Estrogen as a Trigger of Protandric Colony Formation of Amphiprion ocellaris
Curley, Brandon	1204H10	The Effect of Car Exhaust on Phaseolus lunatus and Phaseolus vulgaris
Decker, Skyelar	102D12	Reduction of Carbon Dioxide Production in Cattle Via Dietary Additives
Degroat, Jacqueline	1205L10	The Relationship Between pH Level and Coliform Bacteria Levels between a Man-made versus Natural Ponds
Del Vecchio, Anthony	1605L10	The Effects of Heat on Magnetism
Dengler, Andre	905L10	Suspension Bridge Design
Dodd, Amarica	1206H10	The Effect of Changing Water Temperature on the Growth of Elodea
Douglas, Mary	1003T09	The Relationship Between Different Materials And Energy Production
Duke, James	1404D12	Investigating the Roles of Oleuropein and Docosahexaenoic Acid as Proteasome Activators
Dyckovsky, Ari	1606H11	Photon Mode-matching for Remote Hybrid Entanglement Between Distinct Quantum Memories
Eisenhower, Samantha	503W10	Comparing the Vitamin C Content of Home vs. Industrial Canned Fruits
Fackler, Jessica	803B09	How Does the Pitch of the Wind Turbine Blades Affect the Electricity Output of a Wind Turbine
Faley, Kelsi	1703H10	The Effect of Intraspecific Cooperation in Sibling Plants Descended from the Same Parental Type on the Amount of Biomass Produced
Fatseas, Elizabeth	1504L12	The Effect of Turmeric and Cinnamon on the Suppression of Agrobacterium tumefaciens.
Fernandez, Ariana	1103P12	Measuring the Efficacy of Biological Treatment Units to Manage Propylene Glycol Runoff when Utilized as a Deicing Agent
Ferrara, Gia	203H10	The Effect of Color on Memory
Figliozzi, Christine	1405V10	Effects of Red Bull and Monster on Blood Pressure
Fitzgerald, Grace	204P10	How Meditation Affects Physical Dexterity
Foote, Claire	205V10	Does Fingerprinting Differ by Ethnicity?”
Footen, John	1704S10	The Effect Of Exogenous Salicylic Acid In Reducing Adverse Effects Of High Salinity On P. vulgaris
Fox, Allison	206P10	The Effect of Font Size on Series Memorization
Freeman, Nicolas	1705S09	The Effect Of Plant Growth Regulator And Short Exposure To Red Light On The Reversal Of Thermo-inhibition In L. Sativa Seeds

Last Name, First Name	Project No.	Project Title
Friedman, Yuval	1505D12	The Treatment of Citrus Mold (Penicillium digitatum) via Acoustic, Ultraviolet, and Vibrational Controls
Fuhrmann, Benjamin	207T09	In an Eyewitness Situation, Will Subjects be Able to Identify a Perpetrator?
Galownia, Taylor	702S10	A Comparison Between Different Barriers Protecting Soil From Rain And Wind Erosion
Gibney, Theresa	504P09	The Relationship between Freezing Ferrofluid and Ferrofluid Spike Height
Gillis, Evelyn	1706L10	Variations in Sugar Levels in Acer saccharum Sap
Godby, Amanda	804V10	How Does the Brand of Battery Affect the Length of Its Life?
Godman, Austin	805B10	The Effect of Bleach Exposure on the Conductivity of Aluminum
Goodwin, Michelle	1207V10	How Does Acid Rain Affect Water Quality?
Gorick, Catherine	1506W12	Investigating the Antifungal Properties of the Lower Termite Reticulitermes flavipes
Greenfield, Jeffrey	703H10	The Accuracy of a Mid-Range Weather Forecast
Gupta, Vivek	305D12	The Effect of Lithium on Neurogenesis in Neurologically Impaired Procambarus clarkii (Crayfish)
Guzman, Ana Gabriela	401D12	Investigating the Effect of Cissus quinangularis Extract on the Collagen Synthesis by Fibroblasts
Haislip, Kristen	906G09	Tsunami Protection
Hale, Mason	208C09	How does a Book’s Appearance affect its Popularity among Teen Readers?
Hartless, Casey	1302F10	The Effect of the Proximity of Facial Ratios to Phi on Facial Aesthetic Appeal
Hasan, Adel	1208H12	Using Siderophores from Pseudomonas syringae to Chelate Heavy Metals of Iron(III) and Copper(II)
Hasnain, Syed	1209B10	Carbon Dioxide Car Emissions: Science Fair Project
Hawes, Daniel	1210B10	The Effect of Development on Nitrate Pollutants in Rainfall Runoff
Hawkins, Nicholas	1507S10	The Protective Effect Of Antioxidant Properties Of Grapefruit Seed Extract On Saccharomyces cerevisiae Cells Exposed To An Oxidizing Agent
Heindel, Andrew	1607D12	The Application of a Partially Derived Dirac Equation in Assessing Feasibility of Topological Insulators
Hertzog, Jana	1004D12	The Use of Physarum Prediction of Wind Turbine Placement for Rural Electrification in Underdeveloped Countries
Hilado, Sarah	505T10	The Verification of Sugar Content in Sweetened Beverages by Using Index of Refraction
Hill, Edward	402T09	Anatomical Influences on the Rate of Planaria Regeneration
Hirshman, Nathan	1608D12	The Use of Pressure Sensitive Material to Indicate a Concussive Force: A Novel Approach to Head Trauma Diagnosis
Hiser, Julia	907G09	How does Size, Quantity, and Placement of Holes Affect Sound Suppression
Hoerauf, Elizabeth	1211D12	The Effects of Estuarine Acidification on the Induced Defenses of Crassostrea virginica in the Presence of Callinectes sapidus
Holmberg, Lauren	209D12	Phonetic Shortcuts in Linguistic Expression: A Hindrance to Voice Recognition Program Development
Horvath, Cody	1212V10	What Effect Do Paintballs in Soil Have on Grass Growth?
Howell, Paul	1406D12	Downstream Assay for Laser Capture Microdissection to Examine JC Virus Trafficking into the Central Nervous System

Last Name, First Name	Project No.	Project Title
Im, Seong Bin	1609H12	Rapid Gas Acceleration During Black Hole Mergers
Jasti, Ravirasmi	1407W12	The Effect of the Influenza Virus on Populations of Different Blood Types
Jones, Nicole	1408T10	The Dissolving Rate of Coated Vs. Non-Coated Pain Relievers
Jungles, Kaitlin	306G09	Do Natural Antacids Work Better Than Chemical Antacids
Kanumuru, Venkata-Gautam	210W12	The Effect of Changes in Ultraviolet Radiation on Population Shifts
Kavanaugh, Daniel	806T10	A Robot Could Do That! How a Robot Can be Used to Efficiently Clean Air Ducts
Kemp, David	1213S10	The Effect Of Oil On The Oxygen Output Of The Phytoplankton Nannochloropsis oculata
Kennedy, Brendan Fred	1707L09	Hydroponic Farming versus Conventional Farming Methods
Khan, Nazifa	1708H10	How Does the Distance Of a Ripe Apple Affect the Number Of Days Ripening the Unripe Apple
Kim, Dana	1709S09	The Effect Of Biodegradable Bags On Raphanus sativus Growth
Kirwan, Emma	403F10	The Effect of Natural Substances Applied to Decalcified Eggs on Percent Mass Change
Klug, Jenny	1710T10	Plant Pot Size Optimization
Koepsell, William	506P09	A Comparison of Single-use and Reusable Hand Warmers
Kot, Natalia	1104H10	The Effect of Deforestation on Agriculture
Krauss, Lauren	1711G10	The Effect of Trellis Diameter on Vine Growth
Krumpe, Molly	404L12	The Effect of Malachite Green on Vibrio fischeri's Ability to Communicate via Quorum Sensing
Ladak, Ziyanah	1214F09	The Effect of Hay and Straw on the Absorption of Oil
Lambert, Callie	1712C10	A Comparison of Household Items Versus Specifically Purchased Items as a Deer Repellent.
Lancaster, Matthew	1713C10	The Effect of Overhead Power Lines on the Growth of plants
Larson, Joshua	1215C09	A Statistical Comparison of Vehicular Fuels (Vegetable Oil, Biodiesel, Diesel, and Gasoline) and Their Pollutants
Lauer, Michael	604W10	Under Clocking a Graphics Processing Unit
Law, Darren	1610F10	How Does Water Affect Static Friction?
Le, Tina	1216V09	Pollution Kills: How Does Pollution Affect Aquatic Organisms
Lee, Adrian	307W10	The Relationship Between the Amount of Nutrients in Homemade Yogurt and the Amount of Nutrients in Manufactured Yogurt
Lee, Jessica	1714P10	The Effect of Different Active Ingredients in Hairsprays on the Life of Roses after Seven Days.
Leisersohn, Sarah	908H10	The Effect of the Material of a Softball Bat on the Distance a Softball will Travel
Lewis, Anna	1105D12	The Cyanobacteric Remediation of Freshwater Dead Zones
Liu, Tatiana	308P10	The Effect of Algae Strains Scenedesmus and Stigeoclonium on the Removal of Inorganic Nitrogen
Lohr, Ashley	309L12	Sugar Quality of Zinnia elegans as a Coevolution Factor in Color Selection by Lepidopterans
Lord, Alexandra	1409C09	Barriers to Medical-Error Reporting in the NICU
Lord, Nilanka	507V10	The Effect of Fat Content on Milk Spoilage

Last Name, First Name	Project No.	Project Title
Mabery, Sydney	1715B10	The Effect of the Shape of a Greenhouse on the Growth of a Plant
Mace, Eliza	1611S12	Modeling Energy Resolution of the CMS Electromagnetic Calorimeter
Manser, Grace	1612H10	The Effect of Light on Artwork
Margulies, Kelsey	1103P12	Measuring the Efficacy of Biological Treatment Units to Manage Propylene Glycol Runoff when Utilized as a Deicing Agent
Markowski, Mae	1508L10	Physarum poly-Theseus: Protist with Primitive Intelligence
Mathur, Anurag	909D12	Determining if Magnetospirillum magnetotacticum Can Be Used to Kill Tetrahymena pyriformis via Magnetically Induced Hyperthermia as a Basis for Alternative Cancer Treatment
Mauch, Joellen	910D12	An Analysis of Vortices Formation to Determine Structural Energy Efficiency and Integrity
McCord, Nicholas	1613T10	The Effect of the Length of a Paintball Barrel on its Accuracy
McCurdy, Robert	704C10	The Effect of Soil Density on the Damage Caused by Earthquakes
McFarland, Grant	807F10	How do Different Kinds of Barriers Affect the Reduction of Sound
Meadows, Allison	401D12	Investigating the Effect of Cissus quinangularis Extract on the Collagen Synthesis by Fibroblasts
Meka, Vamsi	1208H12	Using Siderophores from Pseudomonas syringae to Chelate Heavy Metals of Iron(III) and Copper(II)
Meyer, Kara	103L10	Does the Method Used to Stop Cribbing Affect the Amount of Times an Equus caballus Cribs?
Miyamoto, Yuna	310T10	How Do Different Forms of Orange Juice Affect the Level of Vitamin C?
Modolo, Christina	508C10	The Relationship Between Copper Household Plumbing Age and Rate of Copper Absorption Into Drinking Water
Montgomery, Nicholas	808F12	Three-dimensional Model-based Pose Estimation of a Baseball From a Two Dimensional Image
Mook, Patricia	509P10	The Effect of Varying Amounts of Conditioner on the Tensile Strength Hair Strands
Moore, Nathalie	1716W10	The Effect of Common Houseplants on Levels of Indoor Oxygen
Moser, Allison	1717B10	The Effect of Gray Water Solutions on the Size of Lima Beans
Mumpower, Scott	1614L10	Get the Lead Out: Can the Accuracy of a Lead – Free “Green” Hunting Bullet Help Reduce the Exposure of Lead in Humans and Wildlife?
Nagley, Patricia	1410V10	Dissolution of Different Pills
Nelson, Melanie	1106H10	The Effect on Road Salt on Salinity
Newman, Zachary	605D12	The Integration of Evolutionary Algorithms into Optimization of Functions via the Markov Chain Monte Carlo Framework
Nguyen, Duy	1005F10	The Effect of Renewable Energies on Cost and Productivity
Nguyen, Vy	211V10	How does Chewing Different Flavors of Gum Affect the Memory.
Nichols, Geoffrey	104L12	Study of Directed Song in T. guttata as a Function of Environment
Nilsson, Caroline	405D12	The Characterization of Organismal Electromagnetic Fields Using Kirlian Photography
Norris, Nicole	510F10	The Comparison of Vitamin C Levels of Organic and Inorganic Lycopersicon esculentum
O`Connell, Marie	511S10	The Relationship Between Temperature And The Length Of The Chemiluminescence Reaction Between Luminol, Perborate, And Copper Sulfate

Last Name, First Name	Project No.	Project Title
O`Donnell, Colin	1107D12	The Remediation of Sulfur from Coal via Thermophilic Bacteria and Fenton Chemistry
O`Neil, Sean	105C10	The Effect of Organic Substances on Stink Bugs
Oreshkov, Andrey	1615B10	Comparing Amateur Crater Measurements to NASA Measurements
Oswald, Courtney	911G09	The Effect of Durability, Absorbency, and Reactivity to the Sun on Synthetic and Eco-Friendly Fabrics
Padgiotis, Aspasia	1411W09	What Factors Affect The Solubility of Kidney Stones?
Palmer, Dagney	1616T10	The Effect of Distance on Magnetism
Papazian, Alyssa	106S10	The Effect Of Natural, Plant Derived Molluscicide On Physa species
Peddibhotla, Bharath	1617B09	The Effect of Magnesium on Gravity
Perry, Victoria	1412G10	How does Genetics Affect Taste
Petty, Matthew	1006B10	The Effect of Hull Quantity on Fluid Resistance
Phillips, Preston	212T10	The Effect of Wait Groups versus Not Wait Groups for Marshmallows on School Grades
Phillips, Shelby	809W12	The Effect of Temperature on Light Brightness of Christmas Lights
Pineda, April	912H10	The Effect Of Tensile Strength on Fishing Line
Pothen, Mary	1509W12	In Search of a Predictive Virulence Marker: Examining Phylogenetic Long-term Trends and Characteristics in the Evolution of Hemagglutinin Surface Proteins in Human Influenza Type A
Powers, Amanda	213C09	How Age Affects Ability to Read and Comprehend Volume and Numbers
Pradhan, Aishwaryaa	406W12	Comparison of Genomic Sequences of BRCA1 (breast cancer1, early onset) Gene
Prem, Prathija	1718F10	The Effect of Carbon Dioxide on the Mitotic Index of Allium sativum root tip cells
Rackoski, John	214F10	The Effect of Sunlight on the Tunneling Distance of Pogonomyrmex
Raffensperger, Tyler	1007T09	Are Residential Wind Turbines Economically Feasible?
Randev, Toshali	512W09	Styrofoam Be Gone
Reynolds, Cameron	913D12	The Development of Nonwoven Spray Fabric for Medical Application
Rhymes, Michelle	705F10	How Does Evaporation Affect Crystal Growth?
Rivera, Adrienne	1618C10	The Effects of Temperature and Humidity on the Pitch of a Piano Key
Robinson, Tayler	706B10	How the Acidity of the Ocean Affects Phytoplankton
Rooney, Shannon	914F10	The Effect of the Type of Roof Structure on the Amount of Weight It Can Hold
Rosado, Michelle	1008V10	How Does the Cost of Batteries Affect Its Durability?
Rosas, Natalie	1510T09	Which Active Ingredients in Acne Medicines Penetrate Those Pesky Pimples?
Rosenthal, Anson	1303V12	A Model to Optimize the Prevention of a Zebra Mussel Invasion in the Susquehanna River
Sachs, Andrew	107C10	The Effects of Barometric Pressure on the Behavior of Palaemonetes sp. (Ghost Shrimp)
Saggu, Pritpal	1719D12	The Use of Mixotrophy in Lemna sp. (Duckweed) to Enhance Carbon Sequestration
Saikumar, Adithya	1009W10	The Analysis of the Effect of Nano Particles on Solar Panels

Last Name, First Name	Project No.	Project Title
Sastry, Arjun	1217B10	The Effect of Road Salts on Algae Oxygen Production
Saunders, Dylan	1619T10	What Major Chord Affects The Tuning Of A Guitar The Most?
Scheffer, Lucynda	407B10	The Correlation Between Mitochondria and Synapses in the Optic Lobe of the Fruit Fly
Schendzielos, Rachel	1620F09	The effect of material reflectance properties on the Bidirectional Reflectance Distribution Function (BRDF).
Scherbenske, Adam	1108W10	The Effect of Fertilizer on Soil pH
Schumacher, Samuel	513S10	The Effect Of Sodium Carbonate, Calcium Hydroxide, And Citric Acid On The Removal Of Calcium Carbonate In Hard Water
Scott, Lauren	1720H10	How Does the Direction Of Plant Growth Affect the Biomass Of Jalapeno Peppers?
Shain, Logan	1218B10	Effect of Different Covers on Soil Erosion
Sharifzadeh, Matin	1413S09	The Synergetic Effect Of Garlic (Allicin) And Ampicillin On The Antibacterial Sensitivity Of E. coli
Sharifzadeh-Moghaddam, Yasamin	1506W12	Investigating the Antifungal Properties of the Lower Termite Reticulitermes flavipes
Shayka, Mark	1621L10	Centripetal Force: Bank on It!
Smith, Rhiannon	1219G10	The Effect of a Power Plant on the Potomac River
Sohn, Lydia	1220S09	A Comparison Of Different Sunscreen Brands On The Population Density Of Nannochloropsis oculata
Sokol, Catherine	514C10	The Effect of the Fat Type on the Spread and Thickness of Chocolate Chip Cookies
Sotos, Peter	1622T10	The Effect of MP3 Bit Rate on Sound Quality and Genre Classification
Staszak, Geoffrey	1721V10	The Effect of Temperature on a Carnation’s Transpiration Rate
Stevens, Matthew	915C09	Does Baking Balsa Wood Increase The Strength To Weight Ratio?
Stone, Forest	1511G10	The Effect of Temperature on the Suvivability of L. acidophilus Bacteria
Strain, Lance	1304L09	The Spidron Formula To Be or Not To Be
Studebaker, Nicholas	1109H10	The Effect of Isopropylamine Salt of Glyphosate on the Growth of Grass and Pansies
Tatman, Ryan	1010P12	The Effects of Dimples on a Fuselage
Tedd, Andrew	1414P10	The Effect of Bacteria Levels on Privately Maintained Pools Versus Publicly Maintained Pools
Tennyson, Ashlyn	1110H10	The Effect of Chemical Dispersants on Planarian During Oil Spill Clean Up
Thapa, Monica	1221F10	The Effect of Different Stages of Plant Succession Surrounding a Pond of the pH and Nutrients in the Soil and pH and Nitrate in the Water
Thomas, Brooke	1415L12	Not at a Snail’s Pace: Allantoin from Helicoidea as an Epidermal Regenerative Agent on Lumbricus Terrestris
Thomas, Rain	1722D12	The Effect of Kin Recognition via Root Communication in Food Crops
Thomas, Samantha	311S10	The Effect Of pH On Gelation Caused By Bromelain To Find The Optimum Functioning pH Level For Bromelain
Thomas, Zachary	1623L10	Ballista Angle Shoot-off
Tiblin, Jessica	1011D10	The Effect of the Number of Blades on a Wind Turbine's Efficiency
Trader, Deborah	1723G10	Sibling Rivalry: Compost, Fertilizer, and Soil

Last Name, First Name	Project No.	Project Title
Trainor, Riley	916P10	The Effect of Ultraviolet Light on Oil Paint
Ulkuatam, Selin	707B09	The Effect of Land Temperature on the Duration of a Tornado
Vanburen, Stefan	606D12	The Utilization of Genetic Algorithms on Optimization of Truck Routing Efficiency
Vennitti, Corinne	1111G09	The Effect of Scent-Based Deterrents on the Eating Habits of White Tailed Deer
Videgar, Erin	1416S10	The Antagonistic Effect Of Lactobacillus acidophilus On E. coli
Villalobos, Rachel	515V10	Getting Rid of Stink
Votroubek, Emily	917B10	The Effect of Strobe Lightning on the Amount of Objects in a Photograph
Wang, Robert	1417B09	The Effect of Isopropyl Alcohol on Viruses
Whitaker, Katherine	1112D12	The Biodegradation of Azo Dyes Via Bacillus subtilis: A Novel Approach to Wastewater Treatment
Wilhelm-Wenzel, Jordan	1724C10	The Effects of the Capillary Attraction of Water on the Percent Moisture Content of Wood
Woods, Julia	215D12	Defining Risk: Risk Perception and Experience in Young Adults
Yocca, Kailey	1624S10	The Effect Of Different Types Of Shin Guard Materials On The Amount Of Force Absorbed
Yoo, Soyeol	216F09	The Effect of Rewriting Notes Versus Retyping Them on a Student's Memorization
Zhou, Mark	516V10	The Effects of Acid Rain on Metals

Animal Sciences (100)

Project No.	Last Name, First Name	Title
101V10	Coombs, Ian	Canine Ability to Recognize Spoken Words
102D12	Decker, Skyelar	Reduction of Carbon Dioxide Production in Cattle Via Dietary Additives
103L10	Meyer, Kara	Does the Method Used to Stop Cribbing Affect the Amount of Times an Equus caballus Cribs?
104L12	Nichols, Geoffrey	Study of Directed Song in T. guttata as a Function of Environment
105C10	O`Neil, Sean	The Effect of Organic Substances on Stink Bugs
106S10	Papazian, Alyssa	The Effect Of Natural, Plant Derived Molluscicide On Physa species
107C10	Sachs, Andrew	The Effects of Barometric Pressure on the Behavior of Palaemonetes sp. (Ghost Shrimp)

101V10

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Canine Ability to Recognize Spoken Words

Ian Coombs

Park View High School (PVH)

The point of this experiment was to test if a canine has the cognitive ability to recognize spoken vocabulary successfully. The independent variable for the experiment was the words that were tested for (shoe, brace, octopus, stuffed animal, rope, T-shirt, and ball) as well as the control command 'outside'. The dependent variable was the number of times the words were correctly recognized. The subject for the experiment was an 8 year old black standard poodle, who has pancreatic problems. Words for the experiment are taught to the subject using tactile, vocal, and visual methods. The object is then placed among 3 of the other items. The canine is asked to retrieve one and the choice is recorded and the object replaced and then the testing begins again. The averages of the results include 1,0,.75,.08333,.91666. This shows that canines, or at least poodles, show an aptitude to recognize spoken vocabulary. The experimental hypothesis for this experiment states that if a canine can recognize spoken vocabulary then it can find an example of this object hidden among other objects. Using the chi-square test, one may determine that the afore mentioned hypothesis was supported due to a comparison of the number of correct retrievals to incorrect retrievals and that the value of P was less than .01. The effect of the IV had a significant effect since for only two objects,which have a negative association, had little success being chosen. A similar experiment could use different species.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

102D12

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Reduction of Carbon Dioxide Production in Cattle Via Dietary Additives

Skyelar Decker

Dominion High School (DMH)

Cattle produce 80 million tons of greenhouse gases per year. During digestion, they break down food into simpler molecules including carbon dioxide which is the largest cause of global warming. Treating the food sources of cattle such that carbon dioxide production is minimized may be a viable option.

The purpose of this research was to determine whether carbon dioxide production in cattle could be reduced via dietary additives. Oregano and alpha galatosidase were added to test tubes containing hay, Escherichia coli and gastric juice which simulated the bovine digestive tract. Bromothymol blue was distributed to all tubes and was used to measure carbon dioxide concentration via analysis with a spectrophotometer. After five days, statistical analysis using a t-test indicated that the null hypothesis, that feed additives will have no effect on carbon dioxide production, was both supported and refuted. While both additives reduced carbon dioxide production, only oregano significantly reduced it.

With the many adverse effects produced as a result of global warming, it is imperative that methods be created to minimize such harmful effects. It is suggested that food additives such as oregano may be a simple solution by which to do so and the use of such merits further explanation

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

103L10

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Does the Method Used to Stop Cribbing Affect the Amount of Times an Equus caballus Cribs?

Kara Meyer

Loudoun Valley High School (LVH)

The purpose of this experiment was to see if a cribbing collar or Chew Stop Aerosol would keep an Equus caballus, also known as a horse, from cribbing. The independent variable was the method used to stop the horse from cribbing, for example the cribbing collar or the Chew Stop Aerosol. The dependent variable was the amount of times the horse cribbed over the course of ten trials, which spanned thirty days. The control was the amount of times a horse would crib without the use of the collar or aerosol. Over the course of thirty days, the experiment tested how many times a horse cribbed in the span of thirty minutes. The results showed that the average amount of times a horse cribbed with a collar was 47.2, the Aerosol 122.8 and the constant was 135.9. This data was statistically significant because the p value calculated between the experimental groups was less than .05. The hypothesis was if an Equus caballus used a cribbing collar, then it will crib less than if using a Chew Stop Aerosol. The data showed that the cribbing collar was the most effective way of preventing horse for cribbing, supporting the hypothesis. A few questions arose during this experimentation, would the amount of times a horse crib directly relate to the area in which the horse is cribbing at, such as a fence, bucket, or stall door? Further research could explore the type of horse or the time of day all impact cribbing.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

104L12

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Study of Directed Song in T. guttata as a Function of Environment

Geoffrey Nichols

Loudoun Valley High School (LVH)
Academy of Science (AOS)

The songs of nine mated young male zebra finches were recorded to determine the effect of environment on directed song qualities and see if the father was the favored tutor. They were raised in two different environments: a complex one and simple one. The complex environment had four adult pairs (including the father), which increased the learning potential for juveniles. The simple environment contained one isolated adult pair, serving as a controlled learning environment. Males had colored bands placed on them for easy identification. Separated males were recorded in the same cage in an anechoic room for short intervals with their mate. The songs were recorded using the program Raven Lite and analysis was conducted using Sound Analysis Pro.

The results support previous research on song learning and inheritance. The juveniles copied song primarily from their fathers, though other songs appeared in the repertoire of two juveniles. One finch was excluded due to a lack of a coherent song. The sons of the control male had low similarity to their father's syntactical structure, but appeared to keep the same notes and basic sound structure. In the complex environment, most finches favored their father as a tutor. This supports the hypothesis of patrilineal imprinting and contradicts previous results where the fathers were not favored. This experiment also supports the hypothesis that juveniles do not copy song exactly and can have very high variability in their learning habits

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

105C10

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Organic Substances on Stink Bugs

Sean O`Neil

Loudoun County High School (LCH)

Stink Bugs have the potential to destroy important crops, such as soybeans, throughout the Mid-Atlantic region. They have also become a household pest and emit an unpleasant smell. This project's intention was to find a way to control this problem by finding repellents and attractants that have a high success rate with Stink Bugs. Four test devices were assembled, each containing two 36cm x 24cm x 16cm plastic containers linked together by a 15cm long by 6cm diameter plastic tube. Based on research, supposed attractants, Dill and Sunflower Oil, and repellents, Mint and Garlic, were used in the experiment. During each test, one of the materials was placed within one container, and the other container was left empty. Ten Stink Bugs would then be placed through the removable cap in the center of the connecting tube. Each test lasted 5 hours, at the end of which the number of Stink Bugs in each container was counted. After all testing, Garlic had s success rate of 85% in repelling Stink Bugs, with Mint repelling 83%. The Dill and Sunflower Oil produced no significant results for attracting Stink Bugs. These resu7lts support the hypothesis. The data is significant and supports that Mint and Garlic can be used effectively as repellents. They can be used to keep the bugs out of the house and away from the crops.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

106S10

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Natural, Plant Derived Molluscicide On Physa species

Alyssa Papazian

Stone Bridge High School (SBH)

Snails and slugs are destructive pests in agriculture and can cause economical loss. Metal and salt based molluscicides are toxic and can runoff into the water, affecting the aquatic environment. The alternative pest control method should be explored and biologically evaluated for efficacy. Some plants have medicinal properties and dangerous for the environment. The project evaluates efficacy of natural, non-toxic, plant derived molluscicides for the eradication of Physa sp.
Seven snails were placed in the middle of each bin with the IV (neem, yucca, lemon balm) mixed with food at one end, while the control (food without IV) at the other. After 2 hours, the snails closer to the repellent and to the food without repellent were counted (DV), to determine if snails were repelled by the natural, plant derived molluscicides. The average number of snails close to lemon balm, yucca, and neem were 4.8(variance 3.5), 1.6(variance 1.6) and 1.5 (variance 3.4). T-test shows significant difference ($p<0.05$) in the number of snails repelled by lemon balm and control, average numbers of snails on the lemon balm side were more than its control. T-test of control-yucca and control-neem showed statistically significant difference ($p<0.05$) in the number of snails repelled. ANOVA returns $p<0.05$ showing statistically significant difference in the number of snails repelled by all 3 with lemon balm repelling the least and neem repelling the most thus supporting the alternative hypothesis. Neem is a safe, organic way out of 3 plant derived molluscicides to repel destructive pests in the garden. Further studies could test the effectiveness of natural repellents in a realistic environment while investigating if there is an adverse effect on plants. and compare it with the effectiveness of commercial pesticides.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

107C10

Animal Sciences
100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Barometric Pressure on the Behavior of Palaemonetes sp. (Ghost Shrimp)

Andrew Sachs

Loudoun County High School (LCH)

• The project is designed to test whether Palaemonetes sp. are able to detect changes in weather through a change in barometric pressure.
• In this experiment, it is predicted that the shrimp will seek deeper water when the pressure falls, due to an incoming weather system, because they feel threatened and will respond by moving to a safer environment.
• Ghost Shrimp were put in a tank with an environment that remained constant throughout the testing, with the exception of the barometric pressure fluctuations caused by weather events.
• Over the course of the testing, five low-pressure systems passed through the area. During each event, the shrimp migrated to deeper water. Immediately following this pressure drop, the Ghost Shrimp went back to more dispersed activity patterns in shallow and deep waters. While the Ghost Shrimps' behavior during each weather event was impacted, neither the speed at which the pressure dropped, nor the level to which it dropped, seemed to be a significant contributing factor.
• The P-Value is 0.028493, it was found using the difference of Ghost Shrimp in the shallow half compared to the deep half of the tank from the beginning of the event to the end of the event. The P-Value supports the hypothesis.
• The results of the experiment indicated that Ghost Shrimp can "predict" the weather through pressure changes as pressure was the only variable during the course of the weather events and the testing.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Behavioral & Social Sciences (200)

Project No.	Last Name, First Name	Title
201C09	Alliss, Emily	The Impact of Divorce on Children: A Parent's Perspective
202L10	Castelli, Maximilian	The Impact of Texting on the Amount of Objects Seen
203H10	Ferrara, Gia	The Effect of Color on Memory
204P10	Fitzgerald, Grace	How Meditation Affects Physical Dexterity
205V10	Foote, Claire	Does Fingerprinting Differ by Ethnicity?”
206P10	Fox, Allison	The Effect of Font Size on Series Memorization
207T09	Fuhrmann, Benjamin	In an Eyewitness Situation, Will Subjects be Able to Identify a Perpetrator?
208C09	Hale, Mason	How does a Book’s Appearance affect its Popularity among Teen Readers?
209D12	Holmberg, Lauren	Phonetic Shortcuts in Linguistic Expression: A Hindrance to Voice Recognition Program Development
210W12	Kanumuru, Venkata-Gautam	The Effect of Changes in Ultraviolet Radiation on Population Shifts
211V10	Nguyen, Vy	How does Chewing Different Flavors of Gum Affect the Memory.
212T10	Phillips, Preston	The Effect of Wait Groups versus Not Wait Groups for Marshmallows on School Grades
213C09	Powers, Amanda	How Age Affects Ability to Read and Comprehend Volume and Numbers
214F10	Rackoski, John	The Effect of Sunlight on the Tunneling Distance of Pogonomyrmex
215D12	Woods, Julia	Defining Risk: Risk Perception and Experience in Young Adults
216F09	Yoo, Soyeol	The Effect of Rewriting Notes Versus Retyping Them on a Student's Memorization

201C09

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Impact of Divorce on Children: A Parent's Perspective

Emily Alliss

Loudoun County High School (LCH)

My research project is on impact of divorce on children from parents' perspective. This project is to determine biggest concerns parents have for their children in the midst of a divorce. It is the hope to expand the current research available to parents, educators, and mental health professionals who come into daily contact with these children. The hypothesis is that parental concerns for children during divorce are large.
A survey was developed that identified possible parent concerns for children. The survey collected information on gender and age. Survey results were obtained from several Northern Virginia court ordered divorce classes. Over 50 participants filled out the survey in a one and a half month period.
Results indicate that overall about two-thirds of participants said they were either never or sometimes concerned for children. Only one-third of the participants had more consistent concerns. The parent's biggest concern was that children would not be learning the same family values from the other parent. Data were also broken down by age group and by gender. When results were broken down by gender, there was no significant difference in reported concerns. However, when data were broken down by age group, the differences in concerns were significant. The older than thirty group showed a more consistent worry about children. A student t-test indicated there was only a 1% chance the result was due to chance.
This project was limited by the number of responses but is a good start in understanding parental concerns for children.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

202L10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Impact of Texting on the Amount of Objects Seen

Maximilian Castelli

Loudoun Valley High School (LVH)

The purpose of the experiment was to show how texting can affect an individuals' ability to recognize object on a computer screen. The project tested fifteen subjects in front of a computer. On the computer, there was a program that would flash at the subjects, and the subjects would relay whenever they saw a flash to the moderator. They would then repeat the experiment, but the second time, they would text while watching the program. The independent variable was texting versus not texting. The dependent variable was how many flashes they would see over the course of the computer program. The control group was the subject watching the program without texting. There were nine male subjects and six female subjects. The result of the experiment was that the subjects saw an average of 2.4 less flashes when they were texting. When they would watch the program without texting, they saw an average of 8.8 flashes. When the subjected were texting, they saw an average of 6.4 flashes. A T-test was performed on the experiment and the P value result were .0003, meaning that there was a statistical significance between the two experimental groups. The hypothesis was that if someone texted, they would see less flashes than if they did not text. It was supported by data. Further research could explore trials with many more subjects or the difference in reaction time.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

203H10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Color on Memory

Gia Ferrara

Heritage High School (HTH)

The purpose of this experiment was to determine if color had an effect on the number of items recalled. In this experiment the independent variable was the color “flyer” group and the dependent variable was the number of items recalled. Additionally, the control group was the black and white “flyer” group. The testing subjects had one minute to look at the “flyer” they were given and then they had one minute to take a quiz on what they remembered. For this experiment there was a t-test done for the descriptive statistics. The mean for the black and white “flyer” was 38.125 and the mean for the color “flyer” was 45.88235294, respectively. The alternative hypothesis was if information is written in color, then more information will be recalled and it was not supported. The calculated t-value was -1.180028707 and the critical t-value was 2.039513438, respectively. Since the calculated t-value is less than (<) the critical t-value, the experiment failed to reject the null hypothesis, which means a rejected alternative hypothesis. It was determined that there was no statistical difference due to a small sample size. An area of error was that the testing area changed towards the end of the experiment. Further research could explore the possibility of keeping the age group and the testing area constant. Additionally, further research could include keeping the number of testing subjects from each gender and the age range constant.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

204P10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Meditation Affects Physical Dexterity

Grace Fitzgerald

Potomac Falls High School (PFH)

The purpose of the experiment was to determine whether meditation had an effect on physical dexterity, whether it was positive, negative, or neutral. It was predicted that if a human test subject meditates, then their physical dexterity will be positively affected. The independent variable was the amount of time meditating, and the dependent variable was the results of the dexterity test. Once a test subject has consented to participating in the experiment, they were placed in a well-lit, temperature-controlled, and noise controlled-environment. The test subject would then take the O'Connor Finger Dexterity Test for sixty seconds, and the results would be recorded. After this, the test subject would meditate for ten minutes in complete silence using the Zazen Breath Meditation Technique. After meditation was complete, the test subject would take the O'Connor Finger Dexterity test for a second time, also for sixty seconds, and the results would be recorded. This process was repeated for a total of thirty times with thirty different test subjects of different ages and sexes. The data supported the hypothesis. Most test subjects had higher results after meditating than before meditating, by an average of about two percent. Men seemed to improve the most, usually scoring about 2.87% higher after meditation than before. Age was also a contributing factor. Subjects age 21-45 seemed to improve the most, by about 2.25%, while subjects age 12-20 improved the least, by about 1.87%.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

205V10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Does Fingerprinting Differ by Ethnicity?"

Claire Foote

Park View High School (PVH)

The purpose of this experiment was to see if fingerprints differed within ethnicity. Fingerprinting is really interesting and can be a lot of fun when looking at different prints. This experiment is something important to try.

The main idea of this experiment is to test out different fingerprints and see what the most common print is among them. The 1st thing that has to be done in this experiment is collecting all 50 fingerprints from different people. For this experiment 50 people had to be collected. In this project the testers each gave their fingerprints on an index card. The results from the fingerprints were put into a chart containing all of the data.

The results of the experiment came back rejected according to the hypothesis. The hypothesis stated that the most common fingerprint among different ethnicities was the whirl. This part of the hypothesis was true. The tests used in this experiment were the Chi-test. In this test nominal date was being used. The null hypothesis was supported in this experiment because the results were rejected. There weren't any errors in this experiment. There was no trouble in identifying the fingerprints. The independent variable which was ethnicity did not have an impact on the fingerprints. When doing this experiment in the future the scientist performing this experiment should find out the different types of ethnicities people have in them not just the direct ones like Hispanic or Caucasian.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

206P10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Font Size on Series Memorization

Allison Fox

Potomac Falls High School (PFH)

The purpose of this experiment is to see if people memorize a sequence of letters better if the font size is changed. This was achieved by having a sheet with 12 point font and one sheet having 36 point. The independent variable is the size of font in a series of letters to be memorized. The dependent variable is the degree of series memorization measured in characters. Test subjects are needed for this experiment; characteristics include: males and females between high school and middle aged adults. Procedures include: hand out the test sheet side down, flip over the sheet for 45 seconds to review, and then they write down as much of the sequence that is memorable. Repeat this for the second sheet. Major findings include the average number of characters memorized in 36 point was 8.91 and 12 point was 7.53. In the statistical data table, the number of trials was 34. The t in the t-test equaled -1.12, the standard deviation equaled 5.11. The degree of freedom was 66, the probability assuming the null hypothesis was 0.27. The hypothesis of this experiment—If subjects are presented a letter sequence in a small font then they will memorize more of the sequence than in a larger font-- was refuted because the average number of characters memorized was higher for 36 point than 12 point. The independent variable does influence the dependent variable. Further research could explore changing the color of paper that the different size font was printed on.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

207T09

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

In an Eyewitness Situation, Will Subjects be Able to Identify a Perpetrator?

Benjamin Fuhrmann

Tuscarora High School (THS)

The experiment that took place to test was as follows. 39 high school students were tested to see if eyewitnesses could accurately describe the perpetrator of a crime they witnessed. In the test, a computer generated face was shown to all the subjects. The subjects were given a survey about 20 days after the seeing the first face and were shown a “lineup” of computer generated faces. On the survey sheet they chose the number of the computer generated “suspect” they believe to have seen earlier. The same was done for the control group but 19 days after the original showing of the face they were shown the same face and asked if it really is the same. I found that the subjects were not able to identify the face. This information is important because it shows that eyewitnesses are not a reliable source for criminal convictions or identifications. This project could be furthered by adding in a stressful situation to see its effect on memory decay. Simulating a crime could affect the ability of a subject to identify a face.
The Null Hypothesis is that the decay of memory will have no effect on the subjects ability to accurately identify the face. The null Hypothesis was rejected by the Chi-Square test. The Chi squared equals 14.026 with 1 degrees of freedom for this experiment. The two-tailed P value equals 0.0002. The association between the outcomes of the different groups is considered to be extremely statistically significant.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

208C09

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

How does a Book's Appearance affect its Popularity among Teen Readers?

Mason Hale

Loudoun County High School (LCH)

Some authors find that a great plot is not the only factor when it comes to book popularity—cover designs are just as important. Because of this, authors make sure that their covers are detailed and eye-catching. This study tries to determine the specific aspects of book appearance that contribute to the resulting popularity among teens. For experimentation, human subjects were asked to provide input on a variety of book covers. Sixty unique and original book covers of ten colors and six designs were assembled. Thirty-two subjects chose, in order, their favorite three covers (weighted towards their higher ranked covers). Data analysis revealed that teens are likely to choose covers of their favorite color, with 75 % of the subjects choosing covers as such. Also, 48 % of covers chosen by females had the star design. Furthermore, while female subjects picked orange and red covers 0 % of the time, these same covers comprised
18 % of the male choice. Additional research could be done to determine the influence of a book cover summary on its popularity. Furthermore, one could determine if a book with an attractive cover and poor summary would be more popular than one with a dull cover and enticing summary. In closing, this research discovered interesting results regarding the affect of appearance on book popularity.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

209D12

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Phonetic Shortcuts in Linguistic Expression: A Hindrance to Voice Recognition Program Development

Lauren Holmberg

Dominion High School (DMH)

The average American adult speaks well over one million words daily. In casual conversation, even the most articulate speaker will unconsciously drop syllables. The reason primarily is that once speech is fully developed and the brain increases signal speed, pronunciation becomes relaxed. The intent of this research was to determine a difference existed between the percentages of dropped syllables when speech type was altered.

In order to discover if there was a difference in dropped syllables between reading aloud and everyday casual conversation, twenty-nine individuals were recorded for approximately four minutes while engaged in casual conversation. The participants were again recorded as they read a passage aloud. Statistical analysis of recordings conducted via a t-test determined that there were, in fact, significantly larger percentages of dropped syllables in casual conversation. Interestingly, often passages which contained no contractions were actually read as having contractions by test subjects.

Further research would entail determining at which age this difference actually begins to appear or even from which dialects it is most likely to occur. To date, voice recognition programs used in technologies such as security and communications continually evolve. This research indicates that with the advent of texting and the use of social media, the way individuals speak is evolving as well. The implication of this research suggests the evolution of speech patterns is a result of the use of emergent technology into everyday speech and should be integrated in newly created speech recognition programs.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

210W12

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Changes in Ultraviolet Radiation on Population Shifts

Venkata-Gautam Kanumuru

Briar Woods High School (BWH)

With an ever increasing and variable population, various countries have developed economic incentives in order to reduce populations. The development of these incentives gives insight on a looming, but often neglected, problem, the eventual depletion of resources. As seen in various animal populations, there is a point where all resources become expended and populations flat-line (eventually leading to a drastic drop). The goal of this research was to isolate one possible factor in these population shifts, changes in Ultraviolet Radiation.

After obtaining the necessary Ultraviolet and population data for 23 locations, the “trials” were distributed among various categories based on the percent change in UV Radiation and were statistically analyzed (the location Starkville, Mississippi showed no change in UV-B Radiation and thus acted as the control group). Both a Pearson R-Correlation and T-Test of these two variables expressed values lacking statistical significance and failed to support the hypothesis (a change in Ultraviolet Radiation will cause the population to stay dormant or decrease). Upon further analysis, the spread across a map of the encompassing data showed no blatant patterns, helping ascertain the conclusion that environmental factors do not play as an important role in population shifts when compared with certain economical factors.

Further research could explore the uncharacteristically high correlation between a “major change” in UV Radiation (over sixty percent) and population shifts (a correlation of 0.863344077). For this research to be effective though, an increase in available UV Radiation data must be attained (lack of data greatly restrained this experiment).

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

211V10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

How does Chewing Different Flavors of Gum Affect the Memory.

Vy Nguyen

Park View High School (PVH)

This experiment is testing on human subjects, how different flavors of gum could improve the memory. The independent variable is the three flavors of gum, the dependent variable is the number of words memorized, and the control group is no gum. Subjects who were being tested were both male and females from different ages. First, test a person with no gum and give them a sentence to memorize and write down the number of words they got right and continue to do that with minty and fruity but wait 24 hours after each time. The mode for no gum is 15 words memorized; fruity is 13 and for minty is 15 words. According to the chi-square test, the P-Value for no gum was 0.41, P-Value of fruity gum was 0.16 and Minty Gum was 0.11 so the P-Value for all variables came out to be more than 0.05 so the independent variable had no effect on the dependent variable. The alternative hypothesis was if a person chews a different flavor of gum for a certain amount of time then it would have an effect on the memory and was not supported. Flavors of gum did not affect the number of words memorized because the P-value was greater than .05. Incorrect statistical analysis would cause error. One question would be if chewing gum also affects a person's feelings?

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

212T10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Wait Groups versus Not Wait Groups for Marshmallows on School Grades

Preston Phillips

Tuscarora High School (THS)

The purpose of the experiment was to see if delayed gratification for marshmallows would affect school grades. The independent variable was the wait group versus the not wait group. The dependent variable was the grades on the spelling quiz. The control group was the not wait group. The experiment used 25 first grade subjects, 10 boys and 15 girls. The children were given one marshmallow while taking a spelling quiz. If the children completed the quiz without eating the marshmallow, then the children received another marshmallow. The children who didn't wait only received the original marshmallow. The result of the experiment was that three children ate the marshmallow and received 100 percent on the quiz, while 22 children did not eat the marshmallow. The average test score was 87 percent. The t-test between the not touch and the eat/play/lick groupings was found to be significantly insignificant (fail to reject) with the "P" value being <.05 at 0.59. The hypothesis was if the children waited for the second marshmallow, then the children would receive better grades in school; the hypothesis was rejected. The wait group and not wait group didn't affect the school grades. One major error was the setup of the two classrooms, which impacted how peer pressure influenced the children's interaction with the marshmallow. Further research could explore the difference of genders and delayed gratification on school grades.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

213C09

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Age Affects Ability to Read and Comprehend Volume and Numbers

Amanda Powers

Loudoun County High School (LCH)

People sometimes wonder when children finally begin to understand complex problems, like optical illusions or trick questions. In this experiment, children were asked a few questions involving volume and numerical problem solving to determine the effect of age on comprehension of complex concepts. The age range tested was Kindergarten through 3rd Grade. The subjects were shown two identical glasses filled with the same amount of water and were asked which one had more or if they were the same. One of the glasses was then poured into a smaller, wider glass; subjects were then asked which glass held more water or if they were the same. Subjects were shown two identical rows of five quarters and asked which row had more or if they were the same. One row of quarters was then spread out and children were asked again which row had more or if they were the same. Data analysis revealed one could see that age had an effect on level of comprehension. The Kindergarten struggled greatly to understand volume, while the 2nd and 3rd grade grasped the concept quite well, and first graders were in between with about 50% of the test subjects understanding the concept. From the data it was concluded that age is a contributing factor in concept comprehension, and the hypothesis for this project, which was that age would affect understanding was supported. In future studies it would be helpful to look at children from a wider range of schools to see how different teachers and learning environments affect comprehension.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

214F10

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Sunlight on the Tunneling Distance of Pogonomyrmex

John Rackoski

Freedom High School (FHS)

This experiment is about how sunlight affects the activity of Pogonomyrmex occidentalis, the western harvester ant. This experiment relates to animal behavioral sciences. Ants were used in the experiment, though this experiment was used to be the basis of research of how sunlight affects any organism. This includes food collection, construction of shelter, or in humans, work productivity. The hypothesis was, “If the ants were exposed to more sunlight per day, then they will tunnel more.” Three groups of ants, received either 12 hours (control), 8 hours of sunlight per 24 hours, or 6 hours of sunlight per 24 hours. Each group had 15 ant gel habitats with 20 western harvester ants in each. Each habitats tunnel length (mm) was measured every 12 hours for 1 week. T tests conducted supported the experimental hypothesis and the null hypothesis was rejected. The ants exposed to 12 hours of sunlight per day tunneled more than those exposed to 8 hours of sunlight per day, who in turn tunneled more than those exposed to 6 hours of sunlight per day. Sunlight effects organisms activity levels because they can see better, and most organisms regain their energy through sleep at night, when they are not active. Therefore organisms rest in the dark and are not active. This experiment could be conducted again with larger organisms to determine if sunlight has an effect on their work productivity.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

215D12

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Defining Risk: Risk Perception and Experience in Young Adults

Julia Woods

Dominion High School (DMH)

Risk is defined as a situation which entails both uncertainty and exposure or possible consequences. Every day, a person is subject to hundreds of choices and with each choice comes a degree of insecurity. Risk perception is the ability of an individual to see the consequences of a potentially hazardous situation. Currently, there is a surge in adolescent risk taking, which often leads to higher crime rates. With exposure to risky situations, each individual may perceive that risk in a different manner.

The intent of this research was to determine what traits influence the perception of risk by surveying sixty seven young adults. Individuals were surveyed to determine background information and each individual answered risk assessment questions to determine perception of risky situations. The subjects considered “high risk” were individuals living in a crowded household (more than four people per home), having low income (less than $10,000 a year), having less education (less than a college degree), being of a minority ethnicity (African American, Latino and Asian) and being a non-citizen of the United States. The data indicated that subjects within the high risk class were less likely to have engaged in risky situations over the past year. The research negates the common belief that a risky background is a predictor for future risky behavior and thus common perceptions of risk predictors may need to be reconsidered.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

216F09

Behavioral & Social Sciences
200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Rewriting Notes Versus Retyping Them on a Student's Memorization

Soyeol Yoo

Freedom High School (FHS)

This experiment was conducted to determine which study method would be the most effective for memorization. The hypothesis stated that rewriting a set of notes would be more effective than retyping them. The subjects were aged fourteen to fifteen, with 16 boys and 29 girls. The independent variables were rewriting and retyping word sets. The control group was reading word sets. The volunteers received 20 word sets, were given 45 seconds to memorize as many as possible, and would be asked to recite the words they could remember in 30 seconds. The experimenter would record how many words each person remembered. The main finding of the study was that the hypothesis was incorrect; the most effective way of studying was to read the information. The mean for the reading word count was 14, the mean for the rewriting word count was 11, and the mean for the retyping word count was 10. By looking at the t-test analysis, one could see there was a significant difference in the means. The means between the independent variables were smaller than the mean between the control group and the independent variables. Although rewriting was more effective than retyping, reading was most the effective. Another potential experiment would be to see if another method is more effective than reading.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Biochemistry (300)

Project No.	Last Name, First Name	Title
301H10	Alexander, Christine	What is the Effect of Various Stages of Ripeness on the Amount of Extractable DNA from Strawberries?
302G10	Allen, Melissa	The Relationship Between Iodine and Common Cooking Oils
303B10	Cogley, Alexis	The Effect of Artificial Memories on the Brain of Drosophila melanogaster
304W12	Crisp, Emily	Determination of Estrogen as a Trigger of Protandric Colony Formation of Amphiprion ocellaris
305D12	Gupta, Vivek	The Effect of Lithium on Neurogenesis in Neurologically Impaired Procambarus clarkii (Crayfish)
306G09	Jungles, Kaitlin	Do Natural Antacids Work Better Than Chemical Antacids
307W10	Lee, Adrian	The Relationship Between the Amount of Nutrients in Homemade Yogurt and the Amount of Nutrients in Manufactured Yogurt
308P10	Liu, Tatiana	The Effect of Algae Strains Scenedesmus and Stigeoclonium on the Removal of Inorganic Nitrogen
309L12	Lohr, Ashley	Sugar Quality of Zinnia elegans as a Coevolution Factor in Color Selection by Lepidopterans
310T10	Miyamoto, Yuna	How Do Different Forms of Orange Juice Affect the Level of Vitamin C?
311S10	Thomas, Samantha	The Effect Of pH On Gelation Caused By Bromelain To Find The Optimum Functioning pH Level For Bromelain

301H10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

What is the Effect of Various Stages of Ripeness on the Amount of Extractable DNA from Strawberries?

Christine Alexander

Heritage High School (HTH)

The purpose of the experiment was to determine whether the stage of ripeness of a strawberry would have an effect on the amount of extractable DNA. The IV was the ripeness stage of the strawberry, and the DV was the amount of DNA extracted. The control group was the ripe strawberries. First, an extraction liquid consisting of 900 mL of distilled water, 20 grams of table salt, and 100 mL of Dawn dishwashing detergent was mixed into a bowl. One ripe strawberry and 10 mL of the extraction liquid was pureed in a blender. Then, the liquid was strained; cold rubbing alcohol was poured down the side, and placed in a centrifuge for the DNA to separate from the rest of the strawberry liquid. These steps were repeated for the remaining 14 ripe strawberries, and again for the 15 over-ripe strawberries. The means for the amount of extracted DNA from the ripe and over-ripe strawberries were 42.6 and 95.3, respectively. A t-test was used to analyze the results and determine whether the null hypothesis was rejected. The figures show that the null hypothesis failed to reject since the calculated t-value (-5.68) was less than the t-critical value (2.07), and therefore the IV did not have a significant effect between the DV and control group. Further research could be conducted to determine whether DNA multiplies as fruit ripens or not, and numerous trials should be conducted during the experiment to make sure that outliers do not affect the results as heavily.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

302G10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between Iodine and Common Cooking Oils

Melissa Allen

Woodgrove High School (WHS)

When cooking which oil has the least amount of fat? This experiment was conducted in order to discover which of three common cooking oils, canola, olive, or peanut, has the lowest amount of fat. When iodine is added to cooking oil, it fills up the double bonds in the oil and will, eventually, fill all the bonds and change the oil to an amber color. The independent variable was the type of oil. The dependent variable was the number of drops needed to change the color. There was no control. The 10 mL of oil was poured into a 2 mL graduated cylinder and heated in 3 L of 65o C water on a glass top stove. Iodine was added one drop at a time with an eye dropper then stirred until the oil turned amber. After all testing, olive oil was determined the healthiest with an average of 14.7 drops. Canola oil was second with an average of 18.3 drops. In last was peanut oil with 22.2 drops. A t-test was performed to find the statistical accuracy of the findings. The hypothesis was supported based on statistical analysis of the data. The results mean that when cooking, olive oil is the healthiest choice because it has the most double bonds and peanut oil is the least healthy choice as it has the least. Further research could include a larger amount of oils being tested and why exactly iodine fills up the double bonds and not any other liquid.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

303B10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Artificial Memories on the Brain of Drosophila melanogaster

Alexis Cogley

Broad Run High School (BRH)

The problem of the experiment is to understand the Drosophila melangaster's Cerebrum functions. It is possible to write artificial memories in the Drosophila melangaster's Cerebrum, causing it to believe it suffered through a traumatic experience that never occurred. The hypothesis is that if a memory is written by stimulating the Drosophila melangaster's Cerebrum with a pulse of light, then it will elect the same avoidance behavior compared to the Drosophila melangaster's which were shocked. The laser pulses, triggered by a Drosophila melangaster's entry into one chambers of the maze, causing the "caged" ATP to be released, leading to P2X2 receptor activation, and dopamine release. The pulse of light is sufficient to induce the formation of averse memories, leading to a behavior with a higher avoidance rate from that of Drosophila melangaster conditioned with electric shocks. A memory would be written when information from the antennae and the dopamine signal from PPL1 neurons converge on the twelve Kenyon cells. This would strengthen the synapsis in the circuit, and the information would be stored in the weight of the connections. Once the memory trace had been laid down, it could be read when the Drosophila melangaster re-encounters the learned odor, which would cause the Kenyon cells to re-activate the circuit. Finally, the output neurons would compute with the weight of the synapsis and initiate the appropriate behavior. A T-Test was conducted, which a statistical hypothesis in which the test statistic follows a student's T distribution if the null hypothesis is supported, the null hypothesis being opposite to the original hypothesis. The data did support the research hypothesis that the Drosophila melangaster with the memory trace would have a different mean than the Drosophila melangaster without the memory trace.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

304W12

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

Determination of Estrogen as a Trigger of Protandric Colony Formation of Amphiprion ocellaris

Emily Crisp

Briar Woods High School (BWH)
Academy of Science (AOS)

Amphiprion ocellaris form colonies of only one female and one mature male. All A. ocellaris are born non-functional males, and change sex to become a functional male and then the female as they move through the dominance structure of the colony. This experiment has been used to find the triggers behind the formation of the dominance structure within the colony. Last year's research indicated that behavior did not impact colony formation, and that there was a chemical found if the water when the colony was present. These conclusions led to this year's hypothesis that estrogen is the unidentified chemical found in the water, and that it is responsible for determining colony formation. Water samples were taken and run through HPLC to look for forms of estrogen, as well as a change in concentration of estrogen throughout colony formation. Research is still in progress, with a positive control test of an estrogen sample planned for an upcoming date. Another control sample from a tank with an established colony will also be run as a comparison.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

305D12

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Lithium on Neurogenesis in Neurologically Impaired Procambarus clarkii (Crayfish)

Vivek Gupta

Dominion High School (DMH)

Alcoholism is a serious neurological disorder that affects over fourteen million Americans. One of the most damaging consequences of alcohol is its ability to impede the ongoing process of neurogenesis in the brain. This retardation of hippocampal neurogenesis leaves the victim prone to relapse even after alcohol dependency has been treated. By stimulating neurogenesis, a person undergoing alcoholism treatment is less likely to become addicted to alcohol again.

Procambarus clarkii were intermittently exposed to high quantities of alcohol and experimental groups were injected several times with lithium carbonate or a saline solution. They were then injected with bromodeoxyuridine, a thymine analog, twenty-four hours before euthanization in order to mark proliferating cells during that period. The P. clarkii were then dissected and treated with bromodeoxyuridine antibodies causing these proliferating cells to be stained black. Organisms that were exposed to lithium carbonate exhibited significantly higher levels of neurogenesis than control groups. Those exposed to alcohol showed evidence of slowed neurogenesis; however, lithium carbonate injections stimulated neurogenesis in these organisms causing them to display rates similar to those of the control groups.

These differences in the rates of neurogenesis support the idea that lithium carbonate can counteract the neurologically degenerative effects of alcoholism. Lithium carbonate treatment brought the alcoholic group to pre-exposure levels, indicating it would help prevent a drug relapse. Testing the effects of lithium carbonate on mammals exposed to alcohol over a longer experimental period would provide further data as to lithium carbonate's ability to help prevent an alcoholic relapse.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

306G09

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

Do Natural Antacids Work Better Than Chemical Antacids

Kaitlin Jungles

Woodgrove High School (WHS)

Many adults face the problem of heartburn or too much stomach acid. They often do not know which type of antacid to choose, natural or chemical. The purpose of this experiment is to find out whether natural antacids neutralize hydrochloric acid (HCL) better than chemical antacids. In this experiment, a small amount of an antacid was mixed with HCL and the resulting pH was measured. The Independent variables were the natural and chemical antacids which were banana, raw honey, licorice root, Pepto-Bismol ®, Alka-Seltzer ®, and Tums®. The starting pH of the HCL was the control. According to the results, the natural antacids neutralized the HCL better than the chemical antacids. The averages pH values were the following: banana 2.4, raw honey 1.8, and licorice root 1.53, Alka-Seltzer® 1.37, Pepto-Bismol® 1.41, and Tums® 1.25. The hypothesis that chemical antacids would neutralize the HCL better than the natural antacids was not supported based on this experiment. This is because the natural antacids contained a greater percentage of the antacid in it. Further research could explore whether different parts of plants have a greater effect on the pH levels of HCL.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

307W10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between the Amount of Nutrients in Homemade Yogurt and the Amount of Nutrients in Manufactured Yogurt

Adrian Lee

Briar Woods High School (BWH)

The purpose of this experiment was to figure out if homemade yogurt had higher protein content than store bought yogurt. The topic that this study relates to is general biochemistry. The IV of this experiment was the type of yogurt being made, the DV was the protein content in each yogurt (mg/mL), and the control group was the store bought yogurt. During this experiment, two types of homemade yogurt were made. One type was regular homemade yogurt and the other was homemade yogurt with brown sugar. The amounts of protein in these two yogurts were compared to the amount of protein in store bought yogurt by a spectrophotometric test. The homemade yogurt with brown sugar appeared to have the highest protein content. The mean amount of protein for the store bought yogurt was 5.5 mg/mL, 15.6 mg/mL for the homemade yogurt, and 22.3 mg/mL for the homemade yogurt with brown sugar. A t-test was performed on this experiment. The alternative hypothesis, “if homemade yogurt is made, then it will have higher protein content than homemade yogurt,” was supported. The results of the t-test showed that the null hypothesis was not supported, and the probability of the measurements being equal was < 0.0001. The IV influenced the DV because each yogurt had distinguishingly different amounts of protein. Each homemade yogurt was much higher in protein content than the control, store bought yogurt. Further research that could be performed on this topic would be the affect of different types of flavorings in yogurt.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

308P10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Algae Strains Scenedesmus and Stigeoclonium on the Removal of Inorganic Nitrogen

Tatiana Liu

Potomac Falls High School (PFH)

Nitrogen pollution is an imminent issue today that requires an immediate resolution, as it has affected detrimentally aquatic environments and humans alike. Since nitrogen bioremediation is a most favorable solution for the problem of nitrogen pollution, the objective of this study is to determine an optimal algal strain (or strains) for the processes of nitrogen bioremediation. Two green algal strains (the independent variable), the hydrophilic Scenedesmus and the aerial Stigeoclonium, were immersed in a soilwater extract growth medium with a high concentration of an inorganic nitrogen source for 48 hours, and were then analyzed spectrophotometrically for variances in absorbencies of the inorganic nitrogen source. The cultures' absorbencies of the inorganic nitrogen source, the dependent variable, indicated the amount of the inorganic nitrogen source removed, while a reference blank was the control. The data produced a mean absorbance of -0.026 A? for the Scenedesmus cultures, and an average -0.031 A? for the Stigeoclonium cultures; the T-test performed for the set of absorbencies resulted in a p-value greater than 0.05. The hypothesis was verified by the results, for the inorganic nitrogen source absorbencies of the strains were similar, indicating that both strains share a great capacity for removing inorganic nitrogen, and are optimal for nitrogen bioremediation. The type of the algal strains did not seem to affect their level of inorganic nitrogen removal. Further research could explore the rate of inorganic nitrogen removal of the Stigeoclonium strain, and determine if the type of alga does affect an alga's removal of inorganic nitrogen.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

309L12

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

Sugar Quality of Zinnia elegans as a Coevolution Factor in Color Selection by Lepidopterans

Ashley Lohr

Loudoun Valley High School (LVH)

This project investigates the effects of flower color on the levels and types of sugars present in Zinnia elegans nectar. The hypothesis stated that the flowers most frequently visited by butterflies, especially the red and pink shades, will contain the highest levels of disaccharides. The procedure involved extracting nectar from flowers, running separate Benedict's and resorcinol tests, and placing the tubes of nectar in a Spec-20 to measure the transparency and absorbency of glucose, fructose, and sucrose at individual wavelengths. Three two-sample t-Tests assuming equal variances were performed between each pair of colors to determine significant differences among sugar levels based on transmission values. A two-factor Analysis of Variance (ANOVA) was performed to determine if the average sugar levels are the same among all flower colors and if the average level of sugar is the same for all sugar types. Due to the fact that F= 9.95, which exceeds Fcrit=3.33, there are significant differences among sugar levels in different-colored flowers. Since F=21.45 exceeds Fcrit=4.10, there are also significant differences among sugar levels within each flower color. Several t-Test results support the original hypothesis that red and pink flowers contain the highest levels of disaccharides. Flowers with higher sucrose levels are in the red and pink visual range of butterflies and can provide the most potential energy for their pollinators. Some plants and pollinators have become dependent on one another and, based on this study, coevolution is evident between butterflies and zinnias.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

310T10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Do Different Forms of Orange Juice Affect the Level of Vitamin C?

Yuna Miyamoto

Tuscarora High School (THS)

This experiment was conducted to find what form of orange juice contained the most vitamin C because vitamin C is one of the principal needs of humans. Vitamin C helps heal wounds, grow and repair tissues, and fight infections. Three different types of orange juices, fresh squeezed, carton and frozen, were measured with an ascorbic acid strip to find their vitamin C percentages. The control of this project was the average amount of vitamin C percentage in 1mL of an orange essence. 1mL of each orange juice type was diluted with 6.8mL of water to obtain the best accurate results from the ascorbic acid test strips, and the trials were repeated 15 times. Drawing from the averages of the orange juices, fresh squeezed had the most and carton orange juice had the least amount of vitamin C. Also, t-tests were performed to show that there was a significant difference between the variables and the control. The experimental hypothesis was supported through this research because it was predicted that the fresh squeezed orange juices would contain the most vitamin C. Furthermore, the different types of orange juices did affect the amount of vitamin C, because each type resulted with contrasting percentages. For future references, a wider ranged ascorbic acid test strip and a science specific pipette should be used because those two instruments could have affected the outcome of this experiment greatly.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

311S10

Biochemistry
300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of pH On Gelation Caused By Bromelain To Find The Optimum Functioning pH Level For Bromelain

Samantha Thomas

Stone Bridge High School (SBH)

The experiment determined the optimum functioning pH of bromelain and the pH that denatures bromelain causing gelation.
Enzymes therapy has become an innovative drug choice. The therapy with proteolytic enzymes is being considered as a method of treatment using natural medicines. Bromelain, which is extracted from stem of pineapple, is known to break down toxic metabolites and inflammatory products and may reduce pain and inflammation. The structure responsible for enzymatic activity needs to remain intact so that the enzyme retains its activity.
The bromelain solution was exposed to (IV) 1M HCL (pH2), 1M NaOH (pH12), pH 3, 5, 7 buffers. The controls received no bromelain. Bromelain catalyzes the hydrolysis of protein gelatin to form small fragments which cannot form a gel. When bromelain is active it does not let gelation to occur. The gelation was quantified as DV by giving a numeric score (scale of 1-10).The chi squares equal 19.200 with 9 degrees of freedom. The two-tailed P value equals 0.0235. This shows that all the control and experimental groups have a statistically significant difference (p=0.023) thus supporting the alternative hypothesis.
1M NaOH (pH12) showed significant effect and denatured bromelain (experimental groups median 9, frequency 5 and control group median10 with frequency 5). 1M HCL (pH2) denatured bromelain (experimental group median7 with frequency 5 and control group median 10, frequency 5). The pH 3, 5, 7 buffers kept bromelain active while causing gelation with median 3, 3, and 4 respectively. A strong base (1M NaOH- pH 12-14) or strong acid (1M HCL- pH 1&2) denatured bromelain. The pH5 buffer showed minimum gelation.
Further studies could determine the temperature that denatures bromelain. The optimum pH or temperature for proteases and their natural inhibitors can be studied for therapeutic purpose.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Cellular & Molecular Biology (400)

Project No.	Last Name, First Name	Title
401D12	Guzman, Ana Gabriela Meadows, Allison	Investigating the Effect of Cissus quinangularis Extract on the Collagen Synthesis by Fibroblasts
402T09	Hill, Edward	Anatomical Influences on the Rate of Planaria Regeneration
403F10	Kirwan, Emma	The Effect of Natural Substances Applied to Decalcified Eggs on Percent Mass Change
404L12	Krumpe, Molly	The Effect of Malachite Green on Vibrio fischeri's Ability to Communicate via Quorum Sensing
405D12	Nilsson, Caroline	The Characterization of Organismal Electromagnetic Fields Using Kirlian Photography
406W12	Pradhan, Aishwaryaa	Comparison of Genomic Sequences of BRCA1 (breast cancer1, early onset) Gene
407B10	Scheffer, Lucynda	The Correlation Between Mitochondria and Synapses in the Optic Lobe of the Fruit Fly

401D12

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Investigating the Effect of Cissus quinangularis Extract on the Collagen Synthesis by Fibroblasts

Ana Gabriela Guzman

Dominion High School (DMH)
Academy of Science (AOS)

Allison Meadows

Stone Bridge High School (SBH)
Academy of Science (AOS)

This investigation has studied the collagen synthesis by 3T6 mouse embryonic fibroblasts as a result of treatment with Cissus quinangularis extract. A water extract was made from dried C. quinangularis stems, and this extract was added to the culture media to a final concentration of 0.04 mg/mL. At confluence, a Sircol™ Soluble Collagen assay was used to quantify the collagen in the media. Cell counts were used to calculate the collagen production per cell. There was an additional variable of C. quadrangularis tested. The relationship between ascorbic acid and C. quinangularis and quadrangularis extracts was studied by measuring the concentration of ascorbic acid in each extract and treating positive controls with respective concentrations of ascorbic acid. These concentrations were found to be final concentration (in media) of 0.208µM and 0.416µM. In addition, there was a control of no treatment. If collagen concentration per cell is significantly different when the ascorbic acid concentration is constant, future research will investigate other components of C.quinangularis and quadrangularis that could potentially have an effect on collagen synthesis. Research is still in progress.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

402T09

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Anatomical Influences on the Rate of Planaria Regeneration

Edward Hill

Tuscarora High School (THS)

The purpose of the experiment was to research whether there are anatomical influences on planaria cell regeneration and to apply lessons learned to human cell regeneration. The independent variable was making a horizontal dissection across the middle of the planaria's body. The dependent variable was measuring the growth of the planaria segments over time. The control group was the expected growth amputated planaria segments if the segments grew at the same rate. Head segment growth and tail segment growth were the experiment groups. The experiment was comparing head segment groups against control groups and tail segment groups against control groups. After calculating the t-test of the head segment group vs. the control group was 0.59 and the t-test of the tail segment group vs. the control group was 0.66. My P values were 0.29 (head) and 0.66 (tail) were greater than 0.05, which means I have failed to reject my null hypothesis. However my mean supported my hypothesis because the tail group had more growth than the head group. For further research, scientists should research the genetic influences rather than the anatomical influences, because the genes are what allow for tail growth and not the location. If humans had these genes they could also regenerate cells, saving thousands of lives.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

403F10

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Natural Substances Applied to Decalcified Eggs on Percent Mass Change

Emma Kirwan

Freedom High School (FHS)

This experiment was to show which natural substance would be best for moisturizing dry skin. The hypothesis was that if coconut oil, olive oil, and aloe were applied to 15 decalcified eggs each, then coconut oil would have the least percent mass change and therefore would be the best moisturizer to use for dry skin. Each substance was applied to 15 decalcified eggs each, and then each group was placed into a container of light corn syrup. There was also a control group, which contained 15 eggs with no natural moisturizer applied. The dependent variable was the percent mass change of each egg. The results supported that coconut oil was the best substance to use for moisturizing. The eggs with coconut oil held more water in the egg, and the coconut oil was the best natural barrier in the end. An error in this experiment was that some of the eggs contained more of the moisturizer than others. It was difficult to get the same amount of each substance onto each egg every time. To further the results, one could perform an experiment using different store moisturizers. This experiment can benefit people who suffer from dry skin during the winter, or all year round.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

404L12

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Malachite Green on Vibrio fischeri's Ability to Communicate via Quorum Sensing

Molly Krumpe

Loudoun Valley High School (LVH)

Quorum sensing is the communication of bacteria via autoinducers and receivers that allow for the bacteria to exhibit pathogenic or expressed quality. This experiment tested the ability of the bacteria Vibrio fischeri, a gram-negative bioluminescent marine organism, to communicate in the presence of malachite green, which has shown in some studies to be a mutagenic agent. The hypothesis states that the environmental factor of malachite green will cause the bacteria to act as a group and change their expression according to the environment. The experimentation process consisted of pouring photobacterium agar onto six different plates. Out of these plates three were given 1.0 mL of malachite green dispersed onto the plate with a pipette. The other three plates were used as controls, containing only bacteria. Eighteen to 24 hours later, the bacteria reached their peak bioluminescence and were viewed in a dark room after adjusting to the light for five minutes. The bacteria were then analyzed through qualitative means. Next, the bacteria were replated onto three divided plates. One plate consisted of control bacteria on both sides of the plate. The next plate consisted of control bacteria on one side and the malachite bacteria on the other. The last plate consisted of malachite bacteria on both sides. The three conducted trials supported that quorum sensing occurs in masses of bacteria where the quorum is reached, thus expressing their bioluminescence only in those same areas. Also observed were the effects of malachite green on the ability of the control bacteria to glow longer. This may further support the mutagenic capability of malachite green on bacterial cells.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

405D12

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Characterization of Organismal Electromagnetic Fields Using Kirlian Photography

Caroline Nilsson

Dominion High School (DMH)

The anatomical and morphological development of many organisms has long been a challenge for researchers to understand. However, progress has been made in this area of cellular biology especially with the discovery of morphogenetic fields. Morphogenetic fields are energy fields responsible for directing cell growth thus creating the body of an organism. They are present in every living thing. These same fields may also be responsible for phantom limb pain in amputees because they still exist where the limb once existed. Kirlian photography can be used to identify electrical energy within organisms. It was the intent of this research to determine the presence and localization of morphogenetic fields in various organisms.

Sections of earthworms, lima beans and leaves were severed and photographed using Kirlian photographic techniques. All showed communication between severed parts as a result of energy field attraction. Grass, which was not severed, showed concentrated wells of energy where primordial shoots existed. Modified “phantom leaf” experimentation was conducted with leaves and further emphasized the presence of cellular communication through the fields.

Various communications demonstrated through these photographs both legitimizes the presence of energy fields in living organisms, as well as emphasizes the importance of cellular communication within a living organism. The identification of these fields and areas of energy concentration could be widely beneficial; it could be used in the optimization of crop growth or the fitting of an amputee with a prosthetic. Morphogenetic fields, once recognized, could potentially be tailored to achieve a specific productive end.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

406W12

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Comparison of Genomic Sequences of BRCA1 (breast cancer1, early onset) Gene

Aishwaryaa Pradhan

Briar Woods High School (BWH)

The BRCA 1, called “breast cancer 1, early onset” gene is from the class of family of genes called the tumor suppressor genes. A tumor suppressor gene helps prevent cells from growing and dividing in an uncontrolled way as cancer cells do. Comparative genomics shows how many matches of a sequence come up for a certain gene and in a particular species. This can be helpful to scientists to improve their understanding of the function of human genes. In this study the genomic sequence of the BRCA1 gene in humans was compared to the genomic sequences of the BRCA1 gene in other species. Four other species were used; Mus musculus (mouse), Rattus norvegicus (rat), Macaca mulatta (macaque), and Pan troglodytes (chimpanzee). The genetic sequences of the gene were extracted in the FASTA format from the National Library of Medicine genome website www.ncbi.nlm.nih.gov. To compare the sequences, the Basic Local Alignment Search Tool (BLAST) was used to align the sequence of the human and other species. The results showed that the human and chimpanzee and the human and macaque had the best match for alignment of the genomic sequence of the BRCA1 gene. The comparison of the human and rat and of the human and mouse did not show strong alignments. They hypothesis was supported by the results found and the null hypothesis was rejected.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

407B10

Cellular & Molecular Biology
400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Correlation Between Mitochondria and Synapses in the Optic Lobe of the Fruit Fly

Lucynda Scheffer

Broad Run High School (BRH)

In the brain, synapses communicate information from neuron to neuron. Mitochondria supply the ATP that supplies the energy that is used by these synapses. Since synapses represent about twenty percent of the energy requirements of the brain, it has been suspected that there are more or larger mitochondria where there is a higher density of synapses, but this has never been measured. Using previously collected electron microscope photographs from ten consecutive thin sections of the brain of the fruit fly Drosophila, both the synapse density and the mitochondria size and density were measured to see if such a correlation exists and, if so, if it was statistically significant. Surprisingly, the area occupied by mitochondria actually decreased slightly with increased synapse density, with the area of the mitochondria within each measurement grid decreasing by 0.1% for every additional synapse within the grid. The p-test on the results of the regression showed this decrease is not statistically significant with a standard deviation of ±0.28% for the slope. The statistical spread in the data was large enough that the null hypothesis and the hypothesis that the area increases with increasing density could not be distinguished reliably from this data set. Further research could explore a larger sample size of brain tissue to reduce the statistical uncertainty. Alternatively, a more accurate analysis could consider only the mitochondria and synapses within the same cell. This would require a much more elaborate and time-consuming analysis but could potentially lead to a much more accurate result.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Chemistry (500)

Project No.	Last Name, First Name	Title
501W12	Atkinson, Tracey	Electrospinning Blended Nanofibers to Mimic the Tensile Properties of Spider Silk
502L10	Casimiro, Alyssa	The Effect of Alcohol on the Duration of Perfume's Scent
503W10	Eisenhower, Samantha	Comparing the Vitamin C Content of Home vs. Industrial Canned Fruits
504P09	Gibney, Theresa	The Relationship between Freezing Ferrofluid and Ferrofluid Spike Height
505T10	Hilado, Sarah	The Verification of Sugar Content in Sweetened Beverages by Using Index of Refraction
506P09	Koepsell, William	A Comparison of Single-use and Reusable Hand Warmers
507V10	Lord, Nilanka	The Effect of Fat Content on Milk Spoilage
508C10	Modolo, Christina	The Relationship Between Copper Household Plumbing Age and Rate of Copper Absorption Into Drinking Water
509P10	Mook, Patricia	The Effect of Varying Amounts of Conditioner on the Tensile Strength Hair Strands
510F10	Norris, Nicole	The Comparison of Vitamin C Levels of Organic and Inorganic Lycopersicon esculentum
511S10	O`Connell, Marie	The Relationship Between Temperature And The Length Of The Chemiluminescence Reaction Between Luminol, Perborate, And Copper Sulfate
512W09	Randev, Toshali	Styrofoam Be Gone
513S10	Schumacher, Samuel	The Effect Of Sodium Carbonate, Calcium Hydroxide, And Citric Acid On The Removal Of Calcium Carbonate In Hard Water
514C10	Sokol, Catherine	The Effect of the Fat Type on the Spread and Thickness of Chocolate Chip Cookies
515V10	Villalobos, Rachel	Getting Rid of Stink
516V10	Zhou, Mark	The Effects of Acid Rain on Metals

501W12

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Electrospinning Blended Nanofibers to Mimic the Tensile Properties of Spider Silk

Tracey Atkinson

Briar Woods High School (BWH)
Academy of Science (AOS)

Orb weaver dragline spider silk has a high tensile strength at 1.2 GPa and will stretch to up to 130% of its original length. It has been suggested that these properties may arise from the mix of ductile and rigid regions within the silk. This work aimed to create a replacement for this type of spider silk that held both the tensile strength and extensibility values of the silk. Fibrous meshes were created by electrospinning two biopolymers, chitosan mimicking the crystalline sections and elastin mimicking the supple sections of the silk, into the blended meshes to mimic the compound structure of spider silk.

Meshes were electrospun from solutions made of elastin, chitosan, and polyethylene oxide (PEO), which served as an aid to fiber formation. Solutions containing different concentrations of elastin and chitosan were electrospun and all successfully produced nanofibers. Ranges for concentration included a variation of the elastin concentration from 0% weight to 2% weight and for chistosan from 0% weight to 2% weight. After imaging the meshes, the solution containing 2% weight chitosan and 2% weight elastin showed the highest fiber quality. Tensile testing is being conducted on the meshes and results will be finalized within the coming week.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

502L10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Alcohol on the Duration of Perfume's Scent

Alyssa Casimiro

Loudoun Valley High School (LVH)

This project was conducted to determine if alcohol has an effect on how long perfume lasts. This way, chemicals in perfumes can be reduced, and perfumes can be made of more natural ingredients. The independent variable of this experiment was the alcohol in the perfume, and the dependent variable is how long the perfume lasted. The control group consisted of the nonalcoholic perfume, which had the same ingredients, except for the alcohol. The ingredients included 560 ml of distilled water, 10 drops of sandalwood essential oil, and 20 drops of bergamot essential oil.
After conducting the experiment, the results showed that the alcoholic perfume lasted longer, with an average of time of 62 minutes, while the nonalcoholic perfume had an average 49 minutes. At t-test was performed to compare the alcoholic perfume to the nonalcoholic perfume. Because the absolute value of the t-stat is greater than the t-critical values, this indicated that there is a significant difference between the two groups, therefore supporting the original hypothesis. This shows that the independent variable affected the dependent variable; by making the alcoholic perfume stronger and making it last longer.
Further research could explore the quality of different essential oils, types of perfume. Since this experiment was limited in terms of the type of essential oils used, such as bergamot and sandalwood, further research can explore the combinations of essential oils in perfumes. Another example can be exploring different types of perfume like eau de parfum and cologne, which vary in alcohol content.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

503W10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Comparing the Vitamin C Content of Home vs. Industrial Canned Fruits

Samantha Eisenhower

Briar Woods High School (BWH)

The objective of this project was to find out whether the methods of canning peaches and pears using a home versus industrial canning process affects the amount of vitamin C retained. This experiment's focus was the comparison of the quantities of vitamin C found in the canned fruits. Equal amounts of the separate blended fruits were combined with a starch solution and then titrated with an iodine solution that reacts with the vitamin C present. The determination of the relative vitamin C content is made when the iodine solution finishes reacting with the vitamin C in the sample and the iodine solution then reacts with the starch to make a dark blue color. The volume of iodine solution needed to achieve this end point for home canned fruit was statistically compared with industrial canned fruit. When tested under the conditions described, home canned peaches had a lower mean amount of vitamin C than industrially canned. When tested under the conditions described, home canned pears had a higher mean amount of vitamin C. The mean value for the peaches was significantly different for the home canned as compared to industrially canned peaches. However, the mean value of the indicator needed for the pears was not significantly different, but very close. The statistical results do not support the hypothesis that home canned results in an increase in vitamin C content.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

504P09

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship between Freezing Ferrofluid and Ferrofluid Spike Height

Theresa Gibney

Potomac Falls High School (PFH)

The purpose of this experiment was to see if Ferrofluid, a suspension of magnetic nanoparticles, would produce the same spike heights (when near a magnet) after being frozen (at -78.5 degrees Celsius) into a solid state. The hypothesis in this experiment was that if Ferrofluid was exposed to freezing temperatures (the independent variable), then it would have a significant height difference in spikes (the dependent variable) when compared to the Ferrofluid kept at room temperature (the control group). During experimentation, the Ferrofluid was divided into two equal groups, with one group being frozen in dry ice and the other kept at consistent temperature. After the frozen Ferrofluid thawed back to room temperature, both groups were split into thirty samples apiece and their spikes' heights were tested in centimeters by the same strong magnet. For each sample in both groups, the spike height was exactly the same, being 0.5 centimeters in height. This ended in both the mean and mode equaling 0.5 centimeters, and making a statistical data table unable to be completed. In conclusion, the freezing of Ferrofluid was unable to have any effect on the height of the spikes produced. Due to this, the hypothesis was refuted because there was no property change, leading to no change in the dependent variable. A possible experiment that this research could lead too would be to see if turning the Ferrofluid into a gas through boiling, versus a solid from freezing, would have an influence on the Ferrofluid spike heights.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

505T10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Verification of Sugar Content in Sweetened Beverages by Using Index of Refraction

Sarah Hilado

Tuscarora High School (THS)

The purpose of this experiment is to verify the sugar content in sweetened beverages by using a laser and refraction. The independent variable is the sugar amount and the dependent variable is the refraction of the laser beam. The control is a set of premeasured sugar solutions from 10g-50g of sugar in increments of 5g. The hypothesis is the measured sugar content of each beverage will be within 5g of the amount printed on the nutrition label. The null hypothesis states there is no significant difference between the actual sugar content and the amount of sugar printed on the nutrition labels. A sample of each controlled sugar solution was placed in a hollow equilateral triangular prism and a laser, at a fixed distance, shot through the prism and refracted. The angle of refraction was recorded and used later in Snell's Law of Refraction to calculate the index of refraction. This procedure was repeated for six other sweetened beverage products. The index of refraction of the sweetened beverages were compared to the controlled sugar solutions to find the actual sugar content and then checked against the nutrition label. The data in this experiment was quantitative and required a chi-square test for statistical analysis. The data failed to reject the null hypothesis therefore; there is no significant difference between the sugar content of the sweetened beverages and the printed amount on the nutrition labels. Further research could explore many solute concentrations in liquids other than sugar.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

506P09

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Comparison of Single-use and Reusable Hand Warmers

William Koepsell

Potomac Falls High School (PFH)

Which hand warmer is the best? This experiment tested single-use hand warmers against reusable hand warmers to see how quickly they heated up, how high the temperature reached, and how long they lasted. The procedure involved measuring hand warmer temperature with a surface thermometer and measuring time with a stopwatch. Final data averages found that the reusable hand warmer heated up in 29.1 seconds, reached 50.3 degrees Celsius, and lasted for 13,740.3 seconds. Single-use hand warmers heated up in 419.5 seconds, reached 47.9 degrees Celsius, and lasted for 41,425.2 seconds. The hypothesis stated that if a reusable hand warmer hand warmer is tested thirty times against thirty single-use hand warmers, then on average, the reusable hand warmer will heat up the quickest, and the single-use hand warmers will last the longest and reach the highest temperature. The hypothesis was partially supported because the reusable hand warmer did heat up the quickest and the single-use hand warmers did last the longest, but on average, the reusable hand warmer reached the highest temperature. These results show that while single-use hand warmers may last the longest, they are unpredictable. Reusable hand warmers would be a more reliable option. Further research could include comparisons to rechargeable or refillable hand warmers.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

507V10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Fat Content on Milk Spoilage

Nilanka Lord

Park View High School (PVH)

How does milk spoil? Does milk's fat content have anything to do with when the milk spoils? Well this experiment was designed to test just that! In this experiment, the independent variable was the milk's fat content, and the dependent variable was the average time of spoilage. The control group was the group of skim milk. The four types of milk (skim, 1%, 2%, and whole) were tested to see what the average time of spoilage (in hours) was for each one. Each group consisted of 15 cups, each filled with 50 mL of milk. They were all spread out by windows and checked on every 12 hours. When a cup was confirmed spoiled, which was decided by unpleasant smell or discoloration, the amount of hours taken for that particular cup to spoil was recorded. After every cup spoiled, the average number of hours taken for each cup to spoil was then calculated. The most important findings of this experiment were that there was no relation of fat content and milk spoilage. The averages for skim, 1%, 2%, and whole in hours were 91.2, 77.6, 78.4, and 88.8 hours respectively. The alternative hypothesis, which states that fat content on milk would indeed have an effect on milk spoilage, was not supported, as no relation between the two could be determined from the data taken from the experiment. Further research could explore how milk from different mammals, not just cows, could affect spoilage rate.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

508C10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between Copper Household Plumbing Age and Rate of Copper Absorption Into Drinking Water

Christina Modolo

Loudoun County High School (LCH)

It is recognized by the Environmental Protection Agency that high copper intake can lead to kidney and liver damage. Natural water sources generally have very low copper content, but most houses have copper pipes. The Leesburg Utilities Department tests for copper every three years at approximately 33 sites, to ensure that the copper level in drinking water at the faucet does not exceed the action level of 1.3 parts per million (ppm). An investigation was conducted to determine if the age of pipes had an effect on the copper level when drawn from a tap. Houses were chosen from the Country Club subdivision because water originates from one source and the age of the houses vary. A sample of water that has been sitting in the pipes for a one day period was taken. To test the copper, a copper test kit with a measurement range of 0 to 1 ppm was used. The data collected strongly suggested that the older the pipes, the less copper is absorbed into the water over a given time span. The results may indicate that a mineral scale builds up inside the pipes, preventing direct contact between the water and the copper of the pipe. The scale and its effect may increase over time. Further investigation on a larger sample size is necessary to be certain that the age of the pipes does have an effect on copper absorption. The age of the house should be considered when testing under the EPA standards.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

509P10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Varying Amounts of Conditioner on the Tensile Strength Hair Strands

Patricia Mook

Potomac Falls High School (PFH)

This experiment's purpose was to determine if varying amounts of conditioner influenced the tensile strength of hair. There were four groups of three hundred hairs tested. The ultimate tension strength (UTS) of the treated strand groups had to be determined, which provided the dependant variable. The varying amounts of conditioner in each beaker provided the independent variable and the group with no conditioner became the control group. After soaking and air-drying the strands, groups of ten strands were secured to both a spring scale and a surface. The strands were then pulled until they snapped. A t-test was conducted to determine the results. The mean results of the strands treated with fifteen milliliters of conditioner was 3.04 Newtons, for ten milliliters of conditioner it was 3.81 Newtons, for five milliliters of conditioner it was 6.47 Newtons, and for 200 milliliters of water it was 12.19 Newtons. The strands treated with the least conditioner had the highest UTS and the strands with the most conditioner had the lowest UTS. The results were statistically significant, because the hypothesis, if different amounts of conditioner are soaked into hair strands, then the tensile strength of the strands with the most conditioner will be weaker than the tensile strength of strands with the least conditioner, was proven true by the data analysis. The independent variable influenced the dependant variable making the control group's hair stronger than the experimental groups'.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

510F10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Comparison of Vitamin C Levels of Organic and Inorganic Lycopersicon esculentum

Nicole Norris

Freedom High School (FHS)

The purpose of this experiment was to compare inorganic and organic Roma tomatoes' vitamin C contents. The independent variable was whether the Roma tomato was organic or inorganic. The dependent variable was the vitamin C content, measured in milligrams. The process of titration using a starch indicator solution and an iodine-potassium iodide solution was used to determine the vitamin C content after one gram of organic or inorganic tomato was blended with distilled water to create one sample. The results of the experiment demonstrated no difference between the two groups, with both tomato groups having a mean of 1.69 milligrams of vitamin C. These results disprove the alternative hypothesis that states, "If a Roma tomato is organic, then it will have a higher level of vitamin C." It is concluded that whether a Roma tomato is organic or inorganic has no effect on the nutritional value of a Roma tomato, save for the fact that conventionally grown tomatoes are grown with more potentially harmful pesticides. From this information, one can now make an educated decision about purchasing produce, Roma tomatoes specifically, based on the advertised growing method. Further research could be done on the effect of organic or inorganic growing methods on other nutritional aspects of a Roma tomato or other vegetables, testing for other important vitamins like calcium and vitamin A.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

511S10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between Temperature And The Length Of The Chemiluminescence Reaction Between Luminol, Perborate, And Copper Sulfate

Marie O`Connell

Stone Bridge High School (SBH)

This experiment investigated the effect of different temperatures on the length of the chemiluminescence reaction. When investigators are at a crime scene with traces of blood, a luminol solution is used to detect the blood stains. The length of the reaction is important because investigators need the longest time possible to evaluate the blood. Different temperatures may affect the duration of the chemiluminescence reaction.

The hypothesis was 'If the temperature of the luminol solution is 40C, then the length of time that the chemiluminescence reaction is visible will decrease compared to 20C and 4C.' The independent variable was the temperature of the reactants, and the dependent variable was the length of time of the chemiluminescence reaction. The results showed that the means of the experimental groups 40C, 20C, and 4C were 324.4, 487.3, and 759.5 seconds, respectively. The ANOVA test showed a statistically significant difference among the groups. Therefore, the null hypothesis was rejected. The t-tests showed that the alternative hypothesis was supported ($P<0.05$ for all the tests). The independent variable did cause a change in the dependent variable, because the different temperatures of reactants affected the length of time of the chemiluminescence reaction. The group with 4C showed the longest time because the reaction rate was decreased at the lower temperature, and the reactants were consumed more slowly, prolonging reaction time.

An error was that the camera could not film in dull light, so the experiment was repeated. To further this experiment, the chemiluminescence reaction could be tested with different catalysts such as animal blood, bleach, metals, nitrates or alcohol. Testing different catalysts could determine if positive test results were human blood or other catalysts, based on the length of the reaction or the strength of the glow.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

512W09

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Styrofoam Be Gone

Toshali Randev

Briar Woods High School (BWH)

The inspiration for this experiment arose from an unlikely place—a birthday party. Upon noticing the amount of Styrofoam cups being used, the student began to wonder what effects substances had on Styrofoam. It was decided that two strengths of two chemicals, 3 and 6 molar acetone, and 3 and 6 molar acetic acid, would be tested on 2 centimeters by 2 centimeters Styrofoam pieces. The strength of the chemical was the independent variable, while the amount of Styrofoam dissolved was the dependent variable. Prior to experimentation, the alternate hypothesis was: if Styrofoam is dipped in distilled water, acetone with a molarity of 3, acetone with a molarity of 6, acetic acid with a molarity of 3, and acetic acid with a molarity of 6, then the higher concentrated chemicals will dissolve the Styrofoam best. The procedure involved putting 20 milliliters of 3M acetone, 6M acetone, 3M acetic acid, 6M acetic acid, and water in a beaker along with one piece of Styrofoam. The water was considered the control group, since water is unreactive with Styrofoam. Reactants were left for five days and the student recorded the mass each day. After data was analyzed using the T-test, nothing significant arose. The stronger chemicals had no greater of an effect on the Styrofoam than the weaker ones. The statistical tests did not support the hypothesis. It has been found that the chemicals have virtually no effect on Styrofoam. However, this study was limited; further research could explore the effects of stronger or more concentrated chemicals on Styrofoam as well.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

513S10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Sodium Carbonate, Calcium Hydroxide, And Citric Acid On The Removal Of Calcium Carbonate In Hard Water

Samuel Schumacher

Stone Bridge High School (SBH)

Hard water contains dissolved minerals and cations of calcium and magnesium. When heated the carbonates precipitates out forming scale which deteriorates plumbing, lessens the effects of cleaning agents, and prevents efficient heat transfer which affects cost in industrial-sized water boilers. Ion exchange resins are used to treat hard water. They must be regenerated through a process; which can be damaging to environment. It increases sodium and potassium levels in the treated water which can be unhealthy. The experiment compares the efficacy of sodium carbonate, calcium hydroxide, and citric acid on removal of calcium carbonate from hard water.
15 samples of 200mL hard water (considering molarity) were treated with 10.5g of sodium carbonate, 7.4g of calcium hydroxide, and 19.2g of citric acid (IV) and the control was left untreated. After 5 minutes the calcium carbonate (ppm) left was measured (DV) using a water hardness testing kit.
ANOVA returns $p<0.05$ showing statistically significant difference in the average calcium carbonate left in the samples treated with 3 chemicals.
Even thought the t-test showed statistically significant difference ($P<0.05$) in the calcium carbonate left in control and calcium hydroxide treated samples, calcium carbonate left in the samples treated with the calcium hydroxide (1000ppm) and sodium carbonate (293ppm) were higher than calcium carbonate present in the control (280ppm) indicating an error. There was statistically significant difference ($P<1.63E-22$) in the calcium carbonate left in the samples treated with citric acid (15.7ppm) and control. This probably is because the most of the hardness kits measure alkalinity and correlate it with mineral content. Citric acid reduces the pH that is the reason for low values obtained in the samples treated with citric acid. Further studies could test chemicals that can lessen the alkalinity of calcium hydroxide.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

514C10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Fat Type on the Spread and Thickness of Chocolate Chip Cookies

Catherine Sokol

Loudoun County High School (LCH)

The use of different fat types in making Chocolate Chip Cookies seems to have an effect on the cookies overall spread and thickness. In this experiment butter, margarine, and butter-flavored shortening were tested in a Chocolate Chip Cookie recipe to compare which one made larger, taller cookies. The conclusion of the experiment was that, overall, shortening produced cookies that had a smaller diameter and a taller height. The butter cookies were consistently larger in diameter yet shorter in height, while the cookies baked with margarine were in the middle of both categories. The data was found by running an ANOVA single factor test on each dependent variable. The P-values for the height and diameter tests were 0.0000441485 and 0.0840, respectively. Since one P-values are not less than 0.05 than the alternative hypothesis which stated that if the fat used in the cookies melts early in the baking process, then the cookies will be thinner and more spread out must be rejected and the null hypothesis supported . This rejection means that the experiments results were due more to uncontrollable reasons than the independent variable. A possible reason for this particular outcome could be that the oven was a few degrees warmer or cooler for each batch of cookies or that one egg was larger than another in each batch.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

515V10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Getting Rid of Stink

Rachel Villalobos

Park View High School (PVH)

Removing skunk smell from something can be a very hard task. It can take many tries to successfully rid the fabric of odor. That's what this experiment did. This experiment tested the most effective method of removing skunk smell from fabric. The independent variables were hydrogen peroxide and baking soda, tomato juice, vinegar, cologne, and dish soap. The dependent variable was how much the fabric smelled of skunk. The control was fabric with skunk smell on it. Each piece of fabric had skunk secretion on it, and then was treated with the variables. Hydrogen peroxide and baking soda was the best. When the smell of the fabric was measured on a scale of one to ten, one being worst and ten being best, the mean came out as an 8.9. Tomato juice was 6.1, cologne was 2.5, dish soap was 1.4, vinegar was 3.5, and the control group was 1. The alternative hypothesis was, if hydrogen peroxide and baking soda are used on the fabric, then it will be more effective than if the other variables are used. It was supported. The independent variable had a tremendous effect on the dependent variable. The statistical analysis showed x^2 of 10.776 > 3.2 meaning $p > 0.001$. Hydrogen peroxide and baking soda seems to be the best way to remove skunk smell. Further research could explore the results on actual skunk spray, using more variables, and having more trials.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

516V10

Chemistry
500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Acid Rain on Metals

Mark Zhou

Park View High School (PVH)

In a heavily industrialized world, many areas experience acid rain. It is important to know which metals should be used. The purpose of this experiment is to determine which metals are most reactive with acid rain.

During the experiment, metals of different types were placed in cups filled with either distilled water or a diluted sulfuric acid. The independent variable is the solution, the dependent variable is the metal's mass, and the control group is the distilled water group. The metals' mass were taken at regular intervals over a period of one week.

A t-test was done to determine the results of the experiment. The means for the percent change in mass of the iron and control iron were 2.45771% and 1.247% respectively; 1.02757% and 0% for copper and the control copper respectively; 2.19714% and 1.52243% for zinc and the control zinc respectively; and 4.033% and 2.434% for aluminum and the control aluminum respectively.

The alternative hypothesis was if metals were submerged into acid rain, then their mass would decrease. The p-values of all metals except copper were over .05, so the hypothesis was not supported for all of the metals except for the copper. Sources of error include exposure of distilled water to air and the margin of error of the triple-beam balance

Further research could experiment with different chemicals in acid rain and how they affect metals. Research on alloys commonly used in industry could also be explored.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Computer Science (600)

Project No.	Last Name, First Name	Title
601F09	Ahn, Mina	The Effect of the Number of Collections on Searching Time
602H12	Bowen, Genna	Building and Displaying Character Location in ArcGIS
603C10	Bowers, Kyle	Correlation Between Video Game Colors and Their Ratings
604W10	Lauer, Michael	Under Clocking a Graphics Processing Unit
605D12	Newman, Zachary	The Integration of Evolutionary Algorithms into Optimization of Functions via the Markov Chain Monte Carlo Framework
606D12	Vanburen, Stefan	The Utilization of Genetic Algorithms on Optimization of Truck Routing Efficiency

601F09

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Number of Collections on Searching Time

Mina Ahn

Freedom High School (FHS)

In order to have a quick internet search, a computer program has to have an efficient algorithm with a short execution time. The intent of this research was to determine whether or not further subdividing a set of data into multiple collections will shorten execution time. The hypothesis states that if the data is divided multiple times, then the information will be retrieved quickly, however, the index files will grow, reaching a threshold point where the index data will be larger than the actual collection of data. The data, random numbers between one through one hundred million, were divided into groups or collections, and the time was recorded in milliseconds. The time of the experimental groups was compared to the time recorded for the data that were not divided. The results supported the hypothesis because the trend of the mean and other statistics were the same: the time decreased until it reached 256 groups, and then afterwards, the time increased slightly. By comparing the recorded times, it can be concluded that the search time was quicker with more groups but only up to 256 groups. For further research, since the index files became larger than the data collection as there were more groups, having two, short index files would be better than having one long index file.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

602H12

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Building and Displaying Character Location in ArcGIS

Genna Bowen

Heritage High School (HTH)

Using ArcGIS, this project builds and displays the major character movement and events from JRR Tolkien's The Lord of the Rings trilogy in relation to the fictional world of Middle-Earth.

The features of Middle-Earth were created based off a drawn map of Middle-Earth. Data for the location and movement of each character and the location of battles and events were taken from the film adaptation of The Lord of the Rings directed by Peter Jackson. The basemap, forest boundaries, rivers, cities, events, battles, and character location were created in AcrGIS 9.3 using the editor toolbar. The mountain ranges were displayed by assigning elevations to points and constructing a TIN file.

The maps show the relation of the characters to each other, events, and the geography. Opportunities for further research includes creating the character movement in relation to time as well as geography in ArcGIS 10.0 that would better display the location of each character at a specific point in time. Another way to further advance this project would be to create an interactive, online version.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

603C10

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Correlation Between Video Game Colors and Their Ratings

Kyle Bowers

Loudoun County High School (LCH)

In this study the common colors in video games and their ratings were compared. The Hypothesis that if the common colors in the game are darker than the game will have a more mature rating was rejected. The purpose of this project was to see if there were any visual differences relating to color between games meant for older and younger audiences. Eleven video games were played. Ten screenshots were taken from each game. In Adobe Photoshop, twenty pixels were systematically taken from each screenshot. A T test was used to compare the RGB dominance and the RGB values of each game. There was no significant difference between the RGB dominance and the RGB values of the games. The null hypothesis was accepted.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

604W10

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Under Clocking a Graphics Processing Unit

Michael Lauer

Briar Woods High School (BWH)

Computers have evolved a great deal since they were first introduced and they have become more complex over time. This experiment is to show that as technology improves, it may have a negative impact on the performance of basic programs. To test this theory three games of various graphics levels were played on two different graphics cards. The control was the lower performing graphics card, the 8800gt with the independent variables being the higher performance graphics card, the GTX 260, and the three games Half-life, Team Fortress, and Counter Strike. To measure the performance of each game, the Frames Per Second ("FPS") were measured. The higher the FPS the better performance of the graphics card. Each game was played continuously for 75 minutes, benchmarking the average FPS measurements every 5 minutes. According to the T-test, Half Life and Counterstrike showed statistically significant differences in their average FPS when played on the two different graphics cards. Team Fortress did not show FPS measurements that were statistically significant. On the 8800gt the average FPS for Counter Strike was 152.64 FPS, but only 135.36 FPS on the GTX260. For Half Life the average FPS was 71.77 on the 8800gt and 71.42 on the GTX260. These results showed that both games performed better on the lower graphics card. This does support the original hypothesis that a lower graphics card will play a lower graphics game better, however, it also showed that the higher graphics game also performed better on the lower graphics card. Further research could explore why the lower performing graphics card playing both games better than the GTX260.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

605D12

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Integration of Evolutionary Algorithms into Optimization of Functions via the Markov Chain Monte Carlo Framework

Zachary Newman

Dominion High School (DMH)

In recent years, Markov chain Monte Carlo (MCMC) has gained popularity as an approximate algorithm for many problems in applied mathematics. One such problem is the optimization of real functions. Evolutionary algorithms are a promising possibility for the use in MCMC optimization. The intent of this research was to incorporate evolutionary algorithms into MCMC-based methods of optimization, thereby achieving accuracy and efficiency.

A framework was written in C++ to test various Markov chain Monte Carlo (MCMC) methods for optimization over different varying conditions. Within this framework, two existing MCMC methods were implemented: Multiple Independent Chains and Parallel Tempering. An original algorithm, the Evolutionary Optimization MCMC (EOMCMC) algorithm which synthesized various aspects of parallel MCMC and evolutionary algorithms as a means of searching for global maxima or minima, was developed. The three algorithms were compared in terms of accuracy and efficiency. The null hypothesis that the three algorithms would find the same minima after a given number of steps was refuted; the newly developed algorithm outperformed the existing algorithms by best approximating the minimum after a given number of steps.

Further research would entail general refinements to the newly developed algorithm and to determine which parameters result in maximum performance. This research indicates that evolutionary MCMC algorithms are viable for use in optimization, and as such could be generalized to Markov chain Monte Carlo (MCMC) applications such as problems in modeling and applied mathematics.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

606D12

Computer Science
600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Utilization of Genetic Algorithms on Optimization of Truck Routing Efficiency

Stefan Vanburen

Dominion High School (DMH)

The Travelling Salesman Problem (TSP) is an NP-hard computational complexity problem where given points are to be 'visited' once and only once and to which a general solution has not been found. The problem itself is rooted in graph theory but applies to many applications where minimum distance and time is required, such as in trucking routes. Many methods have been used to solve the TSP throughout the years using both heuristic and brute force approaches.

This research consisted of three algorithms written in the Python programming language that were used to solve the TSP: a brute force algorithm, a divide and conquer algorithm which is commonly used in the trucking industry today, and a genetic algorithm. Each algorithm was tested in three configurations: nine cities, twelve cities and thirteen cities. In the nine city configuration, the brute force algorithm returned the best route faster than either of the other algorithms. In the twelve and thirteen city configurations, the genetic algorithm was much quicker than the brute force algorithm, but was 75 times slower than the divide and conquer algorithm.

Further research may show an additional decrease in the number of routes processed to obtain a more optimized algorithm, possibly through the use of trend analysis in the 'genes' of the fit routes versus the genes of the non-fit routes which would further decrease run time. If a suitable approach was determined, it would allow the algorithm to return better results in only a slightly longer run-time.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Earth & Planetary Science (700)

Project No.	Last Name, First Name	Title
701W10	Basso, Leah	Scientific Kites
702S10	Galownia, Taylor	A Comparison Between Different Barriers Protecting Soil From Rain And Wind Erosion
703H10	Greenfield, Jeffrey	The Accuracy of a Mid-Range Weather Forecast
704C10	McCurdy, Robert	The Effect of Soil Density on the Damage Caused by Earthquakes
705F10	Rhymes, Michelle	How Does Evaporation Affect Crystal Growth?
706B10	Robinson, Tayler	How the Acidity of the Ocean Affects Phytoplankton
707B09	Ulkuatam, Selin	The Effect of Land Temperature on the Duration of a Tornado

701W10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Scientific Kites

Leah Basso

Briar Woods High School (BWH)

This Experiment studies whether it is possible to determine wind speed by measuring the force on a kite. To do this, a kite was flown and the forces on the kite string were measured and compared to the corresponding wind speed measured via anemometer. The independent variable was the wind speed; the dependent variable was the force on the kite string and the control variables were air pressure and humidity. A weather station automatically samples the anemometer wind speed readings every second and each time the reading was refreshed a force reading was taken. Thirty five data pairs were recorded. The mean of the wind speed (IV) was 3.03 m/sec and the mean of the force (DV) was 2.77 Newtons. The Pearson correlation test indicates a positive correlation, but not a strong one. The hypothesis “if you measure the force on a kite then you can calculate the wind speed,” was supported by the correlation between the variables. A Pearson correlation result of 0 would have indicated no correlation and the result of 1 would have indicated the perfect correlation. The major source of error was that the wind force was measured at the altitude that the kite was flying at, but the anemometer was measuring wind speed at the ground level. Further research could be done to determine “can the wind speed at the altitude of the flying kite be measured and compared to force on the kite?”

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

702S10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Comparison Between Different Barriers Protecting Soil From Rain And Wind Erosion

Taylor Galownia

Stone Bridge High School (SBH)

Soil erosion is a problem all over the world from farms to mountains, but a good barrier can help. The purpose of this experiment is to provide support for which barrier including hay, rocks, sod, and netting works the best to protect soil from wind and rain erosion. For this experiment, a sloped model was made to test the different barriers, including no barrier (control), to measure the amount of soil eroded in grams after water was showered on top to simulate rain and a fan was applied to simulate wind. Three tin cans were placed at the bottom of each slope with various barriers to catch the eroded soil. The watery-soil mixture was then placed over heat to evaporate the water and then massed to determine which barrier protected the best leaving the least amount of soil in the cans.

The data showed that the sod barrier worked the best with a mean of 4.3 grams of eroded soil compared to the rock barrier with a mean of 6.03 grams, netting barrier of 10.67 grams, hay barrier of 15.63 grams, and without a barrier had an average of 23.67 grams of eroded soil. Sod worked the best because the roots absorbed much of the water as well as trapped soil particles not allowing them to erode away. The experimental hypothesis that stated the netting barrier would work the best to prevent soil erosion was not supported. The t-tests preformed showed that the experimental groups and control group did not have a statistically significant difference. Further research on this area of the experimentation could test which kind of vegetation protects soil best against erosion.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

703H10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Accuracy of a Mid-Range Weather Forecast

Jeffrey Greenfield

Heritage High School (HTH)

The purpose of this experiment was to determine the accuracy of a predicted temperature five days before the actual day. This experiment was practical because the predicted weather tells how people will dress that day or if there may be precipitation. The forecasts were taken for 50 days consecutively. For this experiment there was no control group and the forecast temperature was compared to the actual temperature. The prediction was that the forecast would exceed three degrees Celsius over 50 percent of the time. However, that was completely incorrect as the forecasted temperature exceeded three degrees 24 percent of the time and was accurate 76 percent during the 50 day period. The test performed was Chi-Square. The critical value need to reject the null hypothesis with 47 degrees of freedom was 64.00; however the critical value of the data collected was 48.35. Therefore the data failed to reject the null hypothesis. The alternative hypothesis was rejected which stated: If a weather forecast is predicted five days ahead of time, then it will be inaccurate 50 percent of the time. A major source of error in this experiment is that when the original experiment was designed the forecast would be counted as inaccurate if the predicted was +/- three degrees Fahrenheit. However metrics must be used in science, and three degrees Celsius doesn't not equal three degrees Fahrenheit. A further research question is then: How accurate would the forecast be if it was taken 10 days ahead of time.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

704C10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Soil Density on the Damage Caused by Earthquakes

Robert McCurdy

Loudoun County High School (LCH)

Earthquakes are one major natural disaster that occurs on our planet. Soil composition is one factor that researchers have suggested can have an impact on the way earthquake forces are dispersed and therefore the overall damage to life and property. This experiment attempts to examine the specific role soil density plays in the earthquake equation. Previous research supports the hypothesis that buildings on denser soil would be subject to less movement, and thus suffer less damage, than those built on less dense soils. In this experiment, two types of soils with different densities were subject to the same earthquake simulation and the movement of a weight on top of the soil was measured. The earthquake simulation was made through the use of a controlled hammer apparatus. After the simulation, the distance the sinker traveled vertically was recorded. This process was repeated thirty times for each soil type. The results firmly supported the hypothesis proposed at the start of the experiment. The P value was less than 0.01, showing a significant difference. In every simulation, the lighter potting soil's sinker traveled at least double the distance vertically as the sinker in the denser sand. The sand was almost exactly three times denser than the potting soil, and many simulations showed exactly this correlation. Overall, the experiment supported the original hypothesis that soil density plays a major role on building movement, and thus the damage done by earthquakes. Such research could help in safer building practices in earthquake zones.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

705F10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does Evaporation Affect Crystal Growth?

Michelle Rhymes

Freedom High School (FHS)

Crystals are a thing of beauty. By knowing more about how crystals grow, scientists may be able to improve everyday appliances or even create a new crystal. The independent variable was potential for evaporation to occur. The dependent variable was crystal growth (mm). Two groups were created each containing fifteen geodes. A shell was made to imitate a cave or rock that crystals would normally form in, in their natural environment. Then the solution was poured into the shell and lids were placed over the first group of geodes, preventing evaporation. The second group, which was the control group, was able to evaporate as it would naturally. At the end of twelve days, the solution was poured out and the longest crystal was measured (mm). Data was only taken from group two due to the fact that group one had no crystal growth, indicating that evaporation is needed for crystals to grow. A descriptive analysis of group two was conducted and it showed that over the twelve days, the average size of the crystals increased. By using the data it can be inferred that the alternative hypothesis stating, if the process of evaporation was removed then crystal growth would increase, was not supported. With this new information, scientists may be able to create new crystals by keeping the type of environmental factors crystals need in order to grow. In further research, it can be seen whether or not impurities carried through the air would have an effect on crystal growth.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

706B10

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

How the Acidity of the Ocean Affects Phytoplankton

Tayler Robinson

Broad Run High School (BRH)

The purpose of this experiment was to find out if the acidity of the ocean had any effect on phytoplankton. The independent variable is the acidity of the ocean water, the dependant variable is the nitrate levels. The hypothesis that an increased acidity level in the ocean will have a negative effect on phytoplankton was rejected. The experiment was carried out by having three cups of ocean water for each trial. For the first cup in each trial the pH was set similar to the pH of the ocean (8.4). The second cup was dropped to 7.4, the third was dropped to 6.4. After, one tablespoon of phytoplankton was placed in each cup. Every other day for 8 days the nitrate levels in the water was tested. The average result for each cup was zero. After the statistics were finished the t test proved the null hypothesis was accepted. The null hypothesis being the pH balance of the ocean has no effect on phytoplankton

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

707B09

Earth & Planetary Science
700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Land Temperature on the Duration of a Tornado

Selin Ulkuatam

Broad Run High School (BRH)

The purpose of this study was to determine the effect of land temperature on the duration of a tornado. Tornadoes cause the death of hundreds of people and cost billions of dollars in repairs, thus tornado warnings must become more accurate. The independent variable was the temperature of the brick, which was used to represent land, and the dependent variable was the duration of the tornado. The control was the room temperature brick. A tornado chamber was created using an air ventilation vent. Three different brick temperatures were placed underneath a pie tin that held hot water and frozen carbon dioxide (dry ice). The raw data showed that the duration was longer when the cold brick was placed in the tornado chamber, which was surprising. The mean of the hot brick (47.8ºC) was 133 seconds. The mean of the cold brick (-6.7ºC) was 294 seconds. The mean of the control brick (16.7ºC) was 201 seconds. Three t-tests were conducted to determine the significance of the results. This experiment measured quantitative data and the level of measurement was interval data. The alternative hypothesis was: if the land temperature underneath the tornado is colder, then the duration of the tornado will be longer. The alternative hypothesis was accepted. The independent variable influenced the dependent variable, as shown in the results of the t-test. The only source of error was that dry ice sublimates, thus the amount dry ice could have changed after it had been measured. Further research could explore the effect of water temperature on the duration of a hurricane.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Engineering: Electrical & Mechanical (800)

Project No.	Last Name, First Name	Title
801W12	Ayoub, Jarrod	Hover Craft
802C10	Clark, Ross	The Attenuation Ability of Different Metallic Films on WiFi Signal Strength
803B09	Fackler, Jessica	How Does the Pitch of the Wind Turbine Blades Affect the Electricity Output of a Wind Turbine
804V10	Godby, Amanda	How Does the Brand of Battery Affect the Length of Its Life?
805B10	Godman, Austin	The Effect of Bleach Exposure on the Conductivity of Aluminum
806T10	Kavanaugh, Daniel	A Robot Could Do That! How a Robot Can be Used to Efficiently Clean Air Ducts
807F10	McFarland, Grant	How do Different Kinds of Barriers Affect the Reduction of Sound
808F12	Montgomery, Nicholas	Three-dimensional Model-based Pose Estimation of a Baseball From a Two Dimensional Image
809W12	Phillips, Shelby	The Effect of Temperature on Light Brightness of Christmas Lights

801W12

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

Hover Craft

Jarrod Ayoub

Briar Woods High School (BWH)

This is a miniature hovercraft that is guided solely with a wireless remote controller, along with being equipped with a wireless camera located at the front of the craft that can live stream a video back to the operator. The hovercraft can and will be used in place of a first response exploration crews that are sent into disaster struck areas in search of survivors. It will also help prevent the possibility of injury to the crew members by unmanning the front lines. The hovercraft has the ability to travel over any type of surface from sand to water. The design, plan, and trial tests were all constructed using what little knowledge was available from online sources, all of the questions that could not be answered, were thought up and tested with trial and error. Of the 75 combined test trials, 74 were completed with a 73 overall with the chi squared test. With a 0.05 probability with the degrees of freedom at 1, the value of the 75 trials was 3.841 which then proved that the null hypothesis was wrong. The null hypothesis stated that the hover craft would not function properly and could not complete the tests, since the results of the trials was 3.841 which is much greater than 0.05, the null hypothesis is then rejected. The hovercraft was unable to finish one of the 75 trials which proved that the hovercraft was successful overall.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

802C10

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Attenuation Ability of Different Metallic Films on WiFi Signal Strength

Ross Clark

Loudoun County High School (LCH)

Research has shown that radio waves can be attenuated as they pass through certain metallic films. This fact has provided the basis for physically securing a WiFi or other wireless network. By using a metallic film to define the limits of a wireless network's area, it makes it much more difficult for unauthorized users outside the defined area to access the network due to significant loss of signal strength. The purpose of this project was to determine which metallic film was the most effective at attenuating WiFi signal strength.

A laptop computer with appropriate measurement software was used to log the strength of a WiFi signal being emitted from a wireless router. The wireless router was then surrounded by the metallic film and the impact on signal strength measured. Five of these test runs were preformed with each of the four metallic films and the control for a total of 25 test runs. The results of the test runs show that aluminum foil was the best attenuator of WiFi signal. All other metallic films tested had no significant effect on the strength of the WiFi signal. This result shows that it would be difficult for a private citizen to configure a similar physical security for their wireless network due to the practicality of enclosing an area in aluminum foil.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

803B09

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Pitch of the Wind Turbine Blades Affect the Electricity Output of a Wind Turbine

Jessica Fackler

Broad Run High School (BRH)

The world is in need of a clean power source, and one of the solutions is wind energy. In this experiment, fifteen adjustable wind turbines turned to set pitches of 30°, 45°, 60°, and 75°. Measurements were taken for voltage (Watts) and current (Amps). Power values were then found by squaring the current value. The independent variable was the blade pitch, the dependent variable was the power output, and there was no control, but there was a standard pitch of 45°. The mean power output of a 30° pitch was 0.0000832 watts, the mean output of a 45° pitch was 0.0000234 watts, the mean of a 60° pitch was 0.00000148 watts, and the mean of a 75° pitch was 0.000000953 watts. The 30° pitch produced the most power. The t-test was performed on the data and the data was significantly different. ($P<0.05$) Statistics show that the 30° pitch is more productive than the 45° pitch. The alternate hypothesis was: If four fixed turbine blade pitches (30°, 45°, 60°, and 75°) are tested against each other, then the turbine blade pitch set at 45° will produce the maximum electricity output. This hypothesis was not supported by the statistical data. The independent variable did influence the dependent variable. Further research could explore what wind speeds a 30° pitch would be suited best for, or if there are any other pitches that work just as well as the 30° pitch does.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

804V10

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Brand of Battery Affect the Length of Its Life?

Amanda Godby

Park View High School (PVH)

The purpose of this experiment was to find the longest lasting battery for cost effectiveness. The independent variable of this experiment was the brands of batteries used, Energizer™, Duracell™, Rayovac™, and Enercell™. It was hypothesized that the brand of battery would affect the voltage and amperage measurements and total time the battery lasted, or the dependent variable of the experiment. The control group was Energizer™ batteries. The experiment began by testing the voltage on each battery and inserting them into battery holders in one of four circuits. Amperage and voltage were tested every fifteen minutes until the motors stopped. Batteries were alternated into different circuits after each test. The mean battery life in minutes was 136.06 for Energizer™, 128.87 for Rayovac™, 138.25 for Duracell™, and 119.19 for Enercell™. The mean voltages in volts were 0.88 for Energizer™, 0.87 for Duracell™, 0.90 for Rayovac™, and 0.92 for Enercell™. The mean amperages in amperes were 2.39 for Energizer™, 2.37 for Duracell™, 2.41 for Rayovac™, and 2.51 for Enercell™. A t-test was done, showing that the battery brand did not affect the length of life, or measurements of amperage and voltage. Energizer™ batteries did not show a major difference compared to other brands. The alternative hypothesis was not accepted due to the p-values ranging between 0.2 and 0.25. Duracell™ batteries had the longest life, but Enercell™ maintained higher amperage and voltage measurements. A source of error could have been motor inconsistencies. Further research could explore why the results had no significant differences.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

805B10

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Bleach Exposure on the Conductivity of Aluminum

Austin Godman

Broad Run High School (BRH)

The purpose of the experiment was to discover how the conductivity of aluminum will decay after it corrodes. The project was designed to test the resistance of aluminum wires before and after they were submerged in bleach at 5 day intervals until 25 days. The control was the non-corroded wires, the independent variable was the exposure time, and the dependent variable was the wire-conductivity.
The results of the experiment showed that the resistance of the aluminum wiring increased rapidly within the first 10 days of being corroded, but then leveled out after that. The mean resistances increased from .76 ohms to 1.3 ohms after five days and then held steady around 1.6 ohms after 10 days. The standard deviation tests run on the data showed how much error there was in the results of the experiment. In addition, the T-tests showed the accuracy of the results.
The low T-test outcomes supported that the conductivity of the wires decayed exponentially after being corroded. The standard deviation graph showed that there was little error in the results. The only major source of error in the experiment was human error. The exposure time of the wires and their conductivity had a negative relationship; the test groups were less conductive than the control.
If further research is done on this topic, some questions that should be addressed are how acid will affect the resistance in contrast to a base like bleach. The experiment could also be improved by decreasing the time intervals between tests.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

806T10

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Robot Could Do That! How a Robot Can be Used to Efficiently Clean Air Ducts

Daniel Kavanaugh

Tuscarora High School (THS)

Every building, from schools, to offices, to homes, has a ventilation system that requires routine cleanings to prevent the indoor air from becoming musty and unclean. As half of air-borne illnesses are caused by dirty air vents, it is important to have options to keep these ducts clean. Robots have proven their usefulness everywhere, from collecting soil samples on the moon to helping recovery crews with the oil cleanup in the gulf coast. Since these machines have proven themselves as worthy tools before, this experiment was created to investigate if they can lend their prowess to cleaning simple ventilation systems. The experiment consisted of a robot navigating through a mock ventilation shaft collecting grime placed previously in the duct. The testing began with a basic robot with motors and wheels, which were then joined by various sensors and cleaning tools to see what the best design for an efficient ventilation system cleaning robot should be. The independent variable was the design of the robot and the dependent variable was the performance of the robot through the ventilation system. The data shows that if a robot is fine tuned with the right instruments, it can be made to perform its task in an efficient fashion, thus supporting the hypothesis that a robot can be created to efficiently clean air systems, showing that robots can be used to conveniently benefit homeowners. It also showed that sometimes speed had to be sacrificed for better grime cleanup as the robot with the highest amount of grime cleanup had the slowest time running through the shaft. This project could be further improved by testing the robot in a real ventilation system in an ordinary home as there may be more features in certain ventilation systems that weren't considered in testing.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

807F10

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

How do Different Kinds of Barriers Affect the Reduction of Sound

Grant McFarland

Freedom High School (FHS)

The purpose of this experiment was to test and see which common materials, that are easily obtainable, reduce the levels of sound. This experiment is relevant because soundproofing a home or building can cost large amounts of money and may need to be added to a home that has recently been purchased, has recently had additions, or because of a person or child that lives in the home with loud hobbies.A material that can reduce a large amount of sound while being common and inexpensive can help solve this problem. The independent variable in this experiment was the barrier, or material tested. The materials were generic plywood, Styrofoam™, cardboard, drywall, and glass. The hypothesis was that if plywood, Styrofoam™, cardboard, drywall, and glass are used to test for the reduction of sound, then the glass barrier would reduce sound the best. The hypothesis was not supported in this experiment. Oddly, the plywood barrier proved to reduce the most sound. The results of this experiment can solve noise problems using common materials that can easily be acquired by an average homeowner. Reducing the levels of noise in a home caused by sound occurring in or outside of the home can cost money when using professional grade materials. A cheap solution is necessary.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

808F12

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

Three-dimensional Model-based Pose Estimation of a Baseball From a Two Dimensional Image

Nicholas Montgomery

Freedom High School (FHS)
Academy of Science (AOS)

This research implements robotic vision image recognition techniques of comparing actual pictures to a theoretical model. Specifically, such a comparison is used for pose estimation of a baseball. Because the seams of the baseball follow a precise curve, the model can use the seams to recognize the orientation. Fortunately, the mathematics of this curve is well known, and existing research is adapted to create a model for this project. An appropriate apparatus capable of rotating a baseball along two mutually perpendicular axes of rotation had been designed in previous research. This apparatus is modified and used to obtain a new data set of the actual pictures of the baseball in different orientations. A camera is used to take pictures at ten-degree intervals along each mutually perpendicular axis. Using MATLAB, the pictures are analyzed to extract critical points along the seams. Then the model is rotated according to the rotation of the ball in the picture, and the sum of the squared residuals per point is calculated, which was then used to approximate the accuracy of the model to a certain number of degrees of rotation. This procedure is implemented in an effective robotic vision interface for autonomically determining the relative pose of a baseball in a picture under any possible rotation, and the entire system is then tested in the same way to a certain degree of accuracy.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

809W12

Engineering: Electrical & Mechanical
800

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Temperature on Light Brightness of Christmas Lights

Shelby Phillips

Briar Woods High School (BWH)

The experiment tests relations between temperature and brightness. It demonstrates engineering by testing electrical equipment. This shows if lights hold a constant brightness in colder temperatures compared to a warmer temperature.

The hypothesis: if the string lights are located in a colder temperature location, then the brightness of the lights will stay. It's tested by recording light from lights in different locations at different time. The I.V is the temperature; the D.V is the brightness from lights. The control is lights at room temperature. Each location has a different temperature, so results will compare those to the room temperature.

Using 4 locations, tests were conducted in AM and PM. Averages are as follows; porch -.33°C and 376.7lux, garage 6.03°C and 301.85lux, Dining room 19.2°C and 282.8lux, finally the fireplace 25.1°C and 253.9lux. The Pearson Correlation test shows the fact that temperature does have an effect on light brightness.

The results validate the hypothesis by showing brighter lights in colder temperature. The location with the coolest temperature had brighter lights and the location with the warmest temperature had dimmer lights. This is significant because if lights stay bright in colder temperatures, then one could rotate their lights for longer use.

Further research could explore testing different types of lights, testing the temperatures longer, or testing with a wider range of temperatures?

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Engineering: Materials & Bioengineering (900)

Project No.	Last Name, First Name	Title
901H10	Bigalbal, Alayna	The Effect of Different Shaped Parachutes on the Rate of Descent
902G10	Carver, Bailey	Storm Water Runoff
903G10	Cauley, Forrest	The Effect of Ultraviolet Rays on the Efficiency of Fire Retardent Fabrics
904W12	Chlanda, Joseph	The Effect Snowmaking at Different Wet-bulb Temperatures has on Snowboarding and Skiing Conditions the Next Day
905L10	Dengler, Andre	Suspension Bridge Design
906G09	Haislip, Kristen	Tsunami Protection
907G09	Hiser, Julia	How does Size, Quantity, and Placement of Holes Affect Sound Suppression
908H10	Leisersohn, Sarah	The Effect of the Material of a Softball Bat on the Distance a Softball will Travel
909D12	Mathur, Anurag	Determining if Magnetospirillum magnetotacticum Can Be Used to Kill Tetrahymena pyriformis via Magnetically Induced Hyperthermia as a Basis for Alternative Cancer Treatment
910D12	Mauch, Joellen	An Analysis of Vortices Formation to Determine Structural Energy Efficiency and Integrity
911G09	Oswald, Courtney	The Effect of Durability, Absorbency, and Reactivity to the Sun on Synthetic and Eco-Friendly Fabrics
912H10	Pineda, April	The Effect Of Tensile Strength on Fishing Line
913D12	Reynolds, Cameron	The Development of Nonwoven Spray Fabric for Medical Application
914F10	Rooney, Shannon	The Effect of the Type of Roof Structure on the Amount of Weight It Can Hold
915C09	Stevens, Matthew	Does Baking Balsa Wood Increase The Strength To Weight Ratio?
916P10	Trainor, Riley	The Effect of Ultraviolet Light on Oil Paint
917B10	Votroubek, Emily	The Effect of Strobe Lightning on the Amount of Objects in a Photograph

901H10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Different Shaped Parachutes on the Rate of Descent

Alayna Bigalbal

Heritage High School (HTH)

The slower a parachute descends, the safer the parachute is. What does the affect of changing the shape of the parachute do to the rate at which it descends? This experiment will determine the result of the question. The shapes used in this experiment include a square, rectangle, triangle, and circle, which will be the control group. To find the rate of the descent, parachutes will be created and dropping them from a height of 4.2 meters. Then, the parachutes will be timed how long it takes for each parachute to hit the ground. The tests used during this experiment were ANOVA tests. The results showed that the rectangle's descent was the slowest. The mean of each descent was: Control 3.253secs, Square 3.459secs, Triangle 2.175secs, Rectangle 4.109secs. The value of the F was greater with 9.686 and the value of the F crit was less with 2.769. Therefore, my hypothesis that the circular parachute will descend at a slower rate than the others is supported. This means that the shape of the parachute does affect the rate of the descent. Possible errors that could have occurred include: length, height, and materials. Further research could explore the direction of the descent, stability of each parachute, and the increase of load.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

902G10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

Storm Water Runoff

Bailey Carver

Woodgrove High School (WHS)

Stormwater runoff is an environmental problem both in terms of amount and water quality. To mitigate runoff, roof gardens are used to reduce flow. The purpose of this experiment was to test which soil material would absorb the most water. The media tested (independent variables) were peat moss, vermiculite, and sand. The control groups consisted of the amount of water poured (3.78 liters), media thickness (five centimeters), slope (2%), way the water was poured, runoff intervals measured, and the pouring time (60 seconds). These independent and dependent variables were tested by making a sloped wooden box with a screen on one side. One volunteer poured water out of a can over the media simulating rainfall. Another volunteer measured runoff every fifteen seconds. A third volunteered recorded the data. The most absorbent material was vermiculite and then peat moss. Sand was not effective in reducing runoff. The average cumulative runoff at 90 seconds for the bare slope, vermiculite, peat moss, and sand was 3700.33 milliliters (mL), 1280 mL, 1578.67 mL, and 3267.33 mL, respectively. The statistical tests performed were standard deviation, variance, mean, range, and t-test. The alternative hypothesis, which was supported, was that lightweight soil materials (independent variables) would absorb water better than a bare slope reducing the amount of runoff and/or the length of time that runoff occurs. The t-test results were not significant, possibly due to high variability in the data. No major sources of error were identified. Further research could involve testing other absorbent materials.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

903G10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Ultraviolet Rays on the Efficiency of Fire Retardent Fabrics

Forrest Cauley

Woodgrove High School (WHS)

The purpose of this project is to find whether ultraviolet light from the Sun can degrade the fire retardants in cloth such as upholstery, and cause it to burn quicker in the case of a fire. The Independent Variable in this experiment was whether the cloth was exposed to ultraviolet light or not, while the Dependent Variable was the time that it took to burn through to the other side. The control group was the cotton cloth that was not exposed to ultraviolet light. Both groups of cloth were treated with fire retardants, and then one group was exposed to ultraviolet radiation while the other stayed in the dark. Then after three months, the cloth was burned, and it was recorded how long it took for the cloth to burn through to the other side. The mean amount of time for the group of cloth exposed to ultraviolet light was 6.392 seconds, while the mean for the cotton in the dark was 9.131seconds. The T-test was used in this experiment. The alternative hypothesis was that if a piece of cloth was exposed to ultraviolet light while the other was kept in the dark, then the former would have an accelerated burn rate, and this hypothesis was supported. Further research could explore the degradation rate of the Sun itself on the aluminum hydroxide of the cloth.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

904W12

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Snowmaking at Different Wet-bulb Temperatures has on Snowboarding and Skiing Conditions the Next Day

Joseph Chlanda

Briar Woods High School (BWH)

Snowmaking is a major factor in most ski resorts around the world. If not for snowmaking, resorts could not provide the snow needed to be open from Thanksgiving through March. Snowmaking also has an effect on how snowboards travel. The wet-bulb temperature, a combination of the dry bulb temperature and the humidity, is the independent variable of this experiment. The dependent variable is the distance and time that a snowboard travels at different wet-bulb temperatures. -4º to -5º C was found to be the optimal point between man-made and natural snow in this experiment. These results are supported by using a statistical T-test. The null hypothesis of this experiment, wet-bulb temperature has no effect on snowboarding conditions the next day, was rejected during experimentation. This resulted in the acceptance of the hypothesis, wet-bulb temperature that stays around -5º to -6º C makes snowboarding conditions the best the next day. The data in this experiment could be of greater use if the procedure was implemented at a wider range of snowmaking temperatures.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

905L10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

Suspension Bridge Design

Andre Dengler

Loudoun Valley High School (LVH)

The main idea of this experiment was to improve upon what history told us about how stiff bridges collapse easily. The experimental hypothesis was that the balsa wood bridge will hold up the most weight. The independent variables in this experiment were the balsa wood and the straw bridge. The straw bridge represented the stiff bridges in the 19th and the 20th century bridges that collapsed in heavy snow and fast wind. The control group was the Popsicle stick bridge because it was somewhat flexible and somewhat stiff. The dependent variable in this experiment was mass in kilograms. The weights were primarily bricks weighing 2 to 5 kilograms. The constants were the wood, the towers, the string, the weights, and the height above the ground. The mean for the mass held by the balsa wood bridge was 17 kilograms. The mean for the straw bridge was 67.283 kilograms. The Popsicle stick bridges held a mean mass of 34 kilograms. As it turned out, the most rigid bridge, the straw bridge, was the bridge that held up the most weight. The independent variable was affected greatly by the fact that the suspending cables kept slipping down the main cable thus putting more weight on the cables and towers and not on the deck. Further research would involve finding other means to attach the cables to the main cable. This can be determined through more research and experimentation on the cables.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

906G09

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

Tsunami Protection

Kristen Haislip

Woodgrove High School (WHS)

The study of how different types of barriers effect tsunami damage relates to Environmental Engineering. This problem is scientifically significant because many people have died or lost homes because of tsunamis. The independent variable in this experiment was what the barrier's shape was. The forms of the barrier were concrete and dimpled concrete. The dependent variable was whether the water went over the barrier, and how many toothpicks were moved. The control group of this experiment was the damage caused by the tsunami when there was no barrier. To start the experiment make a data table to record results. Then make a shore with 24 kilograms of sand and 22.7 liters of water. Then build a barrier with one material. Next, place toothpicks behind the barrier. Then make a tsunami and repeat the steps 15 times for each barrier. The data recorded shows that dimpled concrete can best protect from a tsunami because it won't even let water over it. The flat concrete still protected the barrier, but water went over it. The experimental hypothesis was supported. The independent variable, the barrier's shape, effected the dependent variable, whether the water went over the barrier and how many toothpicks were moved. The strength of the tsunamis may have varied, but barriers are needed to withstand different amounts of force. Further research could determine the most cost effective way to make an effective barrier.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

907G09

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

How does Size, Quantity, and Placement of Holes Affect Sound Suppression

Julia Hiser

Woodgrove High School (WHS)

In various occupations the human ear is exposed to many high amplitude sounds; therefore, sound suppression is critical for ear protection. Constructing a soundproof environment without any air gaps is often impossible. This experiment studies how different sizes, numbers, and configurations of holes and frequencies can soundproof an insulated plastic box. A decibel meter was placed inside the box while another was placed just outside. A pitch was played on a piano to determine how the holes affected sound suppression at different frequencies. The different hole scenarios and frequencies were the independent variables, while the amount of sound suppression was the dependent variable. The control situation was the sealed and insulated box without holes. The most successful configuration was a box with two 3-mm holes spaced 4.1 cm apart. This scenario suppressed up to 10 dB more than the control situation suppressed. When the hole size was increased to greater than 4 mm, sound suppression dropped drastically. The hole size for maximum sound suppression was between 3 and 4mm. This experiment could be continued using a much larger box to enable larger hole separation distances.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

908H10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Material of a Softball Bat on the Distance a Softball will Travel

Sarah Leisersohn

Heritage High School (HTH)

The purpose of the experiment was to find out which bat type would allow a softball to travel farther, wooden or aluminum. The independent variable was the bat type and the dependant variable was how far the softball traveled. The control group was the aluminum bat because they are more frequently used in softball. The two bat types were horizontally tied to a fence and a ball was pitched by a pitching machine at 17.89 meters per second and the length the ball traveled was measured in centimeters. The mean distance that the wooden bat hit the ball was 294.13 cm and the mean distance that the aluminum bat hit the ball was 320.85 cm. The t-test shows that there is a 95% confidence level that the aluminum bat hits a softball farther. The hypothesis was that the aluminum bat would hit a softball farther than the wooden bat under the same conditions and the hypothesis was not supported by the data because there was no significant difference between the two bats. Based on the t-test, the t-calculated value was 0.82 and the t-critical value was 2.03. The independent variable influenced the dependant variable because the control group hit the softball farther than the experimental group. Possible major sources of error in this experiment may have been inconsistent weather conditions or the ball hitting a bump in the ground. A question for further research might be if the type of softball or pitching machine may affect the results of the experiment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

909D12

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

Determining if Magnetospirillum magnetotacticum Can Be Used to Kill Tetrahymena pyriformis via Magnetically Induced Hyperthermia as a Basis for Alternative Cancer Treatment

Anurag Mathur

Dominion High School (DMH)
Academy of Science (AOS)

Traditional cancer treatments kill many healthy cells, causing numerous side-effects. This research attempts to rectify this issue by establishing a basis for an alternative cancer treatment using M. magnetotacticum, a bacteria that magnetizes iron particles in its environment creating “biological nanomagnets”. In theory, using an alternating magnetic field, or magnetically induced hyperthermia, causes the biological nanomagnets to vibrate, increasing the temperature of the surrounding area enough to kill cancer cells but not healthy cells. The protozoa T. pyriformis was used as a model for cancer cells because both are killed at 43o Celsius. On a microscope slide, equal amounts of T. pyriformis and M. magnetotacticum were combined and the percentage of non-viable T. pyriformis was counted. This slide was then suspended over a spin plate, set at maximum speed, creating an alternating magnetic field. After 10 minutes, the slide was removed and the T. pyriformis’ non-viability was again determined. As a control, T. pyriformis was tested independently as well as with E. coli K12. The results show that, when combined with M. magnetotacticum, there is an increase of 29.52% in the non-viability of T. pyriformis. In contrast, trials with only T. pyriformis and with E. coli showed an increase in non-viability of 1.92% and 3.13% respectively. These findings could possibly be translated over to cancer cells, meaning that this treatment could be used to target and treat solid tumors. While more research must be conducted regarding biocompatibility, this research has suggested that there is a foundation for such a treatment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

910D12

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

An Analysis of Vortices Formation to Determine Structural Energy Efficiency and Integrity

Joellen Mauch

Dominion High School (DMH)

With increased demand for construction of taller buildings in smaller spaces, buildings must be increasingly structurally extensive to counter the effects of vortices created by wind. Some buildings have wind turbines incorporated into their structure to counter energy cost and inefficiency. However, they actually experience low efficiency due to increased turbulence created as a result of their heights. These turbines create additional vibrations leading to loss of structural integrity and create demand for costly repair.

To determine the aerodynamic qualities of different buildings, the following forms were constructed: rectangle, raindrop, boat, diamond, and organic. Assuming uniform flow over a predetermined height, they were tested in an open wind tunnel to determine which experienced the least turbulence and vortice formation. All buildings exhibited dead zones at their apexes. The aerodynamic qualities were different per building depending on wind speed. At high speeds, the diamond-shaped building experienced the least number of vortices. At low speeds, the boat-shaped building experienced the least. The boat building experienced the least amount of wind force of .0035 lbs at 6 miles per hour and .0063 lbs at 8 miles per hour. The control, rectangular-shaped building experienced less force due to wind than the diamond, organic, and raindrop buildings.

Further research would entail testing buildings with fewer right angles since building height appears to play no role in vortice development. Recommendations are that wind speed in highly urbanized areas to be taken into account when construction takes place to maintain efficiency and building stability and integrity.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

911G09

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Durability, Absorbency, and Reactivity to the Sun on Synthetic and Eco-Friendly Fabrics

Courtney Oswald

Woodgrove High School (WHS)

The purpose of this test is to determine whether eco friendly or synthetic fabrics have the best value. Absorbency, durability, and reactivity to the sun were tested on 6 different profile fabrics.
In the absorbency test, the fabrics were massed, submerged in water, and then massed again. In the durability test, the fabrics were sanded with an electrical sander, and then given manual rubs with steel wool. In the reactivity to the sun test, the fabrics were laid in the sun for 10 days, and pictures were taken to record the changes in the fabrics.
The hypothesis was not supported. The eco friendly and synthetic fabrics have equal value based upon the results. However, different fabrics excel in different categories.
The independent variable influenced the dependent variable in 2 out of the 3 tests.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

912H10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Tensile Strength on Fishing Line

April Pineda

Heritage High School (HTH)

The purpose of this experiment was to indicate which pattern of tensile strength would be the strongest and hold the most weight. A hypothesis that was made was the more intricate the pattern was the more sand (weight) it would be able to hold. The independent variable in this experiment was the different patterns used, which were braided, 2 around 1 pattern, 1 around 2 pattern, and one with no pattern at all. This would make the weight it is able to hold the dependent variable. Throughout the experiment the same materials were kept the same, known as constants, which were the type of fishing line used, sand used, and the bucket to hold the sand. A quick overview of the procedure was to take one example and test it until it broke and this process repeated until each was tested. The results of this experiment did not show much of a difference between each pattern. Also each pattern did not show a repeating number for more than 3 times. The mean of the results showed very little difference going from 6.15kg, 6.07 kg, 7.92 kg, and 7.53 kg. The results show that the hypothesis was not supported because the pattern with the highest shearing weight was the least intricate pattern of all. Some problems that may have occurred in this experiment may have been the one trial where the fishing line broke right away in pattern 1 around 2. Others may have been the lack of better materials. If this experiment was to be expanded, questions that should be asked are, what materials would help make this experiment better.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

913D12

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Development of Nonwoven Spray Fabric for Medical Application

Cameron Reynolds

Dominion High School (DMH)

Injuries occurring during participation in sports are often inevitable regardless of precaution and protection. Resultant bone fracture, though possibly severe, is usually treatable. However, fractures do require time and casting to heal. Casts can cause allergic reactions, frictional burns, sores, blisters, severe dryness, and itching. While doctors can “window”, or cut an area of the cast away, to monitor these issues, recasting or drugs are the main options for relief.

The intent of this research was to create a nonwoven spray fabric that could serve as an intermediate barrier between the skin and the cast or other mending devices. Nonwoven spray fabrics were created consisting of three different volatile carriers (pentane, isopropyl alcohol, and hexane), a latex polymer, and fibers which were sprayed through an HVLP (high pressure low volume) sprayer. The fabric solutions were applied to PVC pipe covered in a layer of wax paper meant to simulate the appendage being prepared for a covering such as a cast.

Results indicated that optimal concentration for maintaining structural integrity of the fabric was achieved with a ratio of 125 ml hexane to 62.5 ml latex to 1.80 g of fibers. Small pieces created contained an average of 24.2 fibers which helped produce structural integrity to the cloth. Further research would entail refinement of concentration to enlarge fabric production in size. Continued research could not only enhance spray fabric creation but may allow the use of spray fabrics to be extended for use in wound and infection treatment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

914F10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Type of Roof Structure on the Amount of Weight It Can Hold

Shannon Rooney

Freedom High School (FHS)

The purpose of this experiment was to find out what type of roof could hold the most mass. It would be beneficial to know this because people could take this into consideration when choosing a style of home if they're in an area where harsh weather can damage their roof. The three types of roofs that were used were gambrel, gable, and flat roof because they are very common. The flat roof was the control group. The hypothesis was that the gable roof would hold the most weight because it is made of triangles, the strongest geometric shape. To find out how much weight each roof could hold, 15 miniature roofs were made for each independent variable. They were each placed under a weight distributor. Weight was then added to the distributor until the roofs would break. The amount of mass it took to break each roof was then recorded in grams and averaged for each group. The experimental hypothesis was not supported because the flat roof held the most mass (22631.33 grams). Then gable roof held the second most (12335.73 grams) and the gambrel held the least (614.13 grams). The reason for these results wasn't that the flat roof could hold the most weight but rather that the joints of the flat roof were stronger because the sides were at a 90° angle. To truly find which roof is the strongest, the joints of the roofs need to be strengthened and the method of extorting weight should be improved.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

915C09

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

Does Baking Balsa Wood Increase The Strength To Weight Ratio?

Matthew Stevens

Loudoun County High School (LCH)

It is commonly known that balsa wood is strong yet light, but can strength improve while reducing weight? Odyssey of the Mind rules for the balsa wood competition state that the wood cannot be changed, including baking it. To test this, balsa wood was baked at different temperatures and times. Pieces were then massed in grams and the vertical force was tested using a hydraulic pressure machine. The strength to weight ratio was then found. The ANOVA: Single Factor, Linear Regression T-Test, and Two Sample T-Test Assuming Unequal Variance were used on the data. The Linear Regression T-Test examined the correlation between time and the strength to weight ratio at each temperature. All temperatures returned values indicating no correlation. The Two Sample T-Test was used to determine whether baking the wood was better than not baking it. All tests returned statistical values that confirmed this. The ANOVA: Single Factor was used to analyze the effect of increasing temperature, which returned a false value. From the test values, the original hypothesis is supported, baking balsa wood increases the strength to weight ratio. It was thought that if the temperature or time of baking was increased, then the strength to weight ratio would increase. The tests show that neither temperature nor time affects the strength to weight ratio. As further research, an experiment could be run to determine what the levels of water are in the wood at each temperature, as this is what is thought to make the wood stronger.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

916P10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Ultraviolet Light on Oil Paint

Riley Trainor

Potomac Falls High School (PFH)

The experiment focused on the fading of oil paint after exposure to UV light. The independent variables, four differently priced paints, were painted onto canvases and put under UV light for 72 hours. A canvas with a stroke of each paint was kept under normal lighting as the control. After 72 hours, observations were made and data was recorded. The hypothesis: If four different oil paints ranging in expense from least expensive to most are put under 72 hours of UV light to compare their ability to hold intensity of color, then the most expensive paint will hold its color the best. The dependent variable, the amount of fading, was recorded and graphed with the statistical analysis. The fading of the paints was recorded in a range of 1-4; 4 being the most fading and 1 being little to no fading. The statistical analysis showed that the highest cost oil paint had a mean of 1, the semi-high cost oil paint had a mean of 2, the lower cost oil paint had a mean of 3, and the lowest cost oil paint had a mean of 4. The control group had a mean of 1. The chi square test was performed on the data and resulted in 3.735880497 at df=87 (without control) and 3.80123572 at df=166 (with control). The results supported the hypothesis, showing that as the price of oil paint increases fading decreases. Further research could explore how different colors or types of paint fade under UV light.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

917B10

Engineering: Materials & Bioengineering
900

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Strobe Lightning on the Amount of Objects in a Photograph

Emily Votroubek

Broad Run High School (BRH)

The purpose of this experiment was to discover which rate of flash would provide the best photograph of a moving object. This entitles that the photograph must only have one object (no multiples) and must be of good resolution. First, the materials were collected and set up. The ping pong ball was dropped at the speed at which gravity pulls down an object (9.9 MPS^2). As the ball fell, the picture was taken. This was continued 15 times at each rate of flashing, w which ranged from one to five. The amount of balls within each photo were counted to conclude which rate of flash would be the best for the photograph of that speed. The data explained that the P level was less than 0.10 as compared to the t-table. Therefore, the null hypothesis could be rejected and the experimental hypothesis could be supported with the research and data. With this, the experiment could be proven correct and significant. The dependent variable of the amount of ping pong balls within a photograph is solely influenced by the rate of flash of the strobe light. This further concludes that the rate of which an object moves needs to be in accordance to the rate of flash for photograph because if it is too slow or too fast, the rate of flash will either produce multiples or nothing. Therefore, the experiment and hypothesis are supported.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Energy & Transportation (1000)

Project No.	Last Name, First Name	Title
1001P10	Canavra, Matei	Cost efficiency and Practicality of Charging a Battery with a Solar Powered Charger Versus a Normal Charger
1002S12	Cawi, Eric	Analyzing the Optimal Location of Solar Farms in the Northeast Corridor of the United States
1003T09	Douglas, Mary	The Relationship Between Different Materials And Energy Production
1004D12	Hertzog, Jana	The Use of Physarum Prediction of Wind Turbine Placement for Rural Electrification in Underdeveloped Countries
1005F10	Nguyen, Duy	The Effect of Renewable Energies on Cost and Productivity
1006B10	Petty, Matthew	The Effect of Hull Quantity on Fluid Resistance
1007T09	Raffensperger, Tyler	Are Residential Wind Turbines Economically Feasible?
1008V10	Rosado, Michelle	How Does the Cost of Batteries Affect Its Durability?
1009W10	Saikumar, Adithya	The Analysis of the Effect of Nano Particles on Solar Panels
1010P12	Tatman, Ryan	The Effects of Dimples on a Fuselage
1011D10	Tiblin, Jessica	The Effect of the Number of Blades on a Wind Turbine's Efficiency

1001P10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

Cost efficiency and Practicality of Charging a Battery with a Solar Powered Charger Versus a Normal Charger

Matei Canavra

Potomac Falls High School (PFH)

The experiment conducted aimed to determine the cost efficiency and practicality of charging a battery with solar power versus charging a battery with household electricity. Two AA batteries were charged with a solar powered charger (IV) and two AA batteries were charged with a normal charger (IV), and then the batteries were discharged (the batteries that charged together discharged together). Both the charge and discharge times (DV) were recorded. It was hypothesized that the “solar batteries” would take longer to charge but would last just as long as the “normal” batteries; the results clearly supported this. The solar powered charger took an average of 30 minutes longer to charge than the normal charger, but the average discharge times were approximately the same. A statistical t-test also determined that the mean charge times of the two chargers were actually identical. To determine the cost efficiency, a series of calculations was performed, which determined that 143759 charges of the “normal” battery would be required for the solar powered charger to pay itself off; this is equivalent to 96 years of moderate battery use. It was concluded that, on a small scale, solar power is an inefficient source of energy and that it is also time and cost inefficient. If the scale of the experiment were to be enlarged, then the cost efficiency and practicality of solar heating systems or solar powered cars could be calculated.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1002S12

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

Analyzing the Optimal Location of Solar Farms in the Northeast Corridor of the United States

Eric Cawi

Stone Bridge High School (SBH)
Academy of Science (AOS)

Solar Power is the least used resource in the United States. It is currently used in rural locations far from the electrical grid. Because the reserves of oil, coal, and natural gas are estimated to run dry within the next 200 years, it is clear that a viable source of alternative energy must be found to replace the existing energy sources used today. The purpose of this research was to determine the optimal location of solar farms in the Northeast Corridor of the United States taking into account the factors of land cost, solar potential, slope direction, and payoff time. Using ArcGIS, a suitability layer was created of contiguous open space in blocks of area greater than 8000 m2 in areas close to population centers. Then, using the spatial analyst, each site's solar potential was calculated. Next, factoring in the cost of solar generated electricity, the cost of land, and the cost of installation for a model solar farm the payoff time of each site was calculated. Any payoff time of less than ten years was listed as a reasonable investment, and the theoretical power output of each reasonable investment was calculated.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1003T09

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between Different Materials And Energy Production

Mary Douglas

Tuscarora High School (THS)

The purpose of my experiment was to find organic materials that could be used to produce energy. A calorimeter was used to measure heat of combustion. The independent variables were organic materials burned. The dependent variables were energy produced. The control was Isopropyl alcohol. A t-test was conducted on the data for each material versus the control. Sawdust and corn stover produced significant amounts of heat, 1515 and 1820 J/g, respectively. Algae did not produce heat, measuring -827 J/g. Corn meal appeared to produce some heat, measuring 551 J/g, but the t-statistic (p= 0.11) did not support that a significant amount of heat was produced. The hypothesis that the algae would produce the most energy was proven wrong. The algae produced negative results which was surprising because it was expected to produce the most heat. Since the calorimeter had to be ventilated so that the material would burn completely, some heat escaped measurement. Also, the experiments were conducted outside and differences between air and water temperatures were not addressed. An extension of this work would be to calibrate the calorimeter and retest the algae.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1004D12

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Use of Physarum Prediction of Wind Turbine Placement for Rural Electrification in Underdeveloped Countries

Jana Hertzog

Dominion High School (DMH)

While United States citizens enjoy a mostly stable electrical grid, many in the world are left completely without electricity. In underdeveloped countries, grids are often poorly planned and regulated, leaving villages in remote areas without access. An unlikely organism may be able to resolve this problem. Physarum polycephalum, a slime mold, has the ability to form organized and efficient networks. The intent of this research was to use this networking capability to indicate access of rural villages to electrical grids while integrating wind turbines into existing systems.

Transparent copies of existing energy grids from Ghana, Kenya, Morocco, and Sri Lanka were taped to bottoms of individual containers. Agar in containers was inoculated with Physarum samples at population centers and oat flakes were placed along existing electrical substations. After 7 days growth, it was determined that despite minor differences, Physarum followed existing grids. Subsequently, Physarum samples were added to new containers with Physarum placed in village locations and oat flakes placed at existing substations and proposed wind turbine sites. Networks suggested new, efficient infrastructure and also possible changes in the existing grid. The null hypothesis, that the slime mold's feeding pattern could not be used to indicate new, more efficient grids using wind power, was refuted. Physarum networks indicated the possibility for new infrastructure in all countries integrated possible wind turbine sites into existing grid systems. Further research would entail investigating whether Physarum would navigate small barriers, mimicking existing natural barriers, to further predict efficient energy grids in these countries.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1005F10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Renewable Energies on Cost and Productivity

Duy Nguyen

Freedom High School (FHS)

Renewable energies are an essential industry today's world must invest in now. Our society revolves around energy and, with a depleting source, new alternatives must be found. This experiment focused on comparing wind turbines, solar plants, and geothermal plants to determine which is the most cost efficient, the energies being the independent variables, and their productivity being the dependent variable. The control was solar plant. There were a total of 5 formulas used. They ranged from simple unit calculations to specific formulas given to me by representatives at the Energy Information Agency (also where the data was gathered). Each renewable energy was run through the formulas (often leading into another formula) and then compared. Geothermal plants ended having the lowest Mean, Standard Deviation, and Variance for all years and for all energy consumers. This results in geothermal plants being the most cost efficient. The null hypothesis, there is no significant difference between renewable energies and their cost efficiencies, was rejected. The hypothesis, if renewable resources are compared according to its cost efficiency, then geothermal plants will be the most cost efficient, was accepted. Issues included generalization and mismatch of hypotheses. For generalization, certain renewable energies can be further split, such as solar into thermal and photovoltaic. To continue the experiment further, separating these groups could lead to improved results. Also, the experiment had to be performed twice. In the original experiment, both hypotheses, the null and alternative, were rejected, resulting in the requirement to redo the experiment.

I used a custom made program to help calculate my data, therefore I will be bringing a laptop to help my presentation

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1006B10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Hull Quantity on Fluid Resistance

Matthew Petty

Broad Run High School (BRH)

This experiment aimed to end the dispute between which boats are more efficient, single-hulled boats or double-hulled boats. It was hoped that this experiment would aid in producing more efficient watercraft to satisfy consumer demands. The experiment included the construction of sc ale models of two types of boats: single-hull boats (Control) and double-hull boats (Independent Variable). They were tested in a bathtub to measure the distance traveled (Dependent Variable) after being propelled by a full water balloon. These models were attached to a line to travel along in the water. After testing each type of hull 16 times, a statistical t-test was performed. The average distance traveled by both showed that double hulls (58.5 cm.) clearly outperformed the single hulls (43.91 cm.). The t-test yielded a p-value of 0.00052. Therefore, the alternative hypothesis (If a boat with more than one hull is tested, then it will generate less fluid resistance than a single hulled boat.) was accepted. The p-value was extremely low and therefore indicates an amount of certainty to the test. The hull quantity influenced the distance traveled based on the average distances recorded, and went further than the control. The error occurred in the propulsion amounts, the balloons lacked a measurement system for input. Further research could explore the displacement factors in the movement of these hulls. In addition, a test could be performed to determine if the salinity of the water makes a difference in the performance.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1007T09

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

Are Residential Wind Turbines Economically Feasible?

Tyler Raffensperger

Tuscarora High School (THS)

Wind turbines create electricity by a rotor spinning from wind. They connect into the main power supply feeding a house, and adds on to the power grid. When this occurs, less power from the power company is needed to fuel the home, thus saving money. This project tested how long it would take for the amount of savings to equal the price of the wind turbine. In a Northern Virginia residential location was used. Electric bills dating back from the past year, wind speeds, and wind turbine output information was acquired and used. The wind was measured at the location using an anemometer, and was calculated to see how much electricity the wind turbine would produce at that given wind speed. Then, the amount of power produced by the wind turbine was put into the equation, and lowered the amount of electricity from the power company. The alternative hypothesis was: If a wind turbine was installed into a house, then the average amount of time it would take to pay off the debt would be about four years. The hypothesis was not supported because it took about 60 years instead of four. A few improvements that can be made to the project would be to possibly have more trials of measuring wind speed, using different kinds of wind turbines, or different locations can be used instead of just one.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1008V10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Cost of Batteries Affect Its Durability?

Michelle Rosado

Park View High School (PVH)

The purpose of this experiment is to determine if the cost of big-name batteries affects its durability. Many people when they look for batteries worry about the price of them and wonder if it is worth their money to buy them. How long they will last is unknown, which, especially with today's economy, has consumers worried about wasting money. When performing an experiment to test which to buy, some steps include buying the batteries being tested and flashlights, turning them on simultaneously for as many hours a day as they want (as long as they are all turned on and off simultaneously), and after recording the results, analyzing them. The independent variables are the batteries' cost and the brands, the dependent variable is the batteries' durability, and the control group is a generic brand, not a big-name brand. The results turned out to show that a cheaper battery is still efficient because it's most cost effective. The hypothesis: "If Energizer is the most expensive alkaline battery, then it will provide energy for the flashlight longer than both Duracell and Rayovac, the cheaper batteries" was supported. Energizer was the most expensive and proved to be the most durable, but Rayovac, the cheapest, lasted just a few minutes less than a big-name brand! The control even lasted longer than a big-name battery (Duracell)! One problem: the bulbs of the flashlight may burn out.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1009W10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Analysis of the Effect of Nano Particles on Solar Panels

Adithya Saikumar

Briar Woods High School (BWH)

Solar energy is the basis for all life on our planet, and people have harnessed the energy of the sun for sustaining life, keeping warm, and most recently, power. Quantum dots, or in this experiment's case, silver (Ag) nano-particles, coated on thin film Photovoltaic cell can be used to enhance the capabilities and efficiency of existing solar cell designs. Quantum dots based solar photovoltaic cell will focus light into silicon to take the breadth of the solar radiation and specifically tune the radiation to optimal silicon-absorbing wavelengths, thereby increasing efficiencies and absorption intensities. A good way to visualize this is to think of the entire rainbow of light being handled by the quantum dots, not just a color or two. Advancement in Solar PV cells, quantum dots, and incorporating cost-effective biodegradable materials will provide the solar consumer with the added benefit of increased energy efficiencies and additional power output. The hypothesis for this experiment was, if a solar panel surface is coated with silver (Ag) nano particles, the voltage output will increase. According to the averages of the control group and the independent variable group which were 5V and 6.3V respectively, the nano particle group (Independent Variable) had a higher voltage output. The results indicate that 26 percent more electrical current was produced. If we can integrate nanoparticle technology with the processes used to mass-produce thin films commercially, it could lead to greater adoption of solar cells and eventually a truly viable alternative energy source.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1010P12

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Dimples on a Fuselage

Ryan Tatman

Potomac Falls High School (PFH)

This project was designed to test the aerodynamic effects of dimples on an airplanes' fuselage. Fuselages for hydrogen powered aircrafts are forced to be very aerodynamically inefficient because of the spherical tanks needed to hold the hydrogen gas under pressure. I hypothesized that if dimples, similar to those found on a golf ball, were added to a fuselage, then the airplane would have less drag and fly more efficiently. By increasing the efficiency of airplanes, fuel consumption would lessen. This would help improve the environment and the economy by reducing the cost of transporting goods by air.

A foam plug was carved out of high density foam to create a mold, which in turn was used to create the plaster positives used for testing. The plaster positives were then dimpled in different areas along their lengths. The fuselages were tested in a homemade wind tunnel designed to measure the force of drag acting on them. The data was then recorded, charted, and compared.

The data showed that dimples increased the amount of drag on the fuselage by a factor of two. Contradicting my hypothesis, adding dimples to a fuselage is not a viable way to reduce drag. Errors in testing could have been caused by friction in the scale system, imperfections in the fuselages, and slight differences in the testing environment. Further testing could be done to see if different dimples sizes, placements, and patterns would be more effective in reducing drag on an airplane.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1011D10

Energy & Transportation
1000

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Number of Blades on a Wind Turbine's Efficiency

Jessica Tiblin

Dominion High School (DMH)

As the world consumes more and more energy each day, the importance of clean, renewable energy becomes a paramount necessity. One such source of energy comes from wind power via turbines. However the design of the turbine requires the utmost efficiency in order to produce the most power. This experiment tests the number of blades on a wind turbine's electrical output in watts.

The purpose of this research was to find the number of blades on a wind turbine that is most efficient. To do that, eight blades were constructed and attached to the turbine one at a time for each trial. The turbine was tested under wind speeds of low, medium, and high. A digital multimeter was used to determine the number of watts produced. As a result, the greatest electrical output was produced by the wind turbine with five blades on it; Blades 1-4 produced on average an increasing number of watts whereas 6-8 produced a decreasing number of watts.

The hypothesis that the greater number of blades on the wind turbine will yield a higher electrical output was both supported and refuted to an extent due to the increase and then decrease of the watts produced by the turbine. According to this experiment, five blades are the most efficient on a wind turbine. Further research can be done concerning the most effective size, weight, material, or design of the blades in order to produce the best turbine possible.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Environmental Management (1100)

Project No.	Last Name, First Name	Title
1101W12	Booth, Molly	Observing the Effect of Human Disturbance on Low Trophic Level Biodiversity
1102S09	Cascio, Kevin	The Efficiency Of Oil-eating Bacteria On Different Types Of Oil
1103P12	Fernandez, Ariana Margulies, Kelsey	Measuring the Efficacy of Biological Treatment Units to Manage Propylene Glycol Runoff when Utilized as a Deicing Agent
1104H10	Kot, Natalia	The Effect of Deforestation on Agriculture
1105D12	Lewis, Anna	The Cyanobacteric Remediation of Freshwater Dead Zones
1106H10	Nelson, Melanie	The Effect on Road Salt on Salinity
1107D12	O`Donnell, Colin	The Remediation of Sulfur from Coal via Thermophilic Bacteria and Fenton Chemistry
1108W10	Scherbenske, Adam	The Effect of Fertilizer on Soil pH
1109H10	Studebaker, Nicholas	The Effect of Isopropylamine Salt of Glyphosate on the Growth of Grass and Pansies
1110H10	Tennyson, Ashlyn	The Effect of Chemical Dispersants on Planarian During Oil Spill Clean Up
1111G09	Vennitti, Corinne	The Effect of Scent-Based Deterrents on the Eating Habits of White Tailed Deer
1112D12	Whitaker, Katherine	The Biodegradation of Azo Dyes Via Bacillus subtilis: A Novel Approach to Wastewater Treatment

1101W12

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Observing the Effect of Human Disturbance on Low Trophic Level Biodiversity

Molly Booth

Briar Woods High School (BWH)
Academy of Science (AOS)

Blandy Experimental Farm is an research facility with 100 by 100 meter succession plots set in a randomized design, each of which is tilled on a rotating basis. The purpose of this research was to observe the effect of the human disturbance on plant and arthropod biodiversity in order to study human impact on managed ecosystems. All plots were originally tilled in 2003 with A plots disturbed in 2004 and C plots disturbed in 2009. Plant data was collected with a quadrant sampling technique and arthropod data was collected with a transect line sampling technique. Arthropods were identified to order and plants to family. ANOVA tests were performed for arthropod abundance between each of the three sampled A plots, C plots, and E plots. The results showed with 95% certainty that plots A1-3, C1-3, and E1-3 have no significant differences. Then, the A plots and C plots were compared to the control (E plots) using a t-Test for proportionality. Results from September show that the A plots and E plots have no statistically significant differences for all arthropod orders (all p-values >0.10). However, the C plots have statistically significant differences for orders Acari, Aranea, Lepidoptera, and Orthopera. This demonstrates the habitats approaching a climax community within the 6 year study period since A was disturbed, which has not yet been reached in the 18 months since C was disturbed. Preliminary November results show that there are statistically significant differences between plots A1-3, C1-3, E1-3. This suggests that towards winter the arthropods travel between various plots, looking for a habitable living environment. Research will continue in March and May to determine if statistically significant seasonal difference exists, and data will be compared to determine the recovery time necessary after human intervention.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1102S09

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Efficiency Of Oil-eating Bacteria On Different Types Of Oil

Kevin Cascio

Stone Bridge High School (SBH)

Oil released into the environment as a pollutant can be harmful. Some bacteria have metabolic pathways that enable them to use and convert oil into nontoxic byproducts. The purpose of this experiment was to determine the efficiency of oil-eating bacteria in degrading different oils.
Different types of oil (IV) were inoculated with oil eating bacterial culture to find out how efficiently the bacteria degraded the oil (DV).
Metabolic activity (the amount of oil degraded) of bacteria is proportional to amount of byproducts released as reducing agents. The reduction of triphenyl tetrazolium chloride indicator (TTC) was indicated by color change (from colorless to pink) and was measured by recording the absorbance at 490nm (DV).
On average, olive oil absorbed around 43%, motor oil absorbed around 18%, and mineral oil absorbed around 16% of the light that was sent through the solutions in the spectrophotometer. ANOVA returned $p<0.05$. The T test for control and experimental tubes of olive oil ($p = 0.006$), mineral oil ($p = 1.73E-05$) show statistically significant difference in the absorbance. The T test for control and experimental tubes of motor oil does not show statistically significant difference in the absorbance thus refuting the alternative hypothesis. The flocculent material observed in motor oil tubes might have affected the absorbance.
The certain hydrocarbons that were metabolized efficiently by the enzymes of the oil-eating bacteria were more in olive oil than mineral and motor oil. Hence more byproducts of microbial metabolism (reducing agents) were released in olive oil causing reduction of Tetrazolium from colorless to pink and increased the absorbance measured at 490 nm.
Future research could explore a specific strain with ability to degrade specific oils efficiently. The strains flourishing in a recent crude oil spill could be tested.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1103P12

Environmental Management 1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

Measuring the Efficacy of Biological Treatment Units to Manage Propylene Glycol Runoff when Utilized as a Deicing Agent

Ariana Fernandez

Potomac Falls High School (PFH)

Kelsey Margulies

Potomac Falls High School (PFH)

The purpose of this experiment was to determine the efficacy of the Biological Treatment Units (BTUs) at Dulles Airport in filtering propylene glycol out of runway runoff. Propylene glycol is an anti-freeze chemical often used to deice airplanes around the world. Although propylene glycol is one of the best deicing chemicals available, if released into the environment, it has fewer harmful effects than the traditional deicing agents. As it breaks down, propylene glycol absorbs oxygen, and in excess can thereby suffocating local vegetation. In addition, if consumed in large amounts by animals, it can lead to serious health issues. At Dulles Airport, a unique BTU system is used to filter propylene glycol, among other chemicals, out of runway runoff and stop it from entering the environment. The airport is still testing these biological treatment units because they are unsure about the effectiveness of such systems. This experiment tested the filtration process of the biological treatment units. A 50/50 mix of propylene glycol was poured onto a model biological treatment unit and filtered through the multiple layers of sand and soil, each thickening with depth. The propylene glycol is expected to stick onto the surfaces of the sediment layers, thereby releasing a mixture with a smaller concentration of propylene glycol. Hopefully with this research, advances and adjustments can be made to the biological treatment units, which will lead to a better filtration system.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1104H10

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Deforestation on Agriculture

Natalia Kot

Heritage High School (HTH)

The experiment's purpose was to examine deforestation's effect on grass. The independent variables were the soil types: deforested, forest, and potting (the control). The dependent variables were the biomass of the grass, in grams, and the height of the grass, in centimeters. Seeds were planted in thirty cups of each soil. Every two weeks for six weeks, the grass was cut, measured for height, and massed on a scale. ANOVA tests were run on the data. The potting soil had the largest mass (mean of 1.19882 g) and height (mean of 12.72 cm) the first cut, but the forest soil prevailed by the second cut, with a mean mass of 0.334857 g and mean height of 6.806667 cm. The deforested soil had the lowest mass and height in all three cuts. By the third cut, its mean mass was 0.06513 g and its mean height was 1.946667 cm. The F-critical was 3.101295757 in all groups. In the last cut, the mass F-value was 16.877258, while the height F-value was 32.35569911.The third cut's mass P-value was 6.4x10-7. The hypothesis was supported by the data and stated that if grass seeds are planted in the three soil types, then the grass in the deforested soil will have the smallest biomass. Forest soil was the most fertile, while deforested soil was the least fertile. The first forty-five plants were planted five days before the second forty-five, so this may have affected the data. Further research could determine if deforestation effects flowers.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1105D12

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Cyanobacteric Remediation of Freshwater Dead Zones

Anna Lewis

Dominion High School (DMH)

Dead zones afflict both oceanic and freshwater ecosystems. These are environments void of oxygen that are uninhabitable for many organisms. A process of remediation is desperately needed to reintroduce healthy habitats, rescue fishing industries and the economies of shoreline cities that depend on that revenue. Nitrogen and phosphorus-rich fertilizer runoff prompts algal blooms which then die and sink to the bottom of the body of water in which they are located. Decomposers then deplete dissolved oxygen content in lower layers. Efforts have been made to reduce fertilizer runoff into bodies of water; however, dead zones are still an issue.

This research explored the use of the facultative anaerobic, photosynthetic cyanobacterial species Nostoc and Anabaena in order to raise dissolved oxygen content of a freshwater dead zone. Because both of these species of cyanobacteria grow in the benthic or lower layer of the water, they do not cause the same surface bloom that creates dead zones. Three different concentrations of Nostoc and Anabaena were added to identical containers filled with oxygen-depleted water and fertilizer and dissolved oxygen levels were monitored for 30 days. Statistical analysis via a t-test refuted the null hypothesis that the cyanobacteria would not increase the dissolved oxygen levels. Both species raised oxygen levels; however, Anabaena far outperformed Nostoc.

Oxygen-producing cyanobacteria can help remediate a hypoxic dead zone. Since strains of both species inhabit fresh and saltwater ecosystems, future research would entail tests in salt water to determine which has greater efficiency in that setting.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1106H10

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect on Road Salt on Salinity

Melanie Nelson

Heritage High School (HTH)

The blizzard of 2011 caused more road salt to be put down on the streets than previous years, which could cause an increase in the salinity of streams nearby streets. This experiment was done to test if a local stream nearby a street was affected by this. The independent variable of this experiment is the increased use of road salt. The dependent variable is the salinity of the stream. The control is the average salinity for streams in Northern Virginia. 15 samples were taken from the main body and the runoff of a stream, and then tested for their salinity by using a LaMotte Salinity test kit. An anova test was used, the mean for the control group was 0.5, the runoff salinity was 2.28, and the main body salinity was 2.51. The hypothesis for this experiment was that the extra road salt on the streets would cause an increase in the salinity of streams. This hypothesis was supported because the calculated F value was more than the critical F value showing a difference in the groups. The P value was less than .05 which states that the extra road salt had an effect on the amount of salt found in streams. Possible problems in this experiment could be the lack of multiple streams, better equipment and testing the stream earlier and longer. Further research could lead more experiments to support this one, which could lead to the use of more environmentally-friendly road cleaning methods.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1107D12

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Remediation of Sulfur from Coal via Thermophilic Bacteria and Fenton Chemistry

Colin O`Donnell

Dominion High School (DMH)

Coal is the most commonly used resource in the production of electricity. The burning of coal, however, pumps millions of tons of poisonous fumes into the air and increases the likelihood of acid rain production and atmospheric warming. Of the four major types of coal, bituminous and lignite are used most commonly in energy production. These contain large amounts of sulfur which enter the atmosphere as harmful sulfur dioxide. The intent of this research was to determine whether the use of thermophilic bacteria Paracoccus denitrificans and Fenton chemistry would remove pyritic sulfur from coal before it is burned.

Thermophilic bacteria such as Paracoccus denitrificans break bonds between carbon and sulfur such as those found in coal. Released sulfur is metabolized for survival. Similarly, Fenton reactions also break carbon-sulfur bonds. Coal samples were washed, dried and subjected to incubation with Paracoccus denitrificans and massed. The samples were then subjected to Fenton reactions and then massed. Via statistical analysis using t-tests, the null hypothesis that Paracoccus denitrificans and Fenton chemistry will not remediate sulfur from coal, was refuted and there was less pyritic sulfur in the coal after treatment.

This research indicates that the use of bacterial processes and Fenton chemistry combined effectively remove pyritic sulfur from coal. The availability of cleaner coal for energy production is plausible and hence exploration of the use of these treatments is merited.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1108W10

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Fertilizer on Soil pH

Adam Scherbenske

Briar Woods High School (BWH)

The purpose of this experiment was to test three fertilizers to see which one would most effectively neutralize acid when mixed with soil. The experiment will model the interaction of the fertilizer with acid rain in the natural world. The fertilizers used were ground limestone, ground gypsum, and crushed egg shells. The control group consisted of soil without any fertilizer added. The acid solution used had a pH of 4.7 for each group. After the solution was poured over the soil mixture, sample from the top and bottom of the soil was tested for its pH. The limestone fertilizer was most effective in neutralization and had a mean top and bottom pH of 7.18 and 7.25 respectively. The crushed egg shells were the next closest with a mean top and bottom pH of 6.56 and 6.64. The null hypotheses were rejected for the limestone and egg shells groups but were accepted for the gypsum group. The original hypothesis of if limestone is added to the soil, then the soil's pH will remain closest to neutral was supported. The only major error in the experiment was the fact that only four containers were used and even after cleaning a little residue was left over from the previous trials. Further research could experiment with the performance of limestone against different acid types such as nitric or carbonic acid. Also, limestone performance could be tested in different soil types such as one based on clay, sand, or silt.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1109H10

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Isopropylamine Salt of Glyphosate on the Growth of Grass and Pansies

Nicholas Studebaker

Heritage High School (HTH)

The purpose of the experiment was to show the devastating effects that over applying herbicides to your unwanted plants. If there is a rain, too close to the time when the herbicide was sprayed, or applied, and it has not had the time to soak into the plant's system, then it will run off into the ground water, and other plants around it. The experiment tested this by diluting Round-up by 50%, then applying it to the experimental group, leaving the control group without herbicide, but only water. The data that was collected supported that even when the herbicide is diluted; it still has harmful effects on plants. In conclusion, The statistics show that the average growth for a grass, naturally growing in nature, will be 7.6 cm per a two week period, however if herbicides are in the soil, the height will decrease about 4 and a half cm over a two week period. The pansies without herbicides increased by almost four cm on average, where as the pansies with herbicides decreased by an average of 8.73 cm showing the effects of the roundup. The hypothesis "If the soil is polluted with herbicides then the plants will not grow as well, based on height, in the polluted soil compare to the non-polluted soil" was supported by the experiment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1110H10

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Chemical Dispersants on Planarian During Oil Spill Clean Up

Ashlyn Tennyson

Heritage High School (HTH)

Oil spills, such as the Bp oil spill, can be devastating to the ecosystem—only worsened by the toxic chemicals used to clean up the oil. This experiment tested the affects of chemical dispersants on Planarian in a mock oil spill. Planarian are resilient non-parasitic flatworms belonging to marine environments. In the test, an increasing amount of chemical dispersant was added to four dishes of water and motor oil (none to the first dish, the control). Over a 10-minute period each Planarian was recorded for how many seconds it took to die. The means per dish were 600, 300, 286, and 224 seconds, respectively. This means that the Planarian had a faster rate of death as the amount of dispersant increased, while the Planarian in the control group did not die. Once graphed in ANOVA, the statistical data supported the alternative hypothesis, as the chemical dispersant did influence the Planarian's rate of death since the Planarian in the dish with the most dispersant died first. Furthermore, the P-value of 1.2167E-22 is less than .05, meaning that the null hypothesis can be rejected. Taking into account major sources of error, such as the possibility that the Planarian were unhealthy, one must assume that the chemical dispersant only made the conditions more hazardous. Therefore a logical inference is that dispersants sink—along with the oil—to organisms well below the surface, making oil spills more dangerous to marine life. Further research could explore the effects of dispersants on surface-dwelling marine creatures.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1111G09

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Scent-Based Deterrents on the Eating Habits of White Tailed Deer

Corinne Vennitti

Woodgrove High School (WHS)

The purpose of this experiment was to determine which deterrent would work the most effectively in keeping deer away from a specific area. This experiment would be helpful to people who live in areas with deer and want to keep them away from their landscaping.

The deterrents that were used were Deer-Off, Hot Pepper Remedy, Irish Springs Soap, human hair, and Coyote Urine. Each deterrent was put into an individual 2m x 2m square by either being sprayed down, tied to a 2 meter stake, or both. The remaining square was the control group which contained no deterrent. Every day, for twenty days, 500 grams of corn feed was put into each square and after twenty-four hours the remaining feed was collected and measured.

For twenty days, the deer ate all of the 500 grams that were put out in the squares. When the data was analyzed using the t-test, the results were all undefined due to the zeros for the standard deviation. Therefore, the hypothesis for the experiment was not supported. The null hypothesis, which was that the deterrents would have no effect on the eating habits of deer, was supported. This most likely occurred because the deer did not have much option for food because it is winter, so when appetizing food was offered they took it, no matter what it smelled like. In order to find out which deterrent works the best, the experiment would have to be repeated in each season.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1112D12

Environmental
Management
1100

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Biodegradation of Azo Dyes Via Bacillus subtilis: A Novel Approach to Wastewater Treatment

Katherine Whitaker

Dominion High School (DMH)

Synthetic acid dyes are used in a wide variety of industries including the cosmetic, food, leather, pharmaceutical, and textile industries. They are cheaper, brighter, and easier to use than natural dyes and have a higher degradation coefficient. Effluent from the use of these dyes, however, is harmful to the environment. Roughly 350 metric tons of dye effluents are dumped into ecosystems every year. Thermophilic bacteria, which are able to function in high temperature environments, have the potential to cheaply and efficiently remediate synthetic dyes.

A thermophilic bacteria, Bacillus subtilis, was introduced into test tubes containing four different dye solutions: acid black 1 (amido black 10B), acid yellow 23 (tartrazine), acid orange 7 (orange (II)), and acid red 14 (new coccine). Control test tubes were established using a solution of water and dye. Every 24 hours, the bacteria-dye solutions and controls were examined with a spectrophotometer to determine whether bacterial processes degraded the dyes. Analysis determined that the null hypothesis, that exposure to Bacillus subtilis will have no effect upon textile dye waste effluent, was refuted. The dyes exhibited increased light transmittance after exposure to thermophilic bacteria and hence were broken down.

The results of this research validate the need for further research into the remedial properties of microbes to determine the most effective method of bioremediation using thermophilic bacteria. Additional research into the bioremediation of other hazardous wastes could also be explored. Bioremediation using thermophilic bacteria may decrease the threat synthetic dyes pose to human and ecological health.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Environmental Sciences (1200)

Project No.	Last Name, First Name	Title
1201T09	Bose, Ipshita	Effect of Chemicals on the Rate of Biodegradation of Oil and Impact on Toxicity in Seawater
1202C09	Branch, Michaela	The Effects of Homemade and Chemical Cleaning Products on the Lifespan of Brine Shrimp
1203D12	Conway, Zachary	The Impact of Crude Oil and Dispersant on Filtration and Molecular Integrity of DNA in Crassostrea virginica
1204H10	Curley, Brandon	The Effect of Car Exhaust on Phaseolus lunatus and Phaseolus vulgaris
1205L10	Degroat, Jacqueline	The Relationship Between pH Level and Coliform Bacteria Levels between a Man-made versus Natural Ponds
1206H10	Dodd, Amarica	The Effect of Changing Water Temperature on the Growth of Elodea
1207V10	Goodwin, Michelle	How Does Acid Rain Affect Water Quality?
1208H12	Hasan, Adel Meka, Vamsi	Using Siderophores from Pseudomonas syringae to Chelate Heavy Metals of Iron(III) and Copper(II)
1209B10	Hasnain, Syed	Carbon Dioxide Car Emissions: Science Fair Project
1210B10	Hawes, Daniel	The Effect of Development on Nitrate Pollutants in Rainfall Runoff
1211D12	Hoerauf, Elizabeth	The Effects of Estuarine Acidification on the Induced Defenses of Crassostrea virginica in the Presence of Callinectes sapidus
1212V10	Horvath, Cody	What Effect Do Paintballs in Soil Have on Grass Growth?
1213S10	Kemp, David	The Effect Of Oil On The Oxygen Output Of The Phytoplankton Nannochloropsis oculata
1214F09	Ladak, Ziyanah	The Effect of Hay and Straw on the Absorption of Oil
1215C09	Larson, Joshua	A Statistical Comparison of Vehicular Fuels (Vegetable Oil, Biodiesel, Diesel, and Gasoline) and Their Pollutants
1216V09	Le, Tina	Pollution Kills: How Does Pollution Affect Aquatic Organisms
1217B10	Sastry, Arjun	The Effect of Road Salts on Algae Oxygen Production
1218B10	Shain, Logan	Effect of Different Covers on Soil Erosion
1219G10	Smith, Rhiannon	The Effect of a Power Plant on the Potomac River
1220S09	Sohn, Lydia	A Comparison Of Different Sunscreen Brands On The Population Density Of Nannochloropsis oculata
1221F10	Thapa, Monica	The Effect of Different Stages of Plant Succession Surrounding a Pond of the pH and Nutrients in the Soil and pH and Nitrate in the Water

1201T09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Effect of Chemicals on the Rate of Biodegradation of Oil and Impact on Toxicity in Seawater

Ipshita Bose

Tuscarora High School (THS)

This experiment was conducted to see if chemicals affect the rate of degradation of oil in seawater compared to the rate of biodegradation. The impact on the toxicity of the water due to the addition of the chemicals was also tested. Oil in seawater that biodegraded was the control group. The independent variable was the chemical used. COREXIT 9500 and Difco Marine Broth were the chemicals that were tested. The dependent variable was the rate at which the oil degraded. The experiment tested four containers for each variable using a seperatory funnel to measure the volume of the oil and water. To measure the toxicity of the water pH strips were used. The data showed that the COREXIT 9500 degraded the oil quickly, the Difco Marine Broth had no effect, and mixing both chemicals together also expedited the rate of degradation compared to the rate of biodegradation. In the future, this experiment could be improved by using more accurate methods of measurement, and it could test different aspects of oil spills.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1202C09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Homemade and Chemical Cleaning Products on the Lifespan of Brine Shrimp

Michaela Branch

Loudoun County High School (LCH)

The cleaning product market fuels a constant need and desire to live sanitary lives, whether it be at home, in the workplace or in public facilities. Lately, the media has pursued the idea of “green” products and has expressed their superiority over the big, brand-name products more commonly used. A few of these chemical products were introduced to the environments of brine shrimp, in addition to alternatively homemade products intended for the same purposes. It was hypothesized that the homemade products would create more suitable environments than the store-bought cleaners. The shrimp were then monitored over time and their lifespans recorded. In some cases the shrimp in the homemade cleaner thrived in their adapted environment, but in others, the shrimp in the store-bought cleaner environments had lifespans that surpassed those of the shrimp in the homemade cleaner environments. It was concluded that the Clorox and Windex alternatives appeared to create less hostile environments for the growth and development of brine shrimp than their brand-name counterparts. The opposite was apparent in the trials of a Pledge alternative, where the shrimp in the Pledge dishes outlasted the shrimp in the homemade wood polish dishes by three hours. Ultimately, the effects of the product depend on the ecosystem and organisms. The P values that were obtained through multiple tests showed significant differences between the natural and chemicals cleaners. The P values supported the null hypothesis for the wood polish trials and also supported the original hypotheses for the toilet bowl cleaner and glass cleaner trials.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1203D12

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Impact of Crude Oil and Dispersant on Filtration and Molecular Integrity of DNA in Crassostrea virginica

Zachary Conway

Dominion High School (DMH)

The Deepwater Horizon oil spill in the Gulf of Mexico was one of the largest disasters the United States has experienced. As a result of the explosion which blew pipe on the wellhead, over 4.9 million barrels of crude oil escaped into the Gulf waters causing extensive damage to marine and wildlife habitats and those organisms which in habit them. Various methods of clean up have been conducted including the use of dispersants.

The intent of this research was to determine the effect of crude oil and dispersant on filtration rate and molecular integrity of Crassostrea virginica (Eastern Oyster). Oysters were placed into three tanks and subjected to crude oil, dispersant and a crude oil-dispersant mix respectively. The fourth tank served as a control. The ability of the oysters to filter was analyzed via spectrophotometer. DNA extracts were analyzed to determine whether structural integrity was compromised. Filtration rates were affected in all experimental tanks with oysters exposed to oil affected the most negatively. DNA of oysters in the dispersant tank was the most degraded.

To date, long-term effects of the Deepwater Horizon spill are unknown. What is evident, however, in the span of less than a month, an organism that sits at the bottom of the food chain is affected. This could have a domino effect, crashing marine food chains. This, consequently, may have serious effects on the economy and livelihood of those on the Gulf shore. Hence continued monitoring of the effects of oil and dispersant is suggested.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1204H10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Car Exhaust on Phaseolus lunatus and Phaseolus vulgaris

Brandon Curley

Heritage High School (HTH)

The amount of car exhaust and pollution in the earth's atmosphere has increased drastically over the past few years. This pollution affects most plants, but does it affect all plants the same? In this experiment, Kidney and Lima Bean plants were exposed to car exhaust and their growth is recorded for 14 days. These plants were put outside and exposed to car exhaust from a corrugated metal pipe each morning and night. Later, these plants were compared to regularly growing plants of the same species. The results of this experiment show that Lima Bean plants were affected by the exhaust greater than the Kidney Bean plants. The mean of the Lima Bean plants affected by the exhaust was 3.4 cm and the affected Kidney Beans had a mean of 5.6 cm. This is displayed visually in the statistics chart because the affected Lima Bean plant had a much taller, sharper line than the Kidney Bean plant. The experimental hypothesis, which was that the exhaust would have an equal effect, was not supported by the data because the P value was less than .05. The car exhaust did have an effect on the growth because, when compared to the control, the height difference reached up to 17.5 cm for Lima Beans and 10.8 cm for Kidney Bean plants. An error in this experiment would be to use plants that grow continuously the same. For further research, an experiment could be done to see if plants are affected when growing near a busy or polluted road.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1205L10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Relationship Between pH Level and Coliform Bacteria Levels between a Man-made versus Natural Ponds

Jacqueline Degroat

Loudoun Valley High School (LVH)

The purpose of this experiment was to see whether or not the pH level and or Coliform bacteria level was different in artificial (man-made) versus natural ponds. In this experiment, water samples were collected from each type of pond and tested for the pH level and Coliform bacteria level. The independent variable was the type of ponds; the dependent variable was the pH level and Coliform level. The mean for the pH level of the artificial pond was 7.05 and 8.05 for the natural pond. The average water temperature in the artificial pond was 2.05 degrees Celsius and 2.19 degrees Celsius in the natural pond. The mean for the Coliform bacteria level in the artificial pond and the natural ponds were 205.75 and 103.35. The hypothesis, which was that the natural pond would have a higher pH level and Coliform bacterial level then the artificial pond, was not supported because the natural pond had a higher pH level, but a lower Coliform level. The P value was greater than .05, which means there was no statistical significance in the data. If this topic was to be improved, the water samples could be gathered for a longer period of time to see if the seasons impacted the results. Also, water could be collected from a different spot in the ponds, such as in the middle. The water samples in this experiment were gathered from a certain spot at an edge of the ponds. If water was gathered from a different spot in the ponds, the outcome could change.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1206H10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Changing Water Temperature on the Growth of Elodea

Amarica Dodd

Heritage High School (HTH)

The point of this project was to determine what the different masses of plants grown in 60, 80, and 100 degree water would be. In order to find this data, 30 plants were grown in each of the three water temperatures. The temperature of the water was maintained through the use of temperature controlled water heaters and a heavy duty thermometer. The bottom of each 10 gallon tank that the plants grew in was lined with a layer of fluorite underneath a layer of gravel. In order to replicate the water of the Chesapeake Bay, sea salt was mixed with regular water from the tap. After a month of growing, the plants were removed and desiccated on a towel until they were thoroughly dried. The masses of the plants were then found using a high grade scale at Heritage High School. The means of each group of plants was then found and recorded. The results show that the plants in the 60 degree water grew more than the plants in the 80 and 100 degree water. This rejects the null hypothesis, but supports the alternate hypothesis. Further research could explore more deeply into the effect that temperature has on the growth of plants, such as height and number of leaves.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1207V10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does Acid Rain Affect Water Quality?

Michelle Goodwin

Park View High School (PVH)

This experiment was done to show which of 3 bodies of water was the most acidic. The waters used were the Potomac, and Shenandoah Rivers, along with a nearby lake. Cabbage juice was used to tell whether these waters were acids or bases. All were bases, and household items were used for comparison. Lemon juice and white vinegar were the only two acids used in this experiment. The independent variable was the type of water. The dependent variable was the amount of acidity, and the control group was distilled water. The Potomac River had the highest pH, 8.47, and the lake had the lowest, 8.28. The Shenandoah River was in the middle with a pH level of 8.42. A Chi Square test and a t-test were done, because it was both qualitative, and quantitative. The results show the p value being less than .05, rejecting the null hypothesis. The alternative hypothesis was “If all three bodies of water are tested, then the Potomac will have the lowest pH.” The experiment showed the exact opposite. Sources of error could include not counting the number of drops of cabbage juice correctly. Further research might include doing this experiment throughout the entire world instead of just Virginia.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1208H12

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Using Siderophores from Pseudomonas syringae to Chelate Heavy Metals of Iron(III) and Copper(II)

Adel Hasan

Heritage High School (HTH)
Academy of Science (AOS)

Vamsi Meka

Freedom High School (FHS)
Academy of Science (AOS)

As industry grows more voluminous, so does the amount of metal pollution in our drinking water. Most of these metals are not biodegradable nor thermodegradable, and their buildup in the human body through biological magnification causes a variety of diseases. The purpose of this project was to use siderophores, iron chelating ligands, from the bacteria Pseudomonas syringae to chelate or remove the metal ions of iron(III) and copper(II) from water in order to reduce this pollution. The bacteria produce these molecules in order to get enough iron for processes such as respiration. Pure siderophores in powder form were brought from Sigma Aldrich. A solution was created from 50ppm solutions of iron(III) and copper (II). After two days, the siderophores were filtered out using Millipore ultrafiltration filters also from Sigma Aldrich. The resulting concentration of metal ions was measured and the difference from the initial concentration was recorded. The control procedure was conducted identically except without any addition of siderophore solution. For both copper and iron, there was a significant loss in concentration with the addition of the siderophores. A loss of concentration was observed in both the experimental and control trials. However, statistical tests show the drop in concentration in the experimental trials were statistically significantly different from the drop in the control trials. The loss in concentration for both metals through chelation, however, was not enough to satisfy EPA standards. Therefore additional research needs to be done in order to optimize the chelation through variations in temperature and/or pH.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1209B10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Carbon Dioxide Car Emissions: Science Fair Project

Syed Hasnain

Broad Run High School (BRH)

Today, Automobile Carbon Dioxide Emissions play a huge factor in the field of environmental sciences. As the concept of having a car has grown over the years, the age factor in cars has played a big part in the buildup of Carbon Dioxide in our atmosphere. This study was conducted to see if there was a significant increase in CO2 over time in automobiles. The Independent variables in this experiment were the two car groups, 2000 and 2010 (cars were randomly picked); the dependent variable was the output of CO_2 emissions. All the cars in the two groups were tested for Carbon Dioxide with a manual CO2 meter. The mean for group 2000 was 397.9 ppm and the mean group for 2010 was 279.9 ppm. A single t-test was performed to see if there was a significant increase over time. The alternative hypothesis was that if the two car groups are compared to each other than there will be an increase in CO_2 emissions as age increases and it was accepted in this experiment. The p-value was 0.021445843 giving us a 95% confidence level that there is an increase over time. This experiment did bring up questions for future studies. Is there an effect on CO_2 emissions if the brand and make are different? Or future studies could explore if temperature and the environment the car is in has an effect on CO_2 levels? By finding these answers, organizations like the EPA can work to limit CO_2 emissions.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1210B10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Development on Nitrate Pollutants in Rainfall Runoff

Daniel Hawes

Broad Run High School (BRH)

The purpose of this experiment was to determine how development affects the movement of nitrate pollutants into rainfall runoff. Rainfall runoff from Loudoun County carries nitrate pollutants into the Chesapeake Bay, negatively affecting the health of the water. To check for nitrates, runoff samples were collected 15 times during rainstorms from three developed locations (a street, a parking lot, and a golf course) and then tested. The independent variable was the sample location. The dependent variable was the amount of nitrates in the runoff measured in milligrams/liter. The control group was a sample of rain that had not run over the ground. The alternative hypothesis for this experiment was that if rainfall runs off developed land, then the amount of nitrate pollutants found in the rainfall runoff will increase. This hypothesis could not be either supported or not supported since the trial groups could not be statistically compared to the control group, which always had a value of zero (a source of systematic error). However, the trial groups demonstrated varying levels of nitrates and trends indicated that there was an effect. In fact, the means for the street, parking lot, and golf course were 5.6. 4.7, and 4.4 milligrams/liter, respectively. T-tests comparing the locations to one another indicated these differences were not significant. Further research could explore comparisons among golf courses, differences between farmland and developed locations, or investigations of nitrates in local waterways.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1211D12

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Estuarine Acidification on the Induced Defenses of Crassostrea virginica in the Presence of Callinectes sapidus

Elizabeth Hoerauf

Dominion High School (DMH)
Academy of Science (AOS)

In the past 250 years the amount of carbon dioxide in the atmosphere has increased from 280 ppm to a current 391 ppm. It is well known that this increase is causing climate change on land, but it has also caused a 30% increase in the pH of the ocean. This acidification affects organisms with calcium carbonate shells by removing carbonate ions from the water by combining with CO_2 to form carbonic acid. The eastern oyster, Crassostrea virginica, is a calcifying organism with a shell strengthening phenotypic plasticity defense that occurs in the presence of the blue crab, Callinectes sapidus. To test if this defense if being affected by the acidification, 8 sets of 8-12 C. virginica were subjected to differing lengths of CO_2 treatment (0, 24, 48, and 72 hours per week) for five weeks, and then a C. sapidus crab was added to one tank of each CO_2 level for four weeks to induce the strengthening defense. Thickness measurements were then taken on the upper shell from the center of the adductor scar and four radial measurements on the edge of the shell. There was no statistically significant difference of thicknesses between the experimental groups at the adductor scar or the shell joint ($p=.51$ and .32). Along the edge of the shell (45°, 90°, and 135° from the adductor scar), significant differences between the groups were seen; (p values of .08, .008, and .003) however there was not a conclusive pattern between the groups. Microhardness data was also conducted on each of the shells to determine if the presence of crabs increased the strength of the shells. If the oysters are losing their defenses, they may become more vulnerable to predation, and the population of this important filter feeder could decrease significantly.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1212V10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

What Effect Do Paintballs in Soil Have on Grass Growth?

Cody Horvath

Park View High School (PVH)

The purpose of this experiment was to try to determine whether or not paintball contents in soil have any effect on grass growth. Three different groups of grass, A, B, C, were subjected to various amounts of paintball liquid over a ten week period of time. A control group of grass received no paintball liquid. Paintballs were punctured and liquid distributed with Group A receiving 2 per week, Group B receiving 8 per week, and Group C receiving an accumulative amount each week. The results proved to be significant with the t value in Group A equaling 2.7530, 5.5134 in Group B, and 4.2945 in Group C. The mean of the Control Group minus the test Groups were 0.80 in Group A, 2.90 in Group B, and 2.50 in Group C. The hypothesis was if a certain amount of paintballs are applied to the same type of grass then it will stop the grass from growing. The hypothesis is supported because after the weeks the experiment was performed, the grass died. The Independent variable influenced the Dependent variable because the amount of paintballs had a direct influence on the health of the grass. There were no major sources of error. Further research could include testing paintballs in other types of plants.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1213S10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Oil On The Oxygen Output Of The Phytoplankton Nannochloropsis oculata

David Kemp

Stone Bridge High School (SBH)

Oil spills are a suspected threat to marine ecosystems, particularly the phytoplankton that exist there. This experiment was designed to determine the relationship between mineral oil and the effect it has on the Nannochloropsis oculata's ability to photosynthesize and oxygenate the surrounding solution. The alternate hypothesis stated that if mineral oil is added in increasing increments of three, five, and seven milliliters to the Nannochloropsis oculata, then the dissolved oxygen level of the phytoplankton solution will be reduced respectively. To test this hypothesis the phytoplankton solutions were allowed to culture for a period of three days before they were exposed to the mineral oil. After being left in the dark for 24 hours, they were then left in the light for three hours to photosynthesize before the dissolved oxygen levels were recorded. A dissolved oxygen Lab Quest probe was used to measure the raw data in ppm or parts per million. The mean values of the control and three experimental groups of three, five, and seven milliliters were 4.6 ppm, 3.2 ppm, 2.8 ppm, and 2.7 ppm respectively. The three experimental groups were compared against the control (with no added mineral oil) by doing a t-test to determine if there is a statistically significant difference with 95% certainty, between the control group and the different conditions of the variables. The null hypotheses, that the phytoplankton tainted with three milliliters, five milliliter, and seven milliliters of mineral oil would have no affect on the oxygen output of phytoplankton compared to the control, were all rejected. The alternate hypothesis was accepted because as more oil was added to the phytoplankton suspension more light was refracted. Therefore the light was not able to reach the phytoplankton in order for them to photosynthesize and release oxygen.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1214F09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Hay and Straw on the Absorption of Oil

Ziyanah Ladak

Freedom High School (FHS)

In this experiment, hay and straw were tested to see which material could absorb more oil. The experimental hypothesis was if hay and straw are used to absorb oil, then straw will absorb more oil because the diameter of one piece of straw is larger than the diameter of one piece of hay. To conduct the experiment, water, salt, used motor oil, and hay/straw were added into a basin. The hay/straw was left in there for 60 seconds. The amount of water and used motor oil absorbed was measured in mL. A ladle was used to take out as much oil possible in just one scoop as the control group. Hay absorbed an average of 52 mL of oil and an average of 29 mL of water. Straw absorbed an average of 67 mL of oil and an average of 36 mL of water. The ladle scooped out an average of 8 mL of oil. The t-tests showed that there was a significant difference in the amount of oil and water absorbed by straw than hay and the experimental hypothesis was supported. The reason that straw absorbed more oil is probably because it is hollower, so it has space for more molecules of oil to be absorbed into it. Further research could explore if it's possible to gain access of crude oil and to see if there is a better way to calculate how much oil was absorbed.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1215C09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Statistical Comparison of Vehicular Fuels (Vegetable Oil, Biodiesel, Diesel, and Gasoline) and Their Pollutants

Joshua Larson

Loudoun County High School (LCH)

Pollution within the world today is an issue of great concern. Sources causing pollution are multiple, from industrial to residential, and commercial to transportation. Petroleum and fuel, are large contributors to this problem. Location, production, distribution, refining, and availability all factor into the amount of resulting pollution. The purpose of this statistical report is to focus on four vehicular fuels and compare their pollutants and environmental impacts.

If vegetable oil (VO) as a fuel is compared to other fuels such as gasoline, diesel, and biodiesel - their pollutants and environmental impacts; then statistics will show that waste vegetable oil will produce fewer pollutants and have less of a negative impact on the environment.

Data collected from this statistical, web-based study revealed multiple changing variables each impacting the emitting pollutants. What was assumed would be a topic with numerical statistics having much supporting data became complex and murky.

Since VO is not given an official fuel status, statistical emissions testings are few and difficult to find; while statistics on the other fuels, especially biodiesel are varied because of the different ingredients, different engine types, and testing protocols. With all these variables VO, as a fuel, has some valuable advantages; being renewable, plant based, domestically produced, energy secure, biodegradable, less harmful to the environment being a food, and costing vastly less to produce.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1216V09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Pollution Kills: How Does Pollution Affect Aquatic Organisms

Tina Le

Park View High School (PVH)

The purpose of this experiment is to find out how fertilizer and engine oil, the independent variables, affect the aquatic organism, Daphnia pulex. 10 Daphnia pulex were placed in cups A , B and C containing 99 milliliters of distilled water. Cup A contained 1 milliliter of engine oil, cup B contained 1 milliliter of fertilizer, and cup C, the control, contained just water. The Daphnia pulex were left for 24 hours. The number of dead organisms counted after the experiment is completed, is the dependent variable. The modes for the control group, fertilizer and engine oil are 0, 2, and 10, respectively. The Chi- square test was used for the statistics, with the results for fertilizer and engine oil at 6.542 and 5.469 respectively. The alternative hypothesis is: If organisms (Daphnia pulex) are exposed to fertilizer and engine oil, then more Daphnia pulex will die in the engine oil sample, than in the fertilizer sample. It was supported because the data from the experiment shows that more Daphnia pulex died in engine oil, than in fertilizer. Although engine oil and fertilizer influenced the number of dead Daphnia pulex more than the control, the p values for both experimental groups were > 0.05. The data was not conclusive enough, due to a small sample size and a low number of trials. Further research could be done to determine how other pollutants affect Daphnia pulex.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1217B10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Road Salts on Algae Oxygen Production

Arjun Sastry

Broad Run High School (BRH)

This experiment examined the effects of magnesium chloride, sodium chloride, and calcium chloride road salts on the oxygen production of algae, which produces more than 50% of Earth's oxygen. In this experiment, the independent variable was the type of road salt and the dependent variable was the algae's oxygen production. The control group consisted of algae without any road salt. The experiment was conducted by placing algae into 4 groups and adding each road salt to one of the groups, with the control representing the fourth group. Oxygen production was measured after four days through a dissolved oxygen test kit. The mean oxygen productions of the control and calcium chloride groups were 5.6 and 6 ppm, respectively. The sodium chloride and magnesium chloride groups' mean oxygen productions were 5.9 and 4.5 ppm, respectively. To analyze significance, t-tests were conducted in which the control's oxygen production was compared with those of the road salt groups. The alternate hypothesis had stated that magnesium chloride would decrease algae's oxygen production the least of the three road salts. This hypothesis was not supported as the results of the t-test found that magnesium chloride had a significantly negative effect on algae oxygen production ($p=.0000027$). Sodium chloride ($p=0.19$) and calcium chloride ($p=0.10$) were found to have no statistically significant effect on oxygen production. Therefore, only magnesium chloride had an influence on algae's oxygen production. Further research could explore how various amounts of road salts affect algae oxygen production and how different road salts affect algae mortality.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1218B10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

Effect of Different Covers on Soil Erosion

Logan Shain

Broad Run High School (BRH)

Soil erosion is occurring more and more in areas, especially in areas with a lot of construction and farming. Covers are being placed over soil to prevent runoff from occurring in these places. This scientific experiment tests the effect of different covers on soil erosion. The dependent variable (amount of soil eroded) is effected by the independent variable (type of cover), because the independent variable, if affective, will absorb the water that causes runoff, and redistribute the water back into the soil over a period of time. This is what occurred when the cover, wood chips, was placed over an angled slope containing soil, with water being poured over it. From the data collected it can be concluded from the P-values of each cover and the control [(no cover) when compared to each other] that wood chips are best suitable for the prevention of soil erosion. Questions that can be asked about the scientific experiment are; does the density of the soil affect the amount of soil eroded or does wind have an effect on the distribution of water to soil?

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1219G10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of a Power Plant on the Potomac River

Rhiannon Smith

Woodgrove High School (WHS)

In this experiment the levels of water quality were tested. The experimental purpose of this experiment was to how the Dickerson, Maryland power plant effected the water in the Potomac River on the Virginia side and the Maryland side. pH, dissolved oxygen, and temperature were all measured to show the effects of the power plant. Each of these was tested at the Virginia side of the Potomac River, the Maryland side of the Potomac River, and there was a control used that was on the Maryland side of the river before the power plant. There were 5 samples taken at each site to equal a total of fifteen trials, and data was recorded. The results showed that the mean of the pH was highest at the Maryland side, along with the dissolved oxygen levels, and the temperature. Further tests could include the effect these pH, dissolved oxygen, and temperature levels have on the plant and animal environment in this area at the Potomac River. Also, a further test should include what waste the power plant creates that could cause the pH, dissolved oxygen, and temperature to be higher at the Maryland side, than those at the other test sites.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1220S09

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Comparison Of Different Sunscreen Brands On The Population Density Of Nannochloropsis oculata

Lydia Sohn

Stone Bridge High School (SBH)

Sunscreen is applied at beaches without consideration of possible negative side effects it may have on the marine environment, including phytoplankton which serves as the base of important food chains. This experiment was designed to test how sunscreen affects Nannochloropsis oculata. The original hypothesis stated that if Coppertone Sport, Banana Boat, and CVS brand sunscreens are added to N. oculata suspension, Coppertone would cause the population density to decrease the most. A spectrophotometer was used to measure the phytoplankton suspension's population density in percent transmittance. The control group (no sunscreen) and various sunscreens were measured every 72 hours, for two weeks. The mean of the change in the Percent Transmittance was: control 5.16, Coppertone 6.453, Banana Boat 7.6, and CVS 6.64. T-tests were performed to compare Coppertone sunscreen with the other sunscreen brands in order to support/refute the original hypothesis. The null hypothesises of Coppertone vs. the control, and Coppertone vs. Banana Boat are refuted because the P-values (0.006 and 7.007 x 10-10 respectively) are less than 0.05. From this, it can be concluded that there is a significant difference between Coppertone and both the control as well as Banana Boat. On the other hand, the null hypothesis of Coppertone vs. CVS is accepted because the P-value (0.451) is greater than zero. This means that there is not a significant difference between Coppertone and CVS, and that the results were due to chance. However, major error occurred due to the opaque qualities of sunscreen, altering the suspensions' percent transmittance which was not due to the actual change in the phytoplankton population. Additional research could distinguish the effects of specific sunscreen ingredients on phytoplankton.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1221F10

Environmental Sciences
1200

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Different Stages of Plant Succession Surrounding a Pond of the pH and Nutrients in the Soil and pH and Nitrate in the Water

Monica Thapa

Freedom High School (FHS)

The experiment's purpose was to understand if nitrate, nutrients, and pH differ between younger and mature succession stages because they are major factors determining plant growth. The independent variable was succession levels, the dependent variable was the nitrate in water, nutrients in soil and pH in both, and the control was tap water and top soil. Markers were labeled and placed every meter surrounding the ponds and those numbers were written on a sheet of paper and 15 were randomly selected to decide where to receive the soil and water samples. The pH sensor, meter, nitrate, nutrient kits, and T-test were used. The younger stages had a higher pH (6.9) in the soil and water, and a higher mode of nutrients (Phosphorus, Potassium, and Nitrogen) than the older stages (6.3pH). Nitrate was depleted in both ponds. The experimental hypothesis was older stages of succession would have a higher nitrate, pH, and nutrients in the soil and water was not supported. Younger stage plants are constantly growing and dying, and the nutrients are being cycled throughout while older plants have stable growth (results to why there were more nutrients in younger stages). The old stage area had many acidic coniferous trees, which came in contact with the water and soil, resulting in a lower pH. In repeating this experiment, more ponds could be tested to confirm succession was the factor in the differing results or test different regions to see if plant variety causes changes in the soil and water.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Mathematical Sciences (1300)

Project No.	Last Name, First Name	Title
1301V10	Bowers, Richard	How Does Birthrate Affect Lifespan?
1302F10	Hartless, Casey	The Effect of the Proximity of Facial Ratios to Phi on Facial Aesthetic Appeal
1303V12	Rosenthal, Anson	A Model to Optimize the Prevention of a Zebra Mussel Invasion in the Susquehanna River
1304L09	Strain, Lance	The Spidron Formula To Be or Not To Be

1301V10

Mathematical Sciences
1300

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does Birthrate Affect Lifespan?

Richard Bowers

Park View High School (PVH)

In the experiment the researcher is attempting to prove whether the number of births affects the life expectancy of a female. The variable in my experiment is fertility and the control group is females that have not had children. The experiment was to compare statistical data to see if fertility has a positive or negative effect on lifespan. The alternative hypothesis is, “If a mother bares multiple children then she will have a shorter lifespan and higher mortality rate than that of one that does not bear children.” This hypothesis was supported. This project could be expanded to include other factors such as, prenatal care, and economic stability in a country.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1302F10

Mathematical Sciences
1300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Proximity of Facial Ratios to Phi on Facial Aesthetic Appeal

Casey Hartless

Freedom High School (FHS)

Is math a beautiful thing? The purpose of this experiment is to explore whether there is a correlation between having facial ratios close to Phi and their aesthetic appeal. In a sense, is that face beautiful because it contains certain ratios? The independent variable in this experiment is forty different pictures, organized into twenty pairs. The dependent variables are which photos are chosen by human testers and which photos have facial ratios closer to Phi. The control group is the photo with the facial ratios that are closest to Phi. The twenty pairs of photos were placed in front of twenty-three high school testers and each person was asked to choose the most attractive picture within each pair. Then six measurements were taken and three ratios were calculated on each photo. The ratios were then subtracted from Phi and the photo with ratios closest to Phi was evaluated. Within the testing results the total number of attractive photos was 344 and the number of unattractive photos was 116. A Chi-square test was then performed and found that there was a significant difference between the data. This supports the experimental hypothesis that if the facial ratios are closer to Phi they will be more aesthetically pleasing. Sources of error included the accuracy of measurement. Further research could evaluate the effect the gender of the tester and the person in the photo within the same scenario.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1303V12

Mathematical Sciences
1300

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Model to Optimize the Prevention of a Zebra Mussel Invasion in the Susquehanna River

Anson Rosenthal

Park View High School (PVH)
Academy of Science (AOS)

The zebra mussel is an invasive freshwater bivalve that can severely disrupt marine ecosystems by drastically reducing phytoplankton concentrations in invaded waters. Its hallmark rapid geographic spread is due to the dispersal of thousands of planktonic larvae, called veligers, into the water column. For this reason, I aim to model an invasion in the Susquehanna River in terms of both the density and geographical scope of the population. I create a virtual representation of the river using GIS data and partition it to treat it as a lattice of discrete locations, called nodes. I use a semi-discrete model to describe both the mussel density distribution over a span of years and the transport of veligers between nodes over a days-long settling period. I use the method of lines, a technique used to solve systems of ordinary differential equations derived from a partial differential equation through spatial discretization, to compute the transport of veligers through each node along the river during the settling period. I set the biological parameters of the model using a method I developed last year incorporating the Excel Solver and mussel density data collected in the Hudson River. I will test the effectiveness of several control methods by simulating the effects of chemical additives on veliger mortality as they spread along the river from a dumping point and quantifying the reduction in invasion severity. The results of this analysis will provide insight for preventative action for organizations working to avert serious damage to the Susquehanna River ecosystem.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1304L09

Mathematical Sciences
1300

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Spidron Formula To Be or Not To Be

Lance Strain

Loudoun Valley High School (LVH)

- The findings from this experiment were inconclusive with the original hypothesis. The data collected both supported and rejected the hypothesis. Of the data collected only 30 percent provided any real evidence that could be used to support or reject the hypothesis. In one example two spidrons followed the same numerical pattern. The first series started at 90mm then decreased to 54 while the second series started at 54mm. both series then simultaneously decreased to 30-18-11-6-4-3-2. This data supported the hypothesis. On the other hand a second set didn't support this theory. The first series of the second set started with 80mm and the second series of the second set started with 68mm. From there they both then reduced to 44. The first series reduced to 26-15-9-5-3-2 while the second series reduced to 33-21-14-7-5-3. That they didn't both continue to follow the same path of numbers is why this disproves the original hypothesis that there is a order or sequence to their decreasing. There are no relevant data to compare the results of this experiment too. Thus validating the accuracy of the results compared to like experiments is not possible. Although extensive data was collected for this data over a period of two consecutive months, more repeated trials using a wider scope of data are needed to accurately assess and support or reject the validity of this theory. Human error is also a factor in this or in any other experiment of that especially those of shorter duration and limited trials.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Medicine & Health Sciences (1400)

Project No.	Last Name, First Name	Title
1401D12	Anderson, Ryan	The Creation and Detection of an Injectable Viscoelastic Ophthalmic Gel
1402F10	Bishop, Katelyn	The Effect of Familial Relationships of the Percentage of Matching Fingerprints
1403P10	Buehler, Kevin	The Effect of Sports Drinks On Teeth
1404D12	Duke, James	Investigating the Roles of Oleuropein and Docosahexaenoic Acid as Proteasome Activators
1405V10	Figliozzi, Christine	Effects of Red Bull and Monster on Blood Pressure
1406D12	Howell, Paul	Downstream Assay for Laser Capture Microdissection to Examine JC Virus Trafficking into the Central Nervous System
1407W12	Jasti, Ravirasmi	The Effect of the Influenza Virus on Populations of Different Blood Types
1408T10	Jones, Nicole	The Dissolving Rate of Coated Vs. Non-Coated Pain Relievers
1409C09	Lord, Alexandra	Barriers to Medical-Error Reporting in the NICU
1410V10	Nagley, Patricia	Dissolution of Different Pills
1411W09	Padgiotis, Aspasia	What Factors Affect The Solubility of Kidney Stones?
1412G10	Perry, Victoria	How does Genetics Affect Taste
1413S09	Sharifzadeh, Matin	The Synergetic Effect Of Garlic (Allicin) And Ampicillin On The Antibacterial Sensitivity Of E. coli
1414P10	Tedd, Andrew	The Effect of Bacteria Levels on Privately Maintained Pools Versus Publicly Maintained Pools
1415L12	Thomas, Brooke	Not at a Snail’s Pace: Allantoin from Helicoidea as an Epidermal Regenerative Agent on Lumbricus Terrestris
1416S10	Videgar, Erin	The Antagonistic Effect Of Lactobacillus acidophilus On E. coli
1417B09	Wang, Robert	The Effect of Isopropyl Alcohol on Viruses

1401D12

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Creation and Detection of an Injectable Viscoelastic Ophthalmic Gel

Ryan Anderson

Dominion High School (DMH)

Cataract surgery is one of the most common eye surgeries performed. However, if any of the clear viscoelastic gel infused under the cornea to open the anterior chamber is left in the eye following the procedure, intraocular pressure can dangerously increase. The intent of this research was to create a viscoelastic gel that would be visually apparent on demand to decrease the risk of residual gel in the eye after flushing. Initial requirements for the gel were that it had to appear under ultraviolet light and be transparent under fluorescent light. It could not dye the intraocular lens inserted in the eye during the procedure nor eye tissue. Different concentrations of fluorescein and RiskReactor IFWB-C0 UV dye to gel mixtures were created, then intraocular lenses and test eye tissue were exposed to these mixtures. Fluorescein rinses clean of the eye, although in order to appear under UV light, the concentration needed was such that the gel became significantly colored. The second dye medium showed ideal coloration and did not discolor intraocular lenses, however, it dyed eye tissue. The eye filters fluid, so it can be assumed that the dye would rinse out. Further research would entail the use of live eye specimens to confirm or refute this. After a week the mixture became cloudy, however this would not be an issue if the dye and gel were mixed immediately before use. Further research would entail the use of other dye mediums and is critical to lessen risk in cataract surgery.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1402F10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Familial Relationships of the Percentage of Matching Fingerprints

Katelyn Bishop

Freedom High School (FHS)

The purpose of this experiment was to test if a child is more likely to have similar fingerprint characteristics to their parents or if all fingerprints are random. The independent variable was the relationship between the subjects and the dependent variable was the percentage of matching fingerprints that the children have to their parents in the experiment. The subjects used for the experiment were fifteen children with both of their biological parents for the experimental group and forty-five randomly selected people split up into three person groups for the control group. The results of this experiment show that there are patterns of fingerprints within families. The average percent of matching fingerprints for the experimental group was 62% and 31% for control group. The T-test of the data shows that there is a significant difference between biologically related people and non-related people when it comes to fingerprint patterns. The experimental hypothesis for this experiment was that if there was a correlation between heredity and fingerprint patterns then there will be similarities found within families; this hypothesis was supported based on the results of the experiment. If this experiment was continued it could examine maternal and paternal relationships and the effect it has on percent of matching fingerprints.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1403P10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Sports Drinks On Teeth

Kevin Buehler

Potomac Falls High School (PFH)

With many people participating in sports and exercise programs, the popularity of sports drinks for hydration has skyrocketed, but what about the damage these drinks cause to teeth? This experiment examined whether sports drinks are better or worse for teeth for teeth than cola. In this experiment, the mass of each tooth was measured, then the teeth were soaked in the liquids for four weeks. After ever week, each tooth's mass was measured to determine the change in mass. The dependent variable was the change in mass of the teeth. Two sports drinks containing sugar, one sugar-free sports drink, and cola were the independent variables in which teeth were soaked. Water was the control liquid. The hypothesis was that teeth soaked in sports drinks would lose more mass than teeth soaked in cola. At the end of the experiment, the mean mass lost in grams of the teeth soaked in the two sugared sports drinks was 28.82 and 30.63%. The mean mass lost in grams of the teeth in the sugar-free sports drink and cola was 21.23 and 17.82% respectively. The independent variables affected the dependent variable, and there was no effect from the control group. The hypothesis was supported for the sugared sports drinks, but not for the sugar-free drink. Quantitative analysis was performed and determined that the data were statistically significant. Further research could explore the chemical makeup of sports drinks to see if they could be made less damaging to teeth.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1404D12

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Investigating the Roles of Oleuropein and Docosahexaenoic Acid as Proteasome Activators

James Duke

Dominion High School (DMH)
Academy of Science (AOS)

In Huntington's disease (HD), an overextended polyglutamine tract causes huntingtin protein (htt) aggregations, apoptosis, and eventually, neurodegeneration. The ubiquitin-proteasome system, which would normally break down these protein aggregates, suffers low proteasome activity levels in HD patients, suggesting proteasome activators could be used for HD treatment. Oleuropein, a phenolic compound in Olea europaea, has been shown to be a proteasome activator but has not been tested on a HD model. The omega-3 fatty acid Docosahexaenoic acid (DHA) is known to induce proteasome-dependent degradation of an estrogen receptor in breast cancer cells.

Two rat cell lines with human huntington gene insertions and RFP tags on htt protein were grown, and average htt protein quantities for each trial were obtained by taking UV microscope pictures of the RFP tagged protein and using ImageJ to find the average fluorescence brightness per unit area for each cell (each trial had 50-200 cells). Oleuropein treatment (100 μM) caused a 20.4% decrease ($p=0.035$) in htt level for the non-HD cell line and a 27.0% decrease ($p=0.036$) for the HD cell line in comparison to untreated trials, as expected due to oleuropein being a known proteasome activator. DHA treatment (100 μg/mL) caused a 22.0% decrease in htt levels for the HD cell line ($p=0.038$), but a 23.1% decrease in the non-HD cell line ($p=0.23$). In regards to statistical significance, this suggests both DHA and oleuropein are potential treatments for HD, but DHA is not necessarily a proteasome activator due to only causing significant htt degradation in HD cells.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1405V10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Effects of Red Bull and Monster on Blood Pressure

Christine Figliozzi

Park View High School (PVH)

The purpose of this study was to see which popular energy drink had the greatest effect on ones blood pressure. The independent variable was the two different energy drinks used (Red Bull and Monster), the dependent variable was how much the subjects blood pressure actually raised and the control was water. There were 15 subjects and each drank 240 ml of Red Bull and then waited 15 minutes and had their blood pressure taken and recorded. The same 15 subjects repeated this only with the other energy drink Monster and with water as well. Based on the trials, the average blood pressure after drinking just water is 96/6 mmHg, the average blood pressure after drinking Red Bull is 293/11mmHg and the average blood pressure after drinking Monster is 138/98mmHg, making Red Bull raise ones blood pressure more than Monster. The experimental hypothesis is, if one drinks Red Bull their blood pressure will raise more than if they drink Monster. The results support that Red Bull does in fact raise ones blood pressure more than Monster. The independent variable (the different energy drinks) did influence the dependent variable (how much the blood pressure raised). In most of the trials Red Bull raised blood pressure higher then Monster did. Further research could explore the other effects of the energy drinks on the body.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1406D12

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Downstream Assay for Laser Capture Microdissection to Examine JC Virus Trafficking into the Central Nervous System

Paul Howell

Dominion High School (DMH)

JC virus (JCV) is a common human polyomavirus activated under conditions of immunosupression established in the context of organ transplants or HIV/AIDS. JCV traffics to the central nervous system (CNS) where lytic infection of the target glial cell-type, oligodendrocytes, can result in the development of Progressive Multifocal Leukoencephalapathy (PML). Within the first six months of diagnosis, PML is typically fatal. Currently it is unclear as to how JCV enters the CNS. However, it is commonly believed peripheral cell types that become infected or harbor JCV, are responsible for trafficking JCV into the CNS.

An immortalized human glial cell line, SVG, was developed for the study of JCV in vitro. The purpose of this study was to establish a downstream assay for Laser Capture Microdissection (LCM). LCM will be used to identify the individual cells and/or cell types infected with, or harboring, JCV within biopsy tissues of PML patients. Therefore, this study examined the rate and level of infection in SVG cultures exposed to various concentrations of JCV by ultra-sensitive Quantitative Polymerase Chain Reaction (QPCR) analysis. With the exception of the latest time point, higher levels of JCV exposure resulted in a higher cell-associated viral copy number. At the latest time point there was no significant difference in copy number generated between the highest and middle JCV exposures, suggesting that optimal viral infection occurs between these two concentrations. These results confirm this QPCR is appropriate for downstream analysis of LCM, which subsequently will aid in identifying infected cells in biopsy tissues.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1407W12

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Influenza Virus on Populations of Different Blood Types

Ravirasmi Jasti

Briar Woods High School (BWH)

The purpose of the experiment was to examine the correlation between blood types and susceptibility to Influenza. The project was completed using raw data gathered from 336 army recruits exposed to Influenza, 196 of whom got sick. In this project the dependent variable is the number of people who get sick in each blood group and the independent variable is the number of people who were exposed to influenza. Overall, 58% of the people exposed to Influenza got sick, but the percentages varied within in each blood group. On an average for all blood groups, 55.75 % of the subjects became ill with a standard deviation of 7.35. The null hypothesis that blood group has no effect on the susceptibility to Influenza was not rejected because the data was not statistically significant ($P>0.05$). When the clinical trial was first completed the sample size for each blood group was very different. This could have affected the accuracy of the results and the conclusion. An immune response called “seroconversion” occurs after an individual is exposed to the influenza virus. The percentage of subjects with a post epidemic titre of >20 was significantly lower in groups O and AB than in groups A and B. This data is statistically significant because $P<0.001$. A continuation of the project would look further into the production of seroconversion titres in reaction to Influenza and other diseases.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1408T10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Dissolving Rate of Coated Vs. Non-Coated Pain Relievers

Nicole Jones

Tuscarora High School (THS)

This experiment was a test to compare coated vs. non-coated pain relievers, and their dissolving rates. To conduct this, 6 coated and 6 non-coated pain relievers were dissolved in simulated stomach acid to see which one would dissolve the fastest. Each pill was placed in 40mL of simulated stomach acid that was heated to 37C(98F). Once that temperature was reached the heat was turned off and the magnetic stirrer was set to 140 rpm. The magnetic stirrer was used to simulate the movements a stomach makes. As soon as the pill was dissolved the timer was stopped and the time was recorded. This was done for each of the 180 pills.
After the experiment was conducted all of the results were averaged. The averages were compared to see which pill actually had the fastest dissolving rate. The standard deviations and T-tests were also found. Standard deviation showed that the error bars were very small. This means that there was very little room for error in this experiment. After the T-tests were conducted it was concluded that all of the p values were less than .05. The null hypothesis (there is no significant difference between coated vs. non-coated pain relievers) was rejected. As shown in TABLE 1 and FIGURE 1, brand name acetaminophen non-coated had the fastest dissolving rate. Therefore the hypothesis stated before the experiment was conducted was accepted. The overall importance of this information is that, non-coated pain relievers can relieve your pain faster than coated pain relievers.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1409C09

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Barriers to Medical-Error Reporting in the NICU

Alexandra Lord

Loudoun County High School (LCH)

Medical-error reporting is an important component of patient safety. Under-reporting of medical errors is an established problem in healthcare. Patients treated in Neonatal Intensive Care Units (NICUs) are an especially vulnerable patient population. This project explored barriers to medical-error reporting in the NICU and determined the medical-error reporting rate in this NICU. Lack of anonymity, lack of time, fear of lawsuits, belief that it is unnecessary to report because there was not a negative outcome, and hesitancy to "tell on" someone else were the predicted barriers to error reporting. It was hypothesized that the majority of NICU staff does not report medical errors.

An anonymous survey was designed and completed by NICU staff. Subjects rated potential barriers based on importance and indicated whether they reported the last medical error they were aware of. The mean rating of each factor and the percentage of staff who reported the last error they were aware of were calculated. Data was analyzed for two groups: all staff members and staff who did not report the last error they were aware of. A one sample t-test was used to determine the statistical significance of results.

Lack of time for reporting, complexity of the reporting tool, and lack of anonymity were found to be statistically significant barriers. Sixty-four percent of NICU staff reported the last medical error they were aware of.

These results indicate that simplifying the reporting tool and making the tool anonymous should increase the percentage of reported medical errors in the NICU.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1410V10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Dissolution of Different Pills

Patricia Nagley

Park View High School (PVH)

Imagine a splitting headache crying out for quick relief. Between Aspirin and Tylenol, which pill would work the fastest to clear up that nasty problem? Luckily, an experiment was done to answer that question. The independent variable was the type of pill used: coated Aspirin, uncoated Aspirin, coated Tylenol, and uncoated Tylenol, and the dependent variable is the time it takes for a pill to dissolve, with the control being tests done in water. Each pill was soaked in both water and hydrogen chloride until the pill was completely dissolved. The results of this experiment showed both types Aspirin to dissolve faster, at 43 seconds for coated and 10 seconds for uncoated versus the 193 seconds of the coated Tylenol and 89 seconds of the uncoated in the trials done in hydrogen chloride. The hypothesis for this experiment, “If Aspirin with coating, Aspirin without coating, Tylenol with coating, and uncoated Tylenol are dissolved in water and hydrogen chloride, then Tylenol with dissolve faster” was unsupported by the results. The independent variable had an effect on the dependent variable, as can be seen when considering the differences in times between coated Tylenol and uncoated Aspirin. The main error that occurred in the experiment is that the Aspirins were possibly both coated or both uncoated. Further research could be conducted to see if different levels in milligrams of medicine change the results.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1411W09

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

What Factors Affect The Solubility of Kidney Stones?

Aspasia Padgiotis

Briar Woods High School (BWH)

The purpose of this project was to determine if different chemicals found in a variety of food could prevent the formation of kidney stones. Calcium oxalate which is usually the primary component of kidney stones was treated with Na2EDTA, citric acid, or tartaric acid. The hypothesis that the kidney stones treated with citric acid, tartaric acid, or Na2EDTA will break or dissolve in the blood filtrate was supported by the experimental data. Na2EDTA, citric acid, and tartaric acid all reacted with calcium oxalate. At 37oC the quantities of calcium oxalate dissolved using citric acid and tartaric acid did not exceed 10% while the quantity of calcium oxalate dissolved in the presence of Na2EDTA was about 20%. The independent variable in each case was the quantity of calcium oxalate and the dependent variable was the quantity of substance used to dissolve the calcium oxalate. The mass of the calcium oxalate dissolved in each of the fifteen trials was averaged together and recorded. The mode of the data for the mass of the Na2EDTA was 3.76g, for the Citric Acid 0.198g, and for the Tartaric Acid 0.298g. The average for the Na2EDTA was 0.3775g, for the Citric Acid 0.2005g, and for the Tartaric Acid 0.3025g. The null hypothesis was accepted and the alternative experimental hypothesis was supported. The use of calcium oxalate kidney stones would be a further step in evaluating the efficiency of Na2EDTA, citric acid, and tartaric acid in dissolving the stones.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1412G10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

How does Genetics Affect Taste

Victoria Perry

Woodgrove High School (WHS)

This experiment relates to the topic of genetics. The purpose was to determine if there was a connection between a human's genetics and their sensitivity to taste. The independent variable was the different types of testing strips and the dependent variable was the reaction to the testing strips. The control was a plain testing strip with no flavor. This was tested on subjects but more importantly, tested on subjects with in different families. By testing subjects with in different families, the outcome of the results was easier to compare. The subjects ranged from the ages of 10 years old to 50 years old. The procedure of the experiment was to lay out the control testing strip along with two different testing strips and have each subject test each testing strip for 4 seconds on their tongue. Each subject rinsed their pallet with water between testing strips and wrote down their results on a chart. The results showed that there is a connection between genetics and taste because every family tested exhibited a connection.

The hypothesis that was originally stated was that there would be a connection between genetics and taste and there was which means, the results supported the hypothesis. The independent variable influenced the dependent variable greatly in this experiment. Further research on this topic could explore whether there is a connection between age and taste.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1413S09

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Synergetic Effect Of Garlic (Allicin) And Ampicillin On The Antibacterial Sensitivity Of E. coli

Matin Sharifzadeh

Stone Bridge High School (SBH)

Antibiotic resistance is an immense challenge in medical field. The use of botanicals is being explored as an alternative strategy for antibacterial drug development against resistant bacteria. The experiment tests if allicin(garlic) and ampicillin act synergetically on the antibacterial sensitivity of E. coli. Allicin is formed by alliinase, an enzyme activated when garlic is crushed and it modifies sulfhydryl/thiol groups in bacteria inhibiting RNA, DNA, protein synthesis. Antibiotic resistance can be reduced by using beta-lactam antibiotic, ampicillin (inhibits cell wall synthesis) with garlic(inhibits RNA and protein synthesis) synergistically. The cell wall components have an effect on the permeability of allicin and determine the susceptibility to garlic.
1mL 10E3 cells were exposed to 3µL ampicillin, and 1gm/mL (100µL, 300µL, 500µL) garlic extract (IV). The individual controls went without antibiotic. The number of colonies (DV) were compared to a 0gm/mL garlic positive control and 0gm/mL garlic+ampicillin negative control. The average CFUs treated with garlic extract for 0µL, 100µL, 300µL, 500µL were 36.8, 37.8, 10, 9.8 respectively. Average CFUs of garlic extract+ampicillin for 0µL, 100µL, 300µL, 500µL were 19.6, 20, 8.6, 3 respectively. The ANOVA for experimental groups (garlic extract+ampicillin) returns $p=0.03$ showing statistically significant difference in CFUs. Even though CFUs decrease when garlic and ampicillin are used synergistically it is not significantly different ($p>0.05$) than CFUs obtained when garlic and ampicillin were used separately. The data was inconclusive, refuting alternate hypothesis. Evidence suggests allicin and ampicillin did not work synergistically to affect antibacterial sensitivity of E. coli.
Further research can test if garlic and antibiotics have a synergistic effect on gram-positive and gram-negative pathogenic bacteria to determine how differences in the composition of their cell walls produce differences in antibacterial sensitivity.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1414P10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Bacteria Levels on Privately Maintained Pools Versus Publicly Maintained Pools

Andrew Tedd

Potomac Falls High School (PFH)

The purpose of this experiment was to determine which pools have more bacteria, those that are publicly owned and maintained or those that are privately owned and maintained. To answer this question, a predetermined number of public and private pools had their bacteria levels tested over a period of 10 days. The same pools were tested each day. Bacteria growth test strips were used to measure the amount of bacteria in each pool, by dipping the test strips into previously collected water samples. At the end of the testing period, the results showed that on average, there was more bacteria in privately maintained pools than there was in publicly maintained pools. The mean for the level of bacteria in the public pools was 20020116 milliliters, and for the private pools it was 80100380 milliliters. The level of measurement used to perform the experiment was quantitative ratio data. The hypothesis stated that private pools would have more bacteria in them than public pools. The hypothesis was supported in this experiment. The independent variable, which was the type of pool, did influence the dependent variable, which was the amount of bacteria in the pool. Further research on this topic could explore the level of bacteria in pools maintained with chlorine as opposed to those maintained with salt water.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1415L12

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

Not at a Snail's Pace: Allantoin from Helicoidea as an Epidermal Regenerative Agent on Lumbricus Terrestris

Brooke Thomas

Loudoun Valley High School (LVH)

The purpose of this experiment is to determine whether the application of different Helicoidea snail mucus increases the rate of healing of cut Lumbricus terrestris. The hypothesis states that the addition of Helicoidea snail mucus to the afflictions on the Lumbricus terrestris will decrease healing time on the worm as compared to a similarly cut worm not exposed to the mucus. For one trial, two worms were measured in length and mass then cut below the clitellum using a razor. On the experimental worm, mucus from either Mesdon thyrodius or Zachsyria provisoria were placed immediately on the injury for three minutes. For the next ten days, both worms were measured in length and mass every other day. The worms dosed with Z. provisoria gained in mass on average by 0.19 grams and in length by 1.667 centimeters. The worms dosed with M. thyrodius gained on average in mass by 0.46 grams and in length by -1.1667. The control worms on average lost mass by -0.75 and lost length by -2.9416. Although a statistical t- test does not show significant differences, it is apparent from the averages that the worms that had experienced Helicoidea mucus healed faster than did the control worms. Based on the results, the hypothesis was supported in that the worms healed faster with the application of the mucus. The experiment could be improved by testing the snail mucus for antibacterial qualities and using different families of snails to aid the worms' healing process

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1416S10

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Antagonistic Effect Of Lactobacillus acidophilus On E. coli

Erin Videgar

Stone Bridge High School (SBH)

L. acidophilus is non-pathogenic, common flora of gastrointestinal tract , used as probiotic and is known to help in digestion/absorption of food and nutrients, improvement of intestinal microflora and immune system, and may inhibit growth of enteric pathogens by producing inhibitory compounds such as bacteriocins that have antimicrobial potential.
The antagonistic effect and concentration of L.acidophilus required to suppress growth of E.coli was determined by adding 1mL of 10E4 cells/mL, 10E3cells/mL, 10E2cells/mL of L. acidophilus (IV)to 1mL of 10E3cells of E. coli in LB broth. E. coli without L. acidophilus was control. The incubation (37C) was followed by dilution (0.5µL cell suspension+20mL of sterile distill water) to get numerable colonies. 100µL was plated on MacConkey's agar which is a selective and deferential media that allows only Gram negative E.coli to form colonies, while inhibiting growth of Gram Positive Lactobacilli. The viable E.coli CFUs were counted (DV).
The Average CFU for control, 10E4, 10E3, 10E2 were 33.3, 0, 18.5, 90.4 respectively. T-test for control and 10E2 cells/mL, contol and 10E3 cells/mL did not show statistically significant difference ($P>0.05$) in CFU. T-test for control and 10E4 cells/mL showed statistically significant difference in CFU ($P<0.5$) thus supporting alternative hypothesis. 10E4 cells/mL of L. acidophilus inhibit growth of 10E3cells/mL of E.coli.
The health benefits of L.acidophilus include reduction of pediatric diarrhea, decrease in toxins in blood, improvement in lactose digestion in lactose intolerant, protection from colon cancer, coronary heart disease, and reducing undesirable effects of chemotherapy/ radiation. More research is required to explore possibility of use of Lactobacilli as an alternative strategy for antibacterial drug development that can be used to control of antibiotic resistant infections.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1417B09

Medicine & Health Sciences
1400

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Isopropyl Alcohol on Viruses

Robert Wang

Broad Run High School (BRH)

In today's society, people are overcautious and might be prone to purchasing anti-illness products. The purpose of the experiment is to see if the 70% alcohol will eliminate the virus. The IV is the contact time of the product and virus. The DV is the amount of infected cells within the wells. The Cell Viability Control is the uninfected cells, the Virus Stock Titer Control is untreated virus, and the Plate Recovery Control is the worst case scenario. First, count the cells. After, seat the cells in a 96 cell plate. Treat the virus with alcohol on different contact times: 30 seconds, 1, 5, and 10 minutes. After the time is met, add the Neutralizer, Newborn Calf Serum. Perform ten-fold serial dilution to see how much of the alcohol is needed. Transfer the diluted mixture onto the cells, and store in 37°C incubator. After 5-8 days, review through CPE. The result was a complete support of the hypothesis. There was no virus present in any of the contact time trials. The controls stayed as they were supposed to. The alternative hypothesis was supported. Therefore it was impossible to perform a data analysis. The IV did an impact on the DV. It showed that the alcohol needed at least 30 seconds. The null hypothesis was rejected.
Further research could explore the effect of the product on other virus, such as the flu because the flu is a huge threat to public health.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Microbiology (1500)

Project No.	Last Name, First Name	Title
1501C10	Alexandre, Marie Bernadette	Effect of a Pepper's Capsaicin Amount and Order of Plating/Incubation on its Antimicrobial Properties
1502W10	Batista, Daphne	Which Contact Lens Solution Sterilizes Bacteria the Best?
1503S09	Channer, Connor	The Effect Of Photoreactivating Light Exposure On Reverting UVB Induced DNA Damage And The Survival Rate Of Saccharomyces cerevisieae Cells
1504L12	Fatseas, Elizabeth	The Effect of Turmeric and Cinnamon on the Suppression of Agrobacterium tumefaciens.
1505D12	Friedman, Yuval	The Treatment of Citrus Mold (Penicillium digitatum) via Acoustic, Ultraviolet, and Vibrational Controls
1506W12	Gorick, Catherine Sharifzadeh-Moghaddam, Yasamin	Investigating the Antifungal Properties of the Lower Termite Reticulitermes flavipes
1507S10	Hawkins, Nicholas	The Protective Effect Of Antioxidant Properties Of Grapefruit Seed Extract On Saccharomyces cerevisiae Cells Exposed To An Oxidizing Agent
1508L10	Markowski, Mae	Physarum poly-Theseus: Protist with Primitive Intelligence
1509W12	Pothen, Mary	In Search of a Predictive Virulence Marker: Examining Phylogenetic Long-term Trends and Characteristics in the Evolution of Hemagglutinin Surface Proteins in Human Influenza Type A
1510T09	Rosas, Natalie	Which Active Ingredients in Acne Medicines Penetrate Those Pesky Pimples?
1511G10	Stone, Forest	The Effect of Temperature on the Suvivability of L. acidophilus Bacteria

1501C10

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Effect of a Pepper's Capsaicin Amount and Order of Plating/Incubation on its Antimicrobial Properties

Marie Bernadette Alexandre

Loudoun County High School (LCH)

This experiment was primarily conducted to determine the effect of a pepper's number of capsaicinoids on the pepper's antimicrobial properties. If adding bell, jalapeño, Serrano, Thai, and habanera pepper extracts to gram positive S.epidermidis on the sheep's blood agar plates, then the habanera pepper would have a greater inhibitory effect on the bacterium since it has a higher number of capsaicin. Since this experiment showed no differences in the pepper's antimicrobial effects, a different procedure was tested: the effect of the chronological order of the incubation and plating of the bacterium and pepper extract using S.epidermidis. The Thai and habanera pepper mixtures were able to inhibit this bacterium when the solution was incubated before being plated on nutrient rich agar. Since S.epidermidis is a gram positive bacterium, the gram negative E.coli was also tested using this incubation before plating method. None of the peppers were able to inhibit E.coli, but the gram positive test showed a significant difference of a 0.037 P value comparatively. Only when the pepper extracts of Thai and habanera peppers were incubated with the gram positive bacteria, S.epidermidis the plated and re-incubated, were any inhibitory action observed on the agar. Peppers with a high enough level of capsaicin could be used in the medical field to treat viruses or infections, thus killing the bacterium present.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1502W10

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Which Contact Lens Solution Sterilizes Bacteria the Best?

Daphne Batista

Briar Woods High School (BWH)

The purpose of the experiment was to see which contact lens solution would sterilize bacteria the best, since all contact lens solutions claim to be the number one cleaner. The independent variable are the three solutions being used, dependent variable is the size of the bacteria's "halo" that is affected by the solution used; the larger the "halo" is, the more effective it was in killing the bacteria. Sterilized water will be used as the control, and constants include the same bacteria species used, filter paper size, time filter paper spent on Petri dish, and equal amounts of solution being used. Filter paper was soaked in the solution and the placed on the Petri dish full of bacteria, it was left overnight and if the solution was effective, it left a "halo" of space where bacteria used to be. The Clear Care solution was the most effective in completely wiping out the entire Petri dish of bacteria. Next came the Opti-Free and Boston Simplus solutions, with averages of 2.25cm and 1.7cm respectively. The alternative hypothesis was supported; the solution with more active ingredients will sterilize bacteria the best. The independent variable had an effect on the dependent variable because of the makeup of ingredients found. Further research, if affordable, could be to test all of the contact lens solutions and compare whether or not a specific ingredient has an effect.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1503S09

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Photoreactivating Light Exposure On Reverting UVB Induced DNA Damage And The Survival Rate Of Saccharomyces cerevisieae Cells

Connor Channer

Stone Bridge High School (SBH)

The Xeroderma Pigmentosum patients are deficient in the nucleotide excision repair of damaged DNA and are sensitive to UV light. Photolyase, DNA-repair enzyme monomerizes pyrimidine dimers in DNA using energy from visible light (300–500nm) after UV exposure, before cell replication which is termed as photoreactivation. The experiment evaluates the occurrence and efficiency of photoreactivation in reverting UVB induced DNA damage and its effect on the survival rate of S. cerevisieae cells exposed to UVB. S. cerevisieae HA2 with a functional photoreactivation system is sensitive to UV-B and produces photolyase thus making it a choice of model organism. LD50 was determined as 17sec by plating 100µL of S. cerevisiae HA2 10E3cells/mL and irradiating with UVB in increments of 5 seconds. The survival rate/CFU (DV) for set1-unirradiated incubated in dark (Positive control) were 7.46, set2-UV-B (for LD50) incubated in dark were 7.58, set3- UV-B followed by photoreactivation (IV) were 8.86. The ANOVA returned p=0.40 showing that the 3 sets do not have statistically significant difference in CFUs. T-test for photoreactivation set and UVB-exposed set returned p=0.32 indicating no statistically significant difference in CFUs thus refuting the alternative hypothesis. The p-value for control and UVB is 0.92, meaning CFUs for control and UVB are not significantly different making the experiment inconclusive as UV light did not affect CFU significantly.
Although humans have not shown the ability to do photoreactivation, further studies could explore the possibility to repair UVB induced DNA damage through topical application of enzyme photolyase, derived from S. cerevisieae, E. coli. The exogenous photolyase that monomerizes UV-induced dimers in cells can be a good alternative to the endogenous excision repair in the treatment of xenoderma pigmentosum.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1504L12

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Turmeric and Cinnamon on the Suppression of Agrobacterium tumefaciens.

Elizabeth Fatseas

Loudoun Valley High School (LVH)

Agrobacterium tumefaciens is a bacterium that destroys multiple plants and vegetation. This experiment was designed in the hopes that it would yield a potential solution to this bacterium that causes crown gall disease in plants. If either cinnamon or turmeric is applied to a carrot slice that is infected with Agrobacterium tumefaciens, then they will inhibit the growth of A. tumerfaciens. In order to perform this experiment, the following materials are needed: carrots, bleach, soil, Agrobacterium tumefaciens, turmeric, cinnamon, Petri dishes, scalpels, inoculating loop, and gloves. The carrots must be cut into slices about ¼ of an inch and bleached afterwards. Next, soil is added to each Petri dish section and packed. Place one carrot slice in each section and inoculate Agrobacterium tumefaciens with an inoculating loop on each carrot slice. In the third disc, either turmeric or cinnamon is be added to each carrot in that disc. Afterwards, place the Petri dishes in a safe spot and observe them over the next two to three weeks. Rate the growth of the bacteria on the following scale: 0=No change, 1=Few White Spots/nodes, 2=Multiple White spots/nodes, 3=Small clusters of white spots/small nodes, 4=Large clusters of white spots/large nodes. The turmeric yielded significant results compared to the control in the t-test (t Stat=4.0; t Critical two-tail=2.78). The results of cinnamon are still pending with hopes that it will be successful much like turmeric. Based on the results, the hypothesis was supported because the turmeric successfully inhibited bacteria growth. This experiment could be improved by cutting the carrots into thicker segments so they don't decay as quickly as they did in this experiment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1505D12

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Treatment of Citrus Mold (Penicillium digitatum) via Acoustic, Ultraviolet, and Vibrational Controls

Yuval Friedman

Dominion High School (DMH)

Fungi are used for everything from food flavoring to antibiotic production. Yet perhaps most importantly, they are a source of disease and death worldwide. Eradication, or even reduction, of the presence of fungal species in and on food and the contamination of equipment used in the sterilization process may improve not only the shelf life of food but also the health of the public.

Penicillium digitatum, a citrus-infecting fungus commonly seen on oranges, was exposed to shaking, ultraviolet light, and different sound frequencies to test its viability afterwards. Liquid cultures of fungi were shaken for 30 minutes by vortex mixer then were immediately plated and growth was observed for two days. Additionally, liquid fungal cultures were exposed to ultraviolet lights for 20 hours and plated followed by two days of growth observation. Lastly, cultures were subjected to sound frequencies of 10 Hz and 35 kHz for 24 hours and were plated and observed for two days. Ultraviolet light and sound frequency exposure did not appear to have any effect on minimizing fungal growth. However, shaking did reduce the growth of the fungi dramatically.

As a result, it is suggested that there are other methods by which food-borne pathogen growth may be controlled. Hence, the incidence and treatment of food poisoning cases could decrease dramatically, not only improving health but also saving thousands in money. Further application may also be seen in the field of medicine, where shaking procedures such as lithotripsy may help decrease fungal infection rate.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1506W12

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Investigating the Antifungal Properties of the Lower Termite Reticulitermes flavipes

Catherine Gorick

Briar Woods High School (BWH)
Academy of Science (AOS)

Yasamin Sharifzadeh-Moghaddam

Stone Bridge High School (SBH)
Academy of Science (AOS)

An investigation was conducted to identify the source of the antifungal properties of the lower termite, Reticulitermes flavipes, when exposed to the fungus Aspergillus niger. Previous research demonstrated antifungal properties in termites, but the actual origin of them was not found. Our investigation consisted of three parts, each testing a different part of the termite/endosymbiont system of protozoa, bacteria and hemolymph. The respective parts of the termite/endosymbiont system were isolated and centrifuged to remove experimental supernatant. Part 1 tested the whole termite system. Part 2 tested the termite hemolymph without protozoa, and part 3 tested the termite hemolymph without bacterial or protozoan endosymbionts. Our hypothesis was that the antifungal properties of R. flavipes would be found in the termite hemolymph. A well diffusion assay was run with the different experimental supernatants on PDA, and fungal growth was analyzed after 48 hours. Two-proportion t-tests were run between the fungal control and isolated supernatants. P-values of 0.0056 between control and full termite system and 0.0055 between control and isolated hemolymph were calculated. A p-value of 0.78 was calculated between the entire supernatant and supernatant filtered through a 0.45µm filter, which removed the symbiont protozoa, demonstrating that the protozoa were not responsible for the antifungal properties. An intermediate conclusion is that the antifungal properties were from the termite hemolymph or endosymbiotic bacteria. Testing continues with a 0.22µm filter to remove the bacteria and further isolate antifungal properties. Gel electrophoresis trials were run to identify prominent antifungal proteins and to compare these to the molecular weights of known antifungal peptides. Gel trials indicated the presence of a small peptide similar in molecular weight to the known antifungal termicin. The finding and isolation of these proteins can lead to future natural fungicides.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1507S10

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Protective Effect Of Antioxidant Properties Of Grapefruit Seed Extract On Saccharomyces cerevisiae Cells Exposed To An Oxidizing Agent

Nicholas Hawkins

Stone Bridge High School (SBH)

Oxidative stress contributes to human disorders, as well as aging. Grapefruit Seed Extract(GSE) holds antioxidant-properties, neutralizes free radicals while protecting cells from oxidative damage.
The experiment assessed the efficacy of 0.04g/mL, 0.05g/mL and 0.06g/mL of GSE(IV) by exposing GSE supplemented S. cerevisiae(10E3cells/mL) to 3%H_2O_2 (50µL), in order to find the GSE concentration with sufficient antioxidant properties to neutralize damaging effects of H_2O_2 that can protect cells from oxidative damage. 200µL suspension was plated and CFUs were counted (DV).
The ANOVA returns P=0.057. Though not statistically significant, there is a difference in CFUs between the control and groups exposed to H2O2. The negative control, 0g/mL GSE+H_2O_2(27.8 CFU)was compared with 0.04g/mL GSE+H_2O_2(22.2 CFU), 0.05g/mL GSE+H_2O_2(42.2 CFU), and 0.06g/mL GSE+H_2O_2(30.4 CFU). The increase in CFUs with the increase in GSE concentrations indicates that cells supplemented with GSE were protected against oxidative damage. GSE will most likely protect human cells from oxidative damage as well due to the similarity in S. cerevisiae and human genes used to repair DNA.
The t-test for Control 0g/mL GSE+H_20_2 and 0.04g/mL GSE+H_20_2, and Control 0g/mL GSE+H_20_2 and 0.06g/mL GSE+H_20_2 returned P=0.1, P=0.65 respectively, indicating no significant difference in CFUs thus refuting the alternative hypothesis. The Control 0g/mL GSE+H_20_2 and 0.05g/mL GSE+H_20_2 showed a statistically significant difference in CFUs(P=0.02).
The effectiveness of GSE in protecting against other mutagens, such as ultra-violet rays, could be explored. The antibacterial properties of GSE could be studied by exploring its effect on bacteria.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1508L10

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Physarum poly-Theseus: Protist with Primitive Intelligence

Mae Markowski

Loudoun Valley High School (LVH)

This project focuses on microbiology with the study of Physarum polycephalum, the common slime mold. The organism currently belongs to the kingdom Protista, but new evidence suggesting Physarum polycephalum's intelligence argues the creation of its own kingdom all together. Could a slime mold possess primitive intelligence? This project investigates this question.

One culture of Physarum polycephalum was placed in a 5 x 5 cm maze, printed on transparency paper, with food at the starting points, and four possible routes: A1 (110 mm), A2 (112 mm), A3 (114.5 mm), and A4 (116 mm). Pieces of the culture were placed within the maze, allowed time to connect throughout the labyrinth, and then observed to see its chosen path. If it had selected the shortest path, A1, then it had "solved" the maze.

In the first trial the Physarum polycephalum chose A1. It abandoned the maze in trial 2 and created its own path in trial 3. In this final trial, the Physarum polycephalum crossed over a wall for a distance of 93.5 mm. Although it was not along a "legal" path, it beat A1 by 16.5 mm.

Ultimately, the hypothesis that the Physarum polycephalum would solve most of the mazes was supported. The varying results probably came from experimental flaws, like the flat maze design and the culture's death. Still, the organism was able to solve the maze two out of three times. Perhaps this is enough evidence for the creation of an entire new kingdom.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1509W12

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

In Search of a Predictive Virulence Marker: Examining Phylogenetic Long-term Trends and Characteristics in the Evolution of Hemagglutinin Surface Proteins in Human Influenza Type A

Mary Pothen

Briar Woods High School (BWH)
Academy of Science (AOS)

Historical records show that the flu can cause a pandemic one year and relatively mild symptoms the next. Can we predict when the next pandemic will occur? The goal of my research is to identify critical markers for virulence by analysis of the evolution of the viral coat protein hemagglutinin (HA) in human influenza type A. Viruses mutate randomly at high frequencies, but evolve in a pattern dictated by immune selection. This evolutionary process selects for the influenza virus with HA surface proteins that can elude host cell antibodies but still bind to the host cell's surface receptors and infect the cell. Structure determines the function of a protein and therefore plays an integral role in phenotypic properties, such as increased virulence. Consequently, a potential correlation may exist between certain protein structural characteristics and levels of pathogenicity. As past research has indicated, structural changes involving receptor specificity serve as strong candidates for virulence markers since binding capability and host specificity are major determinants virulence. The potential of N-Glycosylation as a marker of virulence was tested by comparing glycosylation potential values (obtained from NetNGlyc Server) of virulent and non-virulent amino acid sequences and conducting a statistical t-test to test for statistical significance. Virulent and non-virulent sequences were shown to have significantly different ($P < 0.05$). The identification of these important trends in the viruses' evolutionary history may be predictive of strain epidemic potential and may be even pivotal in isolating the progenitor of future generations of epidemic viruses.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1510T09

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

Which Active Ingredients in Acne Medicines Penetrate Those Pesky Pimples?

Natalie Rosas

Tuscarora High School (THS)

This project discovered which active ingredients in acne medicines are bacteriostatic and bactericidal. The independent variables consisted of varying concentrations of three different active ingredients; the dependent variables were zones of inhibition surrounding drug-soaked (benzoyl peroxide (BP), sulfur, and tea tree oil) sterile disks on E. coli-plated petri dishes, whereas E. coli alone was the control. 5% BP maintained a zone of inhibition between 0.6 cm- 0.625 cm. The 10% percent BP's zones included averages of 0.725 cm, 0.7 cm, 0.713 cm, 0.725 cm, 0.763 cm, and 0.788 cm. The 2.5% BP showed no results. The less than 15% tea tree oil maintained a zone between 0.6- 0.625 cm whereas, the 15% tea tree oil showed averages measuring 0.75 cm, 0.775 cm, 0.775 cm, 0.775 cm, 0.725 cm, and 0.775 cm. The 100% tea tree oil exhibited zones averaging 1.9 cm, 1.925 cm, 2.875 cm, 2.775 cm, 2.575 cm, and 2.475 cm. Interestingly, the tea tree oil's high zones of inhibition masked a slowly decreasing zone, demonstrating its bacteriostatic abilities. The BP's steadily increasing zone made up for its insignificant zone diameter. The null hypothesis was rejected for the tea tree oil at 15% and 100% ($p<0.05$, t-test), and the 10% BP ($p<0.05$, t-test) whereas the null hypothesis failed to be rejected for the <15% tea tree oil ($p>0.05$, t-test) and 5% BP ($p>0.05$, t-test).To further test this project, a larger variety of acne medicines and concentrations would be tested on skin of different genders, ages and races.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1511G10

Microbiology
1500

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Temperature on the Suvivability of L. acidophilus Bacteria

Forest Stone

Woodgrove High School (WHS)

This experiment was designed to determine if the probiotics found in store-bought yogurt can survive temperatures in order to be able to be absorbed into the human small intestine. The independent variable for this experiment was the various temperatures. The dependent variable was the percent of lawn growth of the probiotics at designated temperatures. The control group was the acidophilus capsules with a known bacteria count. Agar-coated Petri dishes were streaked with yogurt and acidophilus capsules for a total of 16 trials each at each temperature. Petri dishes containing yogurt and the control were placed into different temperatures (commercial refrigeration, room, and body temperature) for 48 hours, the same amount of time required for bacteria to gestate in the human body. The results of this experiment show that there is no “magic pill.’ At both room and body temperature, yogurt displayed more bacteria growth; specifically, 13.1250% at room temperature and 63.4375% at body temperature. The t-test rejected the null hypothesis. The alternative hypothesis was if foods that naturally contain L. Acidophilus are exposed to extreme temperatures, then the bacteria will survive as well as store-bought L. Acidophilus capsules. This hypothesis was not supported. The temperature had a major impact on the growth of the probiotic. The acidophilus pill did not outperform the centuries old remedy of yogurt. The major source of error was the inability of the incubators to achieve the exact desired temperatures. Further research should explore if the probiotics can survive the pH of the human digestive system.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Physics & Astronomy (1600)

Project No.	Last Name, First Name	Title
1601H09	Blackley, Nicholas	The Effect of Magnet Spacing on Launch Velocity
1602P10	Brito, Priya	The Effect of Clear Coated Glass Refraction on the Luminous Flux of Reflected Light Particles
1603W10	Bryan, Meghan	The Effect of Guitar String Brand on Accuracy of Pitch and Amplification of a Guitar
1604T09	Cline, Julia	How the Anodization of Titanium Rods Affect Their Ability To Conduct Electricity?
1605L10	Del Vecchio, Anthony	The Effects of Heat on Magnetism
1606H11	Dyckovsky, Ari	Photon Mode-matching for Remote Hybrid Entanglement Between Distinct Quantum Memories
1607D12	Heindel, Andrew	The Application of a Partially Derived Dirac Equation in Assessing Feasibility of Topological Insulators
1608D12	Hirshman, Nathan	The Use of Pressure Sensitive Material to Indicate a Concussive Force: A Novel Approach to Head Trauma Diagnosis
1609H12	Im, Seong Bin	Rapid Gas Acceleration During Black Hole Mergers
1610F10	Law, Darren	How Does Water Affect Static Friction?
1611S12	Mace, Eliza	Modeling Energy Resolution of the CMS Electromagnetic Calorimeter
1612H10	Manser, Grace	The Effect of Light on Artwork
1613T10	McCord, Nicholas	The Effect of the Length of a Paintball Barrel on its Accuracy
1614L10	Mumpower, Scott	Get the Lead Out: Can the Accuracy of a Lead – Free “Green” Hunting Bullet Help Reduce the Exposure of Lead in Humans and Wildlife?
1615B10	Oreshkov, Andrey	Comparing Amateur Crater Measurements to NASA Measurements
1616T10	Palmer, Dagney	The Effect of Distance on Magnetism
1617B09	Peddibhotla, Bharath	The Effect of Magnesium on Gravity
1618C10	Rivera, Adrienne	The Effects of Temperature and Humidity on the Pitch of a Piano Key
1619T10	Saunders, Dylan	What Major Chord Affects The Tuning Of A Guitar The Most?
1620F09	Schendzielos, Rachel	The effect of material reflectance properties on the Bidirectional Reflectance Distribution Function (BRDF).
1621L10	Shayka, Mark	Centripetal Force: Bank on It!
1622T10	Sotos, Peter	The Effect of MP3 Bit Rate on Sound Quality and Genre Classification
1623L10	Thomas, Zachary	Ballista Angle Shoot-off
1624S10	Yocca, Kailey	The Effect Of Different Types Of Shin Guard Materials On The Amount Of Force Absorbed

1601H09

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Magnet Spacing on Launch Velocity

Nicholas Blackley

Heritage High School (HTH)

The purpose of the experiment was to test how magnet spacing affected the efficiency of a linear magnetic accelerator. The experiment was performed by constructing a linear magnetic accelerator and testing the acceleration of a steel ball at different magnet intervals. The independent variable was the velocity of the steel traveled. The dependent variable was the interval of the magnets. Five, six, seven, eight, and ten centimeters were the intervals tested. The control was the magnet intervals at seven centimeters. The test was performed by launching the steel ball into a sand pit and measuring the distance the ball went. Because the ball fell in a parabolic arch, the velocity of the ball could be mathematically determined. The means for the five, six, seven, eight, and ten centimeter intervals were 3.41, 4.36, 4.13, 3.69, and 4.12 m/s respectively. ANOVA tests were performed on the data sets as statistical analysis. The alternative hypothesis stated if the six centimeter interval is tested, it will yield the highest velocity. The alternative hypothesis was supported as the six centimeter mean velocity was the highest. The statistical tests also showed that the five centimeter data set was statistically different from the seven, eight, and ten centimeter data sets. This means that the space between magnets in a linear magnetic accelerator affects the launch velocity. Further studies might explore the optimization of the linear magnetic accelerator in larger scale and with more varying magnet strength.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1602P10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Clear Coated Glass Refraction on the Luminous Flux of Reflected Light Particles

Priya Brito

Potomac Falls High School (PFH)

For many years sun glare issues have caused unruly harm towards drivers as direct sun glare or reflected sun glare. As reflected sun glare, the purpose of the experiment is to determine if a clear coat on a front windshield will have any effect on the luminous flux of light particles. The independent variables, the different refracting objects (no glass, plain glass, and clear coated glass), were altered to effect the luminous flux of the light (dependent variable). A flashlight was first directed straight at the light sensor to determine the original luminous flux (control group). This was then continued with the other independent variables throughout. The control group yielded a high average luminous flux of 485.9033 while the reflected particles that were not refracted, refracted by plain glass, and refracted by clear coated glass averaged 19.99, 14.6, and 11.29667 lux. Statistical findings showed that the three tests involving reflected light particles brought up a larger variation (>3) when compared to the control group which had a variance of 0.00792. The results then showed that the hypothesis – if light rays are both reflected and refracted, by clear coated glass, then less light particles will be sensed- was supported. The results mean that the addition of a clear coat on a windshield influenced and reduced the luminous flux of light particles reflected off of car hoods. Further research could explore the effect of multiple layers of clear coat on reflected light particles as well as the effect of different reflective surfaces.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1603W10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Guitar String Brand on Accuracy of Pitch and Amplification of a Guitar

Meghan Bryan

Briar Woods High School (BWH)

The purpose of this experiment was to find a type of guitar string (IV) that had the most accurate pitch and amplification (DV) after it was being played on for a certain amount of time. Three types of strings (Ernie Ball, Martin, and Elixir) were tested on a Guild acoustic guitar to find out which had the best pitch and amplification after being played for the allotted amount of time. The amplification of the guitar was tested by using a spectrometer and the pitch was tested by using an electronic tuner. The means of the amplification of the Ernie Ball, Martin and Elixir strings were -23.9 decibels, -23.2decibels, and -16.9 decibels. After a T-test was done, it was proven that the amplitude of all the strings was insignificant and the null hypothesis is accepted. For the pitch, a chi-test had to occur and the low E string was tested after each trial of playing music to see if the pitch had either been flat, sharp, or in tune. After the test, it was concluded that the null hypothesis is rejected and the research that the type of guitar string would affect the pitch of the acoustic guitar was supported. This means that after the experiment it was conducted it was proven that different types of strings affect the pitch of an acoustic guitar and don't affect the amplification of an acoustic guitar.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1604T09

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

How the Anodization of Titanium Rods Affect Their Ability To Conduct Electricity?

Julia Cline

Tuscarora High School (THS)

The purpose of this experiment was to discover if differing levels of oxide coating on titanium alloy rods affects their ability to conduct electricity. This is important because when similar rods are used in surgery they could be affecting a process called Intraoperative Neuromonitoring (a procedure that uses an electrical current to determine how close or far the surgical devices are to a patients central nervous systems). In this experiment the independent variable was the amount of oxide coating on the rods, the dependent variable was how much resistance the rods offered, and the control was a rod not anodized; that is without an oxide coating. Two simple circuits were used to test resistance and voltage when powered by a battery. T-Tests, Averages, and Standard Deviation were used. In Table 1B all of the T-Test data was shown to be less than .05, which means that the null hypothesis, that there is no significant difference between the oxides coated rods and the control rod, was rejected. The amount of oxide on the rods did affect the resistance of the rods. In conclusion the experimental hypothesis was accepted by the data and further research could explore more accurately how the anodization affects the resistance of the rods and how exactly this information affects the procedures used in surgery.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1605L10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Heat on Magnetism

Anthony Del Vecchio

Loudoun Valley High School (LVH)

The purpose of this experiment was to observe the effects temperatures had on magnetic properties. The independent variable in this experiment was the types of magnetic being tested. The dependent variable was the time and temperature it took the magnet to lose its properties, such as magnetic pull. The control was simply a magnet not being exposed to an increase of temperature. The experiment was performed with a pendulum, two magnets and a candle. The results yielded that they average temperature at which the magnets lost its magnetic pull was 30.0 and 32.1 in about two minutes. The p value was lower than .05, which showed the there was a statistical significance between the experimental groups. This supported the hypothesis, which stated that the higher the temperature the faster a magnet loses its properties. Further research and experimentation could test if the properties of magnets could be used for refrigeration.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1606H11

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Photon Mode-matching for Remote Hybrid Entanglement Between Distinct Quantum Memories

Ari Dyckovsky

Heritage High School (HTH)
Academy of Science (AOS)

Perfectly secure communication may be possible through the use of quantum communication protocols. Quantum communication utilizes the features of quantum physics – specifically entanglement, a non-classical link between two quantum objects – to guarantee a secure communication channel. Entanglement between two quantum memories (reliable and efficient information storage units) is created over large distances by interfering two photons at a 50:50 beamsplitter. My project evaluates establishing novel remote hybrid entanglement between a single trapped barium ion and a cavity-coupled nitrogen-vacancy center. The theoretical model uses lifetime-limited temporal mode functions and frequency mode-matching to describe the single-photon states emitted from each quantum memory. Using these descriptive mode functions, the interference between the photons is characterized, and the resulting entanglement between the quantum memories is evaluated in terms of fidelity. My computed fidelity surpasses the necessary mark of 99% for practical quantum communication with an acceptable rate of entanglement. Remote hybrid entanglement of this quality has the potential to greatly enhance defense-related and financial communications in the near future.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1607D12

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Application of a Partially Derived Dirac Equation in Assessing Feasibility of Topological Insulators

Andrew Heindel

Dominion High School (DMH)

Over the past few decades, quantum computing has become a leading area of interest among researchers and engineers. However, conventional wire technology and materials have been of little use in the field of quantum computing. Topological insulators may help to alleviate this issue. Three dimensional topological insulators are of primary interest because the internal portion of the insulator insulates while the outer portion permits the flow of electrons. The three dimensional insulator connects at a single Dirac cone between the valence band and the conduction band allowing an increased flow of electrons because they are confined to a single path.

Currently, there are only five compounds accepted as three dimensional topological insulators which indicates that additional insulators may exist. By using Dirac's equation, and setting it equal to one (one Dirac point), it could theoretically prove that the virgin compound follows topological theory. In this research, a new equation and program were created which offers a way to tests compounds if the del operator is known.

Further research would entail refinement of the program to affirm the viability of virgin compounds as topological insulators more quickly. Further accuracy may be achieved if constants are better defined. This would allow insulator use and subsequent quantum computing expansion particularly in the field of computer security.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1608D12

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Use of Pressure Sensitive Material to Indicate a Concussive Force: A Novel Approach to Head Trauma Diagnosis

Nathan Hirshman

Dominion High School (DMH)

Concussions are severe brain injuries caused by significant impact to the head or body. Repeated concussions may cause long-term neurological damage including reduced cognitive function, psychiatric disorders and Second Impact Syndrome, a potentially fatal complication that occurs when one suffers a second head injury before concussion symptoms have completely resolved. Recently, incidents of concussions have increased dramatically in sports. The intent of this research was to design a helmet that would allow more accurate on-field diagnosis and limit repeated brain trauma.

Pressure sensitive film, commonly used in building construction, was tested for its response to impact force. Weights were dropped onto film strips from a height of .6 meters and film color change was noted. Magenta values of photographs of the film were analyzed and indicated a positive correlation between applied weight and color change. Subsequent tests were conducted in which a barrier functioned as a protective helmet between the weight and the strip. As with the first test, magenta values increased as weight increased. Thus, the null hypothesis, that the application of differing weights and forces would have no effect on the color of pressure sensitive material, was refuted. A prototypical helmet was designed, placing pressure sensitive strips throughout the helmet.

Further research would entail determination of the force threshold necessary to cause a concussion in various sized individuals. This value would allow customization of protective helmets based on individual morphology. As a result, traumatic brain injury resulting from competition, military battle or motorcycle could be reduced.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1609H12

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Rapid Gas Acceleration During Black Hole Mergers

Seong Bin Im

Heritage High School (HTH)
Academy of Science (AOS)

van Meter et al. (2010) simulated accretion gas particles around coalescing black holes and found that a small number of the gas particles get accelerated to extremely high speeds. Although all calculations were done using fully incorporated general relativity, these highly accelerated gas particles behave similarly to an object experiencing a slingshot effect which is a purely Newtonian effect. My research focuses on determining if the rapid gas acceleration is a Newtonian effect or a relativistic effect.

I repeated their simulation using purely Newtonian mechanics instead of general relativity, except that I included Schwarzschild radii in my simulation to allow particles to be captured. Using a Monte Carlo simulation and Fourth-order Runge-Kutta method, I calculated the velocities and positions of 75,000 gas particles in the black hole binary simulation. I find that no particle ever reaches a positive mechanical energy meaning no gas particle escapes from the black hole binary system, which suggests that the rapid gas acceleration is not due to Newtonian effects.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1610F10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does Water Affect Static Friction?

Darren Law

Freedom High School (FHS)

How is static friction affected by water on different surfaces? The experiment included the absence of water and the use of water on the different surfaces concrete, metal, and the control, asphalt. A probe which measured force (N) was attached to a low friction pulley that was hooked onto a remote control car. While holding the low friction pulley in place, the car was accelerated, and the highest force on the probe was recorded, which is the point of static friction before it breaks. The surface was sprayed with water and the same procedures were done. Both dry and wet surfaces were tested 15 times each. From the T tests there was no significant difference. The null hypothesis was accepted. The alternate hypothesis “If the asphalt surface is tested, then the difference between static friction and static friction with added water will be the greatest compared to the metal and concrete surfaces” was rejected because statistically, there was no difference. The levelness of the surface was one source of error because not all of the surfaces were level with each other. Further research could explore how static friction affects speed seeing as static friction is not affected easily.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1611S12

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Modeling Energy Resolution of the CMS Electromagnetic Calorimeter

Eliza Mace

Stone Bridge High School (SBH)
Academy of Science (AOS)

Methods of modeling the energy resolution of the CMS Electromagnetic Calorimeter are discussed. Data from a 2007 test of an ECAL endcap at the H4 test beam facility met the 0.5% energy resolution limit set by the CMS design specifications; however, the data did not fit the theoretical energy resolution parameterization well, as measured using a chi-squared test. Histograms of the data had been modeled using the Crystal Ball function. It is hypothesized that using a different mathematical model for the data would yield a better fit to the theoretical model. The uncorrected data from a 5×5 matrix of crystals are obtained from a histogram. These data are then fit to the Weibull function, weights method, logistic distribution, and a combination of the Weibull function and weights method. These functions were all chosen because, unlike the Crystal Ball function, they are not piecewise defined and also because they reflect the general shape of the histograms. The Solver in Excel was used to minimize the chi-squared value between the histograms and each function. The resultant function values for each histogram are then used to calculate the energy resolution for each value of beam energy. The final energy resolution data points are then fit to the theoretical energy resolution parameterization by minimizing the chi-squared value using the Solver in Excel. None of the other functions yield a better fit than the Crystal Ball function.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1612H10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Light on Artwork

Grace Manser

Heritage High School (HTH)

Museums must take lighting into consideration, because it changes the appearance of artwork. This experiment's purpose was to discover the most pleasing light for viewing artwork. Three light sources, a Reveal incandescent, a Daylight CFL, and a Solux bulb, were shown individually on a watercolor painting. After viewing the artwork under the three lights, the subjects, 15 women ages 25-50, ranked them from 1 (most pleasing) to 3 (least pleasing). As it is believed that daylight is the best light source for artwork, the control was a Solux light bulb. The independent variable was the color temperature of the light sources and the dependent variable was the people's preferences.

The results made it evident that the Solux bulb is the most pleasing with a mode of 1. The Reveal incandescent bulb is second with a mode of 2, and the Daylight CFL's mode is 3 making it the least pleasing. An Anova test was performed. The alternative hypothesis, if three light bulbs are shown on a watercolor painting individually, then the light closest to daylight is favored, was supported. The color temperature of the light sources did affect the subjects' preferences. The preferred light was the 3500 K Solux bulb because it is believed that a color temperature of 3500 K appears white. Further research could explore whether the results could vary if a different medium is used for the artwork, as well as if men's preferences vary from women's.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1613T10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Length of a Paintball Barrel on its Accuracy

Nicholas McCord

Tuscarora High School (THS)

This experiment determined whether or not a paintball player should invest the extra money to buy a longer/shorter paintball barrel. Independent variables in this experiment were the length of the paintball barrel and the distance from which the gun was fired. The dependent variable was the accuracy of the paintball based on distance from the center of the target. The control group for each distance was the paintball gun without any barrel. The barrel lengths of 15.9cm, 25.4cm, 30.5cm, and 35.6cm as well as the distances of 5,10,20 and 30 meters. The data collected was quantitative. The null hypothesis for the experiment is “As the length of the barrel increases there is no change over the different distances.” The data showed that the null hypothesis was rejected because the p-value was at an average of .00836. The data also supported the thesis in stating after a certain distance the difference in accuracy would become less and less. In future experiments this same concept could be applied will paintball pistols or firing all 20 paintballs at once increasing the variable of lubrication due to the natural “slickness” of the paintball.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1614L10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Get the Lead Out: Can the Accuracy of a Lead – Free "Green" Hunting Bullet Help Reduce the Exposure of Lead in Humans and Wildlife?

Scott Mumpower

Loudoun Valley High School (LVH)

The purpose of this experiment was to determine if lead–free hunting bullets are more accurate compared to lead core hunting bullets, since lead bullets can create health and environmental concerns. The hypothesis stated that lead–free bullets are more accurate than a lead core bullet. Three different green bullets–Hornady, Barnes, and Nosler were used to measure accuracy. A Speer lead core bullet was used for the control. Each bullet was shot three times for 15 trials. The bullets were shot from a 243 Winchester rifle from 100 meters. The targets were measured for accuracy known as minute of angle (MOA) with an electronic caliper and recorded in millimeters. The Barnes bullet had the lowest average of 27.40 millimeters, the Speer lead core bullet's average was 30.23 millimeters, the Hornady bullet's average was 32.51 millimeters, and the Nosler bullet had an average of 44.55 millimeters. A t-test was used to show there was a significant difference between Barnes/Nosler, Speer/Nosler, and Hornady/Nosler. Barnes/Nosler had a t-stat of -5.74. Speer/Nosler had a t-stat of -3.87. Hornady/Nosler had a t-stat of -3.86. All had t critical values of 1.66, indicating that there were significant differences among these groups, only partially supporting the original hypothesis. A further area to investigate is whether the air temperature and relative humidity have any effect on the bullets' grouping. Additional experimentation could be done with ballistic gelatin to measure bullet penetration and weight retention in relationship to accuracy.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1615B10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Comparing Amateur Crater Measurements to NASA Measurements

Andrey Oreshkov

Broad Run High School (BRH)

Man is getting ready to go back to the moon. For us to do that, we need more information about our only natural satellite than we ever needed before and now more and more information is being found by amateur astronomers. This project will show how close an early amateur astronomer's measurements will be actual measurements. Several craters (independent variable) were picked: Crater Copernicus, Crater Kepler, Crater Sabine, Crater Aristarchus, Crater Aristotle, Crater Aratus, Crater Lambert, and Crater Tycho. By measuring the length of the shadows on the pictures we will be able to figure out the diameter of the craters (dependent variable) later on. The hypothesis stated that a starting amateur astronomer would be able to get measurements closer than 250 meters off the NASA's diameter measurements of the same craters. The experiment disproved my original hypothesis, thus the null hypothesis was not rejected. The experiment showed that the amateur astronomer's measurements differed from NASA's by more than 250 meters. The amateur astronomer's measurements are varied more likely because of the different atmosphere visibility, moisture in the air and human error.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1616T10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Distance on Magnetism

Dagney Palmer

Tuscarora High School (THS)

This project investigated the relationship of distance on magnetism. In this experiment, a magnet was dropped down a 76.2 centimeter steel pipe and timed to see how long it takes (seconds) for the magnet to reach the bottom of the pipe. The hypothesis is if a steel pipe 1.27 centimeters in diameter is used, the magnet will fall the slowest. The independent variable is the inner diameter of the pipes and the dependent variable the time it takes for the magnet to fall through the pipe. Four 76.2 cm long steel pipes with inner diameters of 1.27, 1.905, 2.54, 3.175, and 3.81 cm were used. The control group is a 76.2 cm long PVC pipe 2.54 cm in inner diameter. This experiment can be applied to maglev technology to find an appropriate theoretical ratio representing the distance between the maglev train and its electromagnetic track. The results showed that the magnet fell the slowest in the 2.54 cm diameter steel pipe, at 0.68266667 sec, and was stopped completely in the 1.905 and 1.27 cm pipes. The null hypothesis that there was no difference between the control and the variables was rejected for the steel pipes with diameters of 2.54, the 1.27, and 1.905 cm. However, the 3.175 cm steel pipe, and the 3.81 cm steel pipes failed to reject the null hypothesis. Further research could be done using different materials and sizes of magnets and pipes, and could be timed using a more precise method instead of a stopwatch.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1617B09

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Magnesium on Gravity

Bharath Peddibhotla

Broad Run High School (BRH)

The purpose of this experiment was designed to see if the magnetic charge of a magnet delays the reaction of gravity, upon it. The different types of magnets used in this experiment were two repelling magnets, two attraction magnets, and one constant which was normal magnetite. To complete this experiment, one must get to a height of 25 feet. Using the same amount of tape to put together all the magnets and magnetite, drop them all 15 times, and record the results. After, the means were calculated; one could conclude that the hypothesis was supported by the means. The hypothesis was that, repelling magnets fall slower than the attraction magnets or the constant. The data showed that the attraction magnets took the least amount of time to drop, the constant was in the middle, and the repelling magnets took the most time to drop. This concludes that the magnets do have an effect upon how fast they drop.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1618C10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of Temperature and Humidity on the Pitch of a Piano Key

Adrienne Rivera

Loudoun County High School (LCH)

This experiment evaluated effects of temperature and humidity on pitch of piano keys. The hypothesis was if room temperature is colder, piano's pitch will be lower. And if humidity is higher, piano's pitch will be higher. This experiment measured 4 different pianos with 15 trials for each. Room temperature, humidity and the pitch of 40 keys were recorded for each trial. The dependent variable was pitch. Pitch was tested with a chromatic tuner and compared to others on various trials with different temperature and humidity readings. Data from the P-values in the first ANOVA test for piano's 1-3 demonstrate that the lower the humidity levels, the larger the delta from 440. (P-value for piano 1 was 1.39E-34, piano 2, 6.03E-07, and piano 3, 5.09E-08.) Data from the ANOVA test piano 4 (P-value of 0.972) did not support this, showing no major effects on pitch changes. This could be because the piano was the piano most recently tuned. Pianos were compared with another ANOVA test that evaluated all pitches for each piano. Averages were compared by using Paired T-tests. The P-values were all less than 0.05 showing the pianos were different. Pitch averages for each piano (#1 was -1.02, #2 was -0.30, #3 was -1.87, and #4 was -0.48) show, that from being most in tune to most out of tune, the pianos were 2, 4, 1, and 3, respectively.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1619T10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

What Major Chord Affects The Tuning Of A Guitar The Most?

Dylan Saunders

Tuscarora High School (THS)

This experiment was conducted to test the hypothesis that a chord with higher string tension affects the tuning of a guitar. It was designed using a mechanical strumming arm to reduce human error and then tested which Major chord affects the tuning of a guitar the most. An open strumming served as the control. After an analysis of the data, the F chord, with an average change of 10.4 Cents, was the chord with the highest rate of change. Additional chords tested changed 4.26¢ for the A chord, 10.13¢ for the B chord, 6.4¢ for the C chord, 6.3¢ for the D chord, 4.6¢ for the E chord, 6.6¢ for the G chord, as compared to 3.13¢ for the control group (open strumming). It was also determined that the F chord had the lowest P-Value at 1.0849 x 10-14. The t-test showed a significant difference between all the chords from the control. Due to the high tension of the F chord the highest rate of change in tuning was expected. This supports the alternative hypothesis that: “If a chord with more tension on the strings is played the same amount of times as chords of lesser tension, then the chord with a greater string tension will alter the tuning of the strings the most.” Further research could explore a broader range of chords and chord types.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1620F09

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The effect of material reflectance properties on the Bidirectional Reflectance Distribution Function (BRDF).

Rachel Schendzielos

Freedom High School (FHS)

The Bidirectional Reflectance Distribution Function (BRDF) is used for many different purposes including models of buildings, use in BRDF databases, to make animation look more realistic, and can be used to tell healthy plants from unhealthy plants. This project uses a laser at 1064nm, a common wavelength, to measure the BRDF (the DV) of materials of various surface roughness (the IV) to include: a glossy tile, a matte tile, a sanded glossy tile, and a sanded matte tile. White printer paper was used as the control because it is an approximate Lambertian surface. The measured BRDFs were first compared to both the control and to each other at ten angles with a T-test. Due to limitations in the instrumentation the comparison was expanded to include the effects of quantization error. If the error bars did not overlap then the two materials were significantly different. Both the null and alternative hypothesis were rejected because the glossy material was hypothesized to be the most specular and the matte the most Lambertian, but instead the glossy tile was the most Lambertian and the matte tile was the most specular. Further research could see if these results are repeated with increased angular sampling and more sensitive instrumentation.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1621L10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Centripetal Force: Bank on It!

Mark Shayka

Loudoun Valley High School (LVH)

Everyone loves the thrill of speed on an amusement park ride. Making these rides safe is an important task of engineers. This project was performed to determine how fast roller coaster cars could get through a turn banked at four different degrees by measuring the distance they traveled after exiting the turn. The control group in which this project was based off of was a 0^o banked turn, and as the independent variable there were three other banks based off it, 30^o, 60^o, and 90^o. After the tests were completed the 90^o bank had the farthest distances, ranging from 307cm to 288cm. The 30^o bank came in second with distances between 287cm to 248cm, and the 0^o bank came in third with results between 293cm to 260cm. Some construction faults may have caused the 60^o bank to fail with results between 307cm to 254cm. Multiple t-tests were performed between groups to see if the t Critical was higher than the t Stat. In all of the t-tests, except for the test between 0^o and 60^o, the absolute value of the t Stat was higher than the t Critical. The hypothesis, a roller coaster car will travel faster around a turn and farther after exiting the turn if the banking of the turn is at 90^o, was supported by the results from the 90^o test. This project could be expanded by seeing how different types of track, if it were wooden or steel, would affect the outcome of the same experiment.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1622T10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of MP3 Bit Rate on Sound Quality and Genre Classification

Peter Sotos

Tuscarora High School (THS)

This experiment was a test on the effect of MP3 bit rate on the sound quality and if it had a different effect on different genres. The bit rate of seven different MP3's was changed to a low, medium, and high bit rate (low-32 kbps, medium-96 kbps, high- 192 kbps) and with a control of 320 kbps. Each song was played 25 times for 1 minute equaling a total of 100 trials for each song.
The results showed that with each step up in bit rate, the sound quality improved. This was mainly shown when going from 32 kbps to 96 kbps and from 96 kbps-192 (p value was less than .05). This result showed that the MP3 bit rate did have an effect so my null hypothesis was rejected. Positive results were shown with every step up.
The results also showed that my null hypothesis was rejected regarding the different effects on genre. The songs classified as rap and R&B had the poorest results in the low bit rates. In contrast to that, the techno song had the most positive results at low bit rate. This can be attributed to the more analog sound desired in the rap and R&B and the more digital sound require for a techno song.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1623L10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

Ballista Angle Shoot-off

Zachary Thomas

Loudoun Valley High School (LVH)

The purpose of this physics experiment was to determine the angle for the optimum flight of an arrow. A ballista, a medieval crossbow, was built as the launch mechanism with settings for the varying angles. The hypothesis that 45° was not the optimum angle was supported by the results of this experiment. The independent variables were the angles tested aside from the 45 degree angle (15, 30, 40, 50, 55, 60, 65, and 85). The dependent variable was the distance the arrow traveled with the varying angles. The control was the 45 ° angle data. The constants were the measured angles, the draw of the string, as well as the weather conditions. The ballista was constructed using pine wood following a medieval blueprint. For each angle there were 20 trials. At the conclusion of each shot the distance traveled was measured and recorded. The optimum angle was 55° resulting in an average distance of 54.15 meters. The other varying angles resulted in a parabolic distribution under the 55 ° angle in which the 45° control angle produced a result of 50.75 meters. Both t-Tests and ANOVA tests were performed and validated that there was significant difference between the angles and confirmed that the 55° was the optimum angle for performance. The ANOVA was 43.786 and the F critical was 1.993 which confirmed there was valid difference in this experiment. Varying directly influences the distance an object travels when propelled by a ballista. Further research could be conducted to determine the correlation between increased tension on the throwing arms and the distance an object travels.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1624S10

Physics & Astronomy
1600

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Different Types Of Shin Guard Materials On The Amount Of Force Absorbed

Kailey Yocca

Stone Bridge High School (SBH)

The purpose of the experiment was to find a shin guard that provided the most protection for soccer players. Many injuries during soccer are caused by blows to the leg. Wearing shin guards can reduce the possibility of an injury occurring. By finding the most stable and protective shin guard, athlete's legs are safer.

An arm was constructed to swing from the same height during each test. It also hit at the same spot on every shin guard material. A force sensor was placed directly behind the shin guard material to measure relative force. The dependent variable was the amount of force measured, which was measured in Newtons. The independent variable was the different shin guard materials used in the experiment, including polypropylene, polydyne, and thin plastic. The experimental control was letting the arm hit nothing but the force sensor, showing the amount of force that would have hit an actual shin bone.

The experiment resulted in polypropylene averaging the least amount of force applied to a shin bone, which was -1.2042 Newtons. But the t-tests showed that polypropylene compared with polydyne and thin plastic and were not significant at the .05 level (t values: 2.29006E-22, 1.14133E-20, 3.47965E-14 respectively). Because the t-tests were not significant, the null hypothesis was accepted and the original hypothesis was rejected. The hypothesis stated that polypropylene provided the most protection. The experiment showed that polypropylene does not provide more protection than polydyne or thin plastic because the materials have the same thickness and are able to absorb similar amounts of force. In further research, different shin guard materials could be tested. A different machine could be constructed to test the shin guards, or a different type of guard for the body could be tested.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

Plant Sciences (1700)

Project No.	Last Name, First Name	Title
1701V10	Ahmad, Mohammad	Chemical Crops!
1702V10	Albarracin, Jocelyn	How Does the Environment of the Plant Affect its Growth
1703H10	Faley, Kelsi	The Effect of Intraspecific Cooperation in Sibling Plants Descended from the Same Parental Type on the Amount of Biomass Produced
1704S10	Footen, John	The Effect Of Exogenous Salicylic Acid In Reducing Adverse Effects Of High Salinity On P. vulgaris
1705S09	Freeman, Nicolas	The Effect Of Plant Growth Regulator And Short Exposure To Red Light On The Reversal Of Thermo-inhibition In L. Sativa Seeds
1706L10	Gillis, Evelyn	Variations in Sugar Levels in Acer saccharum Sap
1707L09	Kennedy, Brendan Fred	Hydroponic Farming versus Conventional Farming Methods
1708H10	Khan, Nazifa	How Does the Distance Of a Ripe Apple Affect the Number Of Days Ripening the Unripe Apple
1709S09	Kim, Dana	The Effect Of Biodegradable Bags On Raphanus sativus Growth
1710T10	Klug, Jenny	Plant Pot Size Optimization
1711G10	Krauss, Lauren	The Effect of Trellis Diameter on Vine Growth
1712C10	Lambert, Callie	A Comparison of Household Items Versus Specifically Purchased Items as a Deer Repellent.
1713C10	Lancaster, Matthew	The Effect of Overhead Power Lines on the Growth of plants
1714P10	Lee, Jessica	The Effect of Different Active Ingredients in Hairsprays on the Life of Roses after Seven Days.
1715B10	Mabery, Sydney	The Effect of the Shape of a Greenhouse on the Growth of a Plant
1716W10	Moore, Nathalie	The Effect of Common Houseplants on Levels of Indoor Oxygen
1717B10	Moser, Allison	The Effect of Gray Water Solutions on the Size of Lima Beans
1718F10	Prem, Prathija	The Effect of Carbon Dioxide on the Mitotic Index of Allium sativum root tip cells
1719D12	Saggu, Pritpal	The Use of Mixotrophy in Lemna sp. (Duckweed) to Enhance Carbon Sequestration
1720H10	Scott, Lauren	How Does the Direction Of Plant Growth Affect the Biomass Of Jalapeno Peppers?
1721V10	Staszak, Geoffrey	The Effect of Temperature on a Carnation’s Transpiration Rate
1722D12	Thomas, Rain	The Effect of Kin Recognition via Root Communication in Food Crops
1723G10	Trader, Deborah	Sibling Rivalry: Compost, Fertilizer, and Soil
1724C10	Wilhelm-Wenzel, Jordan	The Effects of the Capillary Attraction of Water on the Percent Moisture Content of Wood

1701V10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Chemical Crops!

Mohammad Ahmad

Park View High School (PVH)

In October 2010, an experiment was created that could change the field of botany as we know it. This experiment tests whether growing common plants such as grass can be sped up. This was done by soaking 3 sets of grass seeds in 3 chemicals, hydrogen peroxide, vinegar, and apple juice along with one set which was soaked in water. After five weeks of growth the 3 sets of grass seeds with chemicals were compared against the set grown with water. The results were encouraging, the average growth for the sets grown with water, hydrogen peroxide, vinegar, and apple juice were, 9.338 cm, 13.538 cm, 3.904 cm, and 6.934 cm respectively. With the use of the T- test the experimenters confirmed their results. However, the original hypothesis of the experimenters, “If grass seeds are dipped in vinegar then their germination rate will increase, compared to the other chemical solutions, such as, hydrogen peroxide, vinegar, and apple juice.” was denied because hydrogen peroxide actually produced the best germination rate. Hydrogen peroxide had the most effect on the grass growth, averaging almost 1.5% better growth rate compared to the set of seeds grown with water. This experiment had promising results but experimenters are not done yet. They are trying to find out if the foods, such as rice, could be grown in the same way which would make making food easier and faster which could in turn help end starvation.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1702V10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Environment of the Plant Affect its Growth

Jocelyn Albarracin

Park View High School (PVH)

This experiment's purpose is to understand how plants interact to their environments. The project consists of plants being placed in the independent variables, which are sandy soil, salted soil, and motor oil soil. The dependent variable is how much the plant grows and the control group is plants placed in an environment of soil. The procedure is mixing environments with soil, placing seeds in a container, and watering the plants to see if they grow. The data that was collected did support the hypothesis because there was a statistical difference from the control. The statistical test used is t-test. The mean for salt is zero and for motor oil. The mean for sand is 11.975mm. The mean for control is 14.075mm. The hypothesis is the plant will grow the fastest in soil mixed with sand and slowest in the salted soil and it was supported. The independent variables influenced the dependent variable because the plants grew slower than control, which shows how plants react to their environment. Further research could explore into new ways of plants becoming unharmed by harmful environments, ways for plants to grow faster, or what environment is better for plants.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1703H10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Intraspecific Cooperation in Sibling Plants Descended from the Same Parental Type on the Amount of Biomass Produced

Kelsi Faley

Heritage High School (HTH)

The purpose of this experiment was to determine if sibling plants from the same F1 parent planted together would have greater biomass produced than non-sibling plants from different F1 parents. Since the plants used, Brassica rapa, are from the crucifer family, results could be applied to increase crop production. The same soil, nutrient, temperature (20oC-25oC), and watering conditions were maintained with lighting 8 cm above the tallest plant. Standard (S) and Non-Purple, Hairless (NPH) F1 plants were planted and grown separately. Seeds were collected and grown in 64 trials for each of three separate F2 groups: (IV) Group A: 2 S seeds and Group B: 2 NPF seeds and the control being Group C, combinations of 2 seeds from A and B. Plant F2 biomass (DV) using measurements of height, fresh root and top mass, and leaf surface area was greater when sibling seeds were grown together than compared to plants from different plants. Means for root/top mass in grams for group A, B, and C were 0.1481/0.6475, 0.1175/0.6501 and 0.0375/0.3074 respectively. Separate t-tests for (A:C and B:C_ refuted the null hypothesis that planting seeds of similar and dissimilar F1 types would result in the same F2 biomass. Calculated t values for root/top mass A:C 6.3160/4.9507 and B:C 5.961/5.2370 wee larger than the table t values illustrating the possibility of the findings being applied to farming. Further research is being conducted calculating dry root and top mass statistics and by planting two other similar groups.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1704S10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Exogenous Salicylic Acid In Reducing Adverse Effects Of High Salinity On P. vulgaris

John Footen

Stone Bridge High School (SBH)

The survival and distribution of different species of plants depends on their ability to withstand environmental stress, such as Salinity. Salicylic Acid (SA) plays a role in plant defense, functions similar to a plant growth factor and is known to reduce effects of stress on plants. The exogenous application of SA could offer an economical and simple way to increase the salt sensitive plants' survival and productivity in high salinity soil and has a significant practical application in agriculture, horticulture and forestry. The experiment tests if SA reduces the adverse effects of high salinity in P. vulgaris. The set1 seeds (positive control) received water for 11 days. The set2 seeds received 15mL of 0.5 mM SA (IV) at the time of germination. The set3 (negative control) received 15mL of 100mM NaCl solution (day 6 through 11). The set4 received15ml of 0.5 mM SA at the time of germination and 15mL 100 mM NaCl solution during from day 6 through 11. The height of plants was measured as DV.
The t test of Control (positive) and Control (negative) 100mM NaCl shows statistically significant difference ($p<0.05$) in height of P. vulgaris plants grown without (95mm) and with NaCl (43.6mm). The t test for Control (negative) 100mM NaCl and 100mM NaCl+0.05 mM SA shows statistically significant difference ($p<0.05$) in height of salt stressed P. vulgaris plants grown without (43.6mm) and with SA (161.66mm) thus supporting the alternative hypothesis showing that SA help P. vulgaris combat salt stress.
The further research can determine the efficiency of different concentration SA to find out the concentrations that provides better stress tolerance. The effect of foliar salicylic acid applications can be explored by spraying plants with SA and measure biomass of the plants.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1705S09

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Plant Growth Regulator And Short Exposure To Red Light On The Reversal Of Thermo-inhibition In L. Sativa Seeds

Nicolas Freeman

Stone Bridge High School (SBH)

Lactuca sativa seed germination is influenced by temperature. Above 28°C, lettuce seeds lose their ability to germinate, entering dormancy termed “thermo-inhibition.” According to previous research, short exposure to red light and Gibberellic Acid (GA) supplements can reverse thermo-inhibition and allow dormant seeds to germinate at higher temperatures.
The experiment tested whether GA (10% or 20%), 5 minute red light exposure, or a combination of two is most efficient in restoring germination of thermo-inhibited seeds. The experimental groups were red light, GA 10%, GA 20%, red light with GA 10%, and red light with GA 20%. Lactuca sativa seeds were treated with the IV and the Petri-dishes were incubated at 28°C (thermo-inhibition). After four days, percentages of seeds germinated were counted as the DV.
The average seeds germinated for the control were (22.96%), 10% GA (87.48%), and 20% GA (73.91%), Red light (8.86%), Red Light +10% GA (34.41%), and Red light +20% GA (50.25%). T-tests show a statistically significant difference in percent of germinated seeds between control and GA 10% and control and 20% ($p < 0.05$), while all 3 T-tests (Control and Red Light+GA 20%), (GA 20% and Red Light+GA 20%), (Red Light and Red Light+GA 20%) did not show a statistically significant difference ($p>0.05$) in percent of germinated seeds, thus refuting the alternative hypothesis. ANOVA for control, 10% GA, 20% GA returns $p<0.05$ with maximum percentage germination for 10% GA, hence GA 10% is found most efficient in breaking dormancy and restoring germination of thermo-inhibited lettuce seeds.
Further studies may include growing germinated seeds into plants and comparing growth over a time period, or comparing different plant growth regulators to each other for reverting thermo-inhibition.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1706L10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Variations in Sugar Levels in Acer saccharum Sap

Evelyn Gillis

Loudoun Valley High School (LVH)

Many people don't realize that there are people who collect sap from maple trees to sell for a living. That is the purpose of this experiment; to find out whether there is a better day or time to gather maple sap in the best cost interest for everyone. The independent variable in the experiment was the amount of sugar in the Acer saccharum sap as it depended on the time and day it was measured. The process conducted was easy because it was only a few simple steps; drilling a hole in a sugar maple tree, placing a peg in the drilled hole, and then measuring the sap that flowed out through the peg using a refractometer at specific times each day. However, the results of the experiment showed no significant difference between the times and days gathered and the sugar levels. The T-stat value was always less than the T-crit, shown here when comparing 7:30 AM to 5:00 PM. The T- stat value was .0175 while the T-crit was 2.0322. The hypothesis was rejected since it stated that the sugar levels would rise and fall according to the time collected. Actually, the time and day have almost nothing to do with sugar levels in sugar maples. The sugar levels actually depend on weather to make them change. Further research could explore the sugar content in all different kinds of maples instead of just sugar maples.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1707L09

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Hydroponic Farming versus Conventional Farming Methods

Brendan Fred Kennedy

Loudoun Valley High School (LVH)

This experiment was about testing whether or not hydroponics was an effective way of farming. The hypothesis for this experiment was that the Solanum lycopersicum (tomato plants) being grown hydroponically will grow larger and produces bigger and healthier fruit than the plants grown in soil. If hydroponics is an effective means of farming, then that means that it could be used anywhere around the world, and because it takes up much less space than soil farming, more plants could be grown in a small area. The experiment called for fifteen tomato plants to be grown for each experimental group. The two experimental groups were the plants being grown hydroponically and the control group, plants grown in soil. The independent variable was the type of growing medium used for each experimental group; the dependent variable was the height and health of the plants. The procedure was mostly caring for the plants, this meant watering the soil plants, checking the pH and putting in the mineral solutions in the water of the hydroponic systems. The results for this experiment showed that hydroponic farming was the most effective way of farming. The mean height for the hydroponic plants was 6.9 cm, while the mean for the soil plants was 1.6 cm. The hypothesis was supported by the data. One question that arose was whether or not hydroponics will work at a larger scale, will hydroponics work as well for other plants as well as it did for tomato plants.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1708H10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Distance Of a Ripe Apple Affect the Number Of Days Ripening the Unripe Apple

Nazifa Khan

Heritage High School (HTH)

This experiment is designed to test if distance plays a role in the ripening process of an apple. The control group is the unripe apples 5 cm away from ripe apples. The I.V is the distance between the ripe and the unripe apples. The D.V is the time taken to ripen the unripe apples. To conduct this experiment, the scientist needs iodine, and 60 apples (30 ripe and 30 unripe). Data was collected by separate the apples to form the control and experimental group, and then by the ripeness of the unripe apples by cutting and soaking it in iodine. Record the color change.

The result was no significant difference between the groups tested. The mean for the control was 5.7, and 5.4 for the experimental group. The difference being low, didn't support the experimental hypothesis. The I.V did not affect the D.V, both groups of unripe apples ripened close in time. The calculated T (1.48) is less than the critical T (2.05) value, indicating a fail to reject the null hypothesis. The P value (.14) is greater than 0.05, supporting a fail to reject the null hypothesis. A major error to this experiment is placing the apples in one refrigerator instead of giving each group its own.

Further research could explore how the ethylene gas could be contained, and how to stop fruits from responding to it.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1709S09

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect Of Biodegradable Bags On Raphanus sativus Growth

Dana Kim

Stone Bridge High School (SBH)

Biodegradable bags are becoming an increasingly common part of our consumer society. The goal of this experiment was to test two types of biodegradable bags to answer the question of whether either leaches toxins that are harmful to plants such as the common radish, Raphanus sativus. Germinating R. sativus seeds were separated into a control group (one that would not be exposed to biodegradable bags), and two experimental groups. The experimental groups exposed the plants to either thiodipropionic acid from Nordstrom Rack biodegradable bags or to the breakdown products of the polylactic acid (PLA) found in Sun-Chips bags. All the plants were given the same amount of light and water for a period of one month; their heights were measured every three days. At the end of the experiment, the average height of the control group was 5.8 cm, that of the Nordstrom group, 7.0 cm, and that of the Sun-chips group, 6.8 cm. According to T-tests, the probability that the difference in growth between the control group and the Nordstrom Rack group was due to chance alone, which a p-value of about 0.15; for the comparison between the control group and the Sun-Chips group, this p-value was about 0.22. These numbers cannot confirm that biodegradable bags help plants to grow but suggest that these bags certainly do not slow the growth of R. sativus. Thus, the evidence from this experiment does not support the hypothesis that biodegradable bags would have a detrimental effect of the growth of R. sativus. Further research could explore varying amounts of biodegradable bags, different kinds of plants, or absorption of breakdown products by crops.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1710T10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Plant Pot Size Optimization

Jenny Klug

Tuscarora High School (THS)

The purpose of this experiment is to find the minimum size pot that a pepper plant can be planted in but still grow to a healthy size and be productive. This information will help maximize the potential of a rooftop garden. Rooftop gardens can help reduce carbon monoxide emissions, by growing foods closer to its consumers in cities. This is accomplished by reducing the need to transport foods from farms. In the experiment seven Bell Peppers were planted in different sized pots ranging from small to large (independent variable). Each week over a nine week period the Pant's were observed and heights were measured (dependent variable). At the end of the nine weeks the peppers produced by each plant were recorded. The final results were not conclusive but were a good first step in finding the minimum sized pot. Based on the observed heights of the pepper plants, it appears that the heights were leveling out, and approaching the optimum sized pot for size. However looking at the amount of peppers produced the amount continued to increase along with the increasing size of pots, showing that more trials needed to be done to reach this optimum size. The Null hypothesis for the two smaller pot sizes was rejected while the rest of the plants failed to reject. It is clear from the experiment that there is a minimum size pot that can still grow a healthy size plant. The results do not yet show that there is an optimum sized pot for producing peppers. A fallow on to this experiment would include more trials with a greater range of pot sizes and numerous other vegetables.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1711G10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Trellis Diameter on Vine Growth

Lauren Krauss

Woodgrove High School (WHS)

The purpose of this experiment was to determine if the thickness of a vine's trellis affected the growth rate of the vine. The results of this experiment might allow farmers to increase the yield of their climbing plants, such as beans and grapes. The experiment used trellises of three different thicknesses and measured the growth of the vine along each trellis. The control group was a group of plants that grew without the support of a trellis. Once the trellises mere made, one of each thickness was placed in a pot with a climbing plant. The growth of the branches along each trellis, as well as the branch without one, were measured weekly. When the data was compared, it showed that it was usually more beneficial to use a 2cm thick trellis for the species of plant chosen. These results were reached using T-tests. The average growth for the control group over five weeks was 4.7cm, and the average growth for the 2cm thick trellis was 5.0cm. The hypothesis made at the beginning of the experiment was that the 2cm thick trellis would support higher growth rates. Some potential sources of error in this experiment were the way in which the plants were measured, which was by hand, with a piece of string. If this experiment were to be tested again, it would be necessary to include other plants that use different methods of climbing, and test of over a longer period of time.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1712C10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

A Comparison of Household Items Versus Specifically Purchased Items as a Deer Repellent.

Callie Lambert

Loudoun County High School (LCH)

Due to rapid development in this area, deer are driven from natural habitat. With woods surrounding neighborhoods of Leesburg, many gardens have become food sources. If the plant is applied with a product that is found in a common household, then the solution will not work as well as a store-bought repellent and less of the plant will remain uneaten. This experiment was to see if common household items can be used to repel deer, without having to spend money on commercial products or other specific materials. This experiment was conducted over a six week period, using eight similar flowers and seven different repellents (independent variable). The repellents were grouped into either household items, including soap, dog hair, a Tabasco solution and an egg solution, or specifically purchased items, including bloodmeal, commercial repellent and moth balls. One plant remained constant for comparison, and plants were watered and reapplied weekly. A photograph was taken from the same distance and angle at the beginning and end of the evaluation period. The photo was copied into Microsoft VISIO drawing software, with a grid pasted on each picture. After outlining boxes the plant occupies, and counting how many squares are remaining, you can calculate each plant's percentage eaten (dependent variable). In conclusion, the null hypothesis was supported, the group made up of household solutions had more of an affect than the purchased group, with more of the plants left uneaten. The household group's average percentage was seventy six and average for purchased group was thirty percent.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1713C10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Overhead Power Lines on the Growth of plants

Matthew Lancaster

Loudoun County High School (LCH)

This experiment was conducted in order to test if the electric field produced from electricity flowing through overhead transmission lines would affect the germination or growth of chive plants. Knowing these effects could help many things, such as the placement and routes of power lines. It was speculated beforehand that the electric fields flowing around the plants would affect them in a positive way. The growth of the plants would be increased by the electric field. The project consisted of a control group of plants and a group being tested. The test group was constantly exposed to electric fields from overhead wires. Both plant groups received the same amount of sunlight and water each day. In the evening of each day; the plants were watered, the height was recorded, and the number of sprouts in each group were taken. The test plants sprouted with more sprouts and had a growth rate about twice as fast as the controls, but later on the test plant's growth was significantly slowed and the control plants caught up to its heights. A significant difference was present in the height averages between the test and control plants. The electric fields had both a positive and a negative effect on the plants. The field caused increased germination and initial growth then slowed it down as the plants became more mature to have equal heights between the control and test groups.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1714P10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Different Active Ingredients in Hairsprays on the Life of Roses after Seven Days.

Jessica Lee

Potomac Falls High School (PFH)

What if the pretty bouquets mom brought from the florist could last a little longer? When hairspray is sprayed onto hair it holds it in the style and shape, the different active ingredients do such. This experiment uses three different hairsprays, all with different active ingredients. There are four different variables, the independent variables which is the type of active ingredients (alcohol denat, hydrofluorocarbon, and butane), the control group with the roses containing no hairspray. The Dependent variable is which condition the roses are in after seven days. Set flowers in cups, and spray the flower 360° around for three seconds and check every twelve hours. As a result, alcohol denat held the roses the best, and butane ruined the roses. The means of the conditions of the different hairsprays were taken, alcohol denat was a rose condition of 1.2, hydrofluorcarbon was 1.5, butane was 2.2, and control was 1.7. It was found that the data was consistent and close together, determined by the variance and standard deviation. The hypothesis “if a rose is sprayed with a hairspray with an active ingredient of alcohol denat, then the rose will last longer” was supported. The active ingredients definitely impacted the conditions of the roses, the controls stood strong even without being sprayed. If the good active ingredients could be combined, how long would the flowers last?

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1715B10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of the Shape of a Greenhouse on the Growth of a Plant

Sydney Mabery

Broad Run High School (BRH)

Plants have been grown in greenhouses for many years and have contributed to the efficiency of growing agricultural products. During the experiment, three groups of fifteen lima bean plants were placed in three greenhouses of different designs. The designs were a curved-roofed greenhouse, a triangular-roofed greenhouse, and a flat-roofed greenhouse, which was the control. The height measurements were compared after about a week to see whether the greenhouse shape affected the growth of the plant.

After observing the growth rates, the differences in height were shown to have no significance from the change of the independent variable, the greenhouse shape, according to the statistical tests. The mean heights of the plants on the final measurement were 27.91, 27.21 and 24.9 taken in centimeters, with the triangular-roofed greenhouse exhibiting the most growth and the flat-roofed greenhouse exhibiting the least. According to the t test taken, the data was not significant to the hypothesis of the curved greenhouse exhibiting more growth than the flat greenhouse. This concludes that the greenhouse shape appeared to have no effect on the growth of the plant. However, in order to be able to obtain sufficient data, more experiments should be conducted on a larger scale with more precise materials. Further research could explore different sizes of greenhouses and their effects on plant growth as well as a variety of plant species.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1716W10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Common Houseplants on Levels of Indoor Oxygen

Nathalie Moore

Briar Woods High School (BWH)

In recent years, indoor air pollution has become a growing problem, and claims that houseplants can remove air as pollutants have also increased. This study investigates the use of two common houseplants known for their ability to remove air pollutants, as increasers of oxygen levels and the differences between their respective oxygen output. During the run of the experiment fifteen Hedera helix plants and fifteen Saintpaulia ionantha plants were placed individually in a vacuum sealed container under a grow light at forty minute intervals as oxygen levels were monitored. At the end of the experiment, the surface area of each plant was measured and the amount of oxygen produced divided by the total surface area of each plant. No significant difference between the oxygen output of Hedera helix and Saintpaulia ionantha was noted. The alternative hypothesis, “if Hedera helix is allowed to photosynthesize for forty minutes then it will produce more oxygen than Saintpaulia ionantha produces in the same amount of time”, was rejected and the null hypothesis was supported. Both types of plants were commercially grown. The plants may have been exposed to different conditions or cross-bred, affecting the plant’s efficiency in producing oxygen. Temperature was not kept constant during the run of the experiment, and this may have affected the efficiency of oxygen production. Further research could explore the effect other houseplants which exhibit the capacity to remove air pollutants have on oxygen levels.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1717B10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Gray Water Solutions on the Size of Lima Beans

Allison Moser

Broad Run High School (BRH)

Saving water by using water sounds impossible, however, it could be possible through use of gray water. This experiment was conducted to find if plants benefit from gray water. The independent variable was the type of water the plants received: tap or gray. The dependent variable was the mass of the beans produced by the plants. The control group was the plants watered with tap water. Thirty lima bean plants were planted as seeds and watered for 80 days. Half received tap water, and half received gray water. After 80 days, the beans were weighed in grams. The plants that received tap water produced heavier beans than those that received gray water. The mean masses for tap watered plants and gray watered plants were 0.05 g and 0.02 g, respectively. A t-test showed that the results are statistically significant ($p<0.05$). The alternative hypothesis - if lima bean plants are watered with gray water in the form of dishwater, then they will produce heavier lima beans than the lima bean plants watered with tap water - is rejected. The results show that the tap watered plants had a greater mean bean mass than the gray watered plants, meaning the opposite of what was hypothesized occurred. The gray water caused the plants to produce smaller beans than the control. There were no major sources of error. Further research could explore gray water's effect on the number of beans produced. It could also investigate gray water's effect on the composition or pH of soil, which could affect plant growth.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1718F10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Carbon Dioxide on the Mitotic Index of Allium sativum root tip cells

Prathija Prem

Freedom High School (FHS)

The purpose of this experiment was to find out if carbon dioxide increases the growth rate of Allium sativum. Research shows that carbon emissions are increasing the concentration of carbon dioxide in the atmosphere, and that they increase crop yields. If the carbon dioxide in the atmosphere could be harnessed to plants, crop yields could increase on demand. To test if carbon dioxide affects the mitotic index of Allium sativum root tip cells, 15 trials were done. 15 cloves of garlic were placed in a fish tank filled with carbon dioxide which was the independent variable, and 15 cloves of garlic were placed in a tray which was the control group. After seven days, the cells were stained and examined for the mitotic index which was the dependent variable. The mean was higher for the cells exposed to carbon dioxide. Both t-tests of equal and unequal variances showed a significant difference. The experimental hypothesis which was if the carbon dioxide level was increased, then the mitotic index of Allium sativum cells will increase was accepted. So ultimately, carbon dioxide increases the growth rate of photosynthetic plants. It could be improved by adding another fish tank and measuring the mitotic index over time. Further research could be done in the leaf portion.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1719D12

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Use of Mixotrophy in Lemna sp. (Duckweed) to Enhance Carbon Sequestration

Pritpal Saggu

Dominion High School (DMH)

Excess carbon dioxide emissions in the atmosphere are the leading cause of change in weather patterns and increase in atmospheric warming. Controlling emissions is imperative. Enhancing the growth of plants which serve as carbon dioxide sinks may be a solution to this problem. Mixotrophy is the ability of plant cells to export, take up and use carbohydrates to produce organic compounds. Through mixotrophy and autotrophy of plants, biomass may be increased and the corresponding increase of chlorophyll production may enhance carbon dioxide intake.

This research employed the use of mixotrophy where Lemna were grown in various concentrations of sucrose. Lemna were subjected to 10 mL of 0 %, 1 %, 10 %, or 25 % solutions of sucrose every other day and biomass was measured every other day for 3 weeks. Control Lemna showed the least increase of mass while experimental Lemna, when subjected to carbohydrates, doubled mass at various levels after 3 weeks. Maximum growth occurred in the 10 % cultures. Statistical analysis via a t-test determined that the null hypothesis, that solutions of sucrose would play no role in promoting the growth of Lemna, was refuted. Lemna increased in biomass when subjected to all solutions of sucrose.

This supports the idea that mixotrophy can boost algae growth such as Lemna. As result, increased biomass of any plant as a result of mixotrophy could increase the intake of carbon dioxide hence decreasing atmospheric warming. Thus the use of mixotrophy as a treatment for decreasing global warming merits further investigation.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1720H10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

How Does the Direction Of Plant Growth Affect the Biomass Of Jalapeno Peppers?

Lauren Scott

Heritage High School (HTH)

This particular experiment dealt with growing jalapeno peppers right side up and upside down; being able to see how the biomass was affected through the full growing season of these peppers. In this research, the specific item that was changed was the direction of the plant growth, I.V.
The result measured was the biomass of the peppers in millimeters. The control group was the peppers planted right side up.
The mean of the peppers planted right side up was 26.3214, which is similar to the mean of the peppers planted upside down in the experiment, 26.1785.
The alternate hypothesis, or experimental hypothesis; if the pepper plants are grown either right side up and/or upside down, there will be no difference in the biomass. This hypothesis was supported by all of the data collected, and the statistical test, T-test, performed during the process of this experiment. The results from the test showed similarity with the two directions grown. These results have demonstrated the direction of plant growth on jalapeno peppers did not influence the change of biomass.
Further research could explore on different types of jalapeno peppers, or any other, having them in the same conditions that were done in this experiment, having grown them regularly, and upside down. After the research, there might be different results, or the results could turn out to be similar to that particular experiment's findings.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1721V10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Temperature on a Carnation's Transpiration Rate

Geoffrey Staszak

Park View High School (PVH)

The purpose of this experiment is determining the effect of temperature on a carnation's transpiration rate. The independent variable is the temperature of the water, the dependent variable is the transpiration rate of the carnation, and the control group is the carnation tested with room temperature water. Procedures include placing a carnation on a stand, connecting plastic tubing to the sensor and the carnation with the tubing filled with water, starting the EasyData application, starting the data collection, and writing down the data on a piece of paper. The carnations tested in water of 45 degrees Celsius had a mean of -0.0011, the carnations tested in water of 10 degrees Celsius had a mean of -0.0023, and the carnations tested in water of 27 degrees Celsius had a mean of -0.0015. As calculated from a t-test, the p-values for both 45 degrees Celsius and 10 degrees Celsius were <0.0001, meaning that the statistical data was different compared to the control. The experimental hypothesis, if the temperature increases, then the carnation's (Dianthus caryophyllus) transpiration rate will increase, was supported. The data showed that the carnation's transpiration rate did increase when the temperature of the water was increased. Any errors that occurred during this experiment would be placing a wrong data point into a table or graph. What other conditions like light, humidity, and wind effect a carnation's transpiration rate?

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1722D12

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effect of Kin Recognition via Root Communication in Food Crops

Rain Thomas

Dominion High School (DMH)

The ability to successfully grow agricultural crops in arid, underdeveloped countries poses unique problems when addressing the provision of food to the people of these countries. Determining a method by which plants could thrive better would perhaps offer a solution.

Corn, pumpkin, cantaloupe, and bell pepper seeds were planted in individual flats. In one flat, seeds from the same plant were sown together (siblings) while in a corresponding flat, seeds from different plants of the same species were sown together (nonsiblings). Plant growth was noted and statistical analysis indicated that there was a significant difference in growth of nonsibling pumpkins and corn where nonsiblings grew better than sibling counterparts. Interestingly, cantaloupe siblings grew better than their nonsibling counterparts. Peppers showed no significant difference in growth in either group.

The identification of self versus nonself may play a role in overall plant growth depending on the species. Sibling plants may cull the “runts” hence allocating resources for their own growth. Nonsibling plants may communicate with others in order to enhance growth. The importance of this is that by noting growing patterns in familial versus nonfamilial plantings, recommendations may be made for crop cultivation in underdeveloped countries where harsh growing conditions. If familial growth or lack thereof is noted, familial versus nonfamilial seeding could be employed which would perhaps enhance plant growth in less than desirable conditions. This, in turn, would increase crop growth which would then be available to feed people in underdeveloped nations.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1723G10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

Sibling Rivalry: Compost, Fertilizer, and Soil

Deborah Trader

Woodgrove High School (WHS)

To find what helps a bean plant grow the highest, either fertilizer or compost (the independent variables), 45 bean plants were grown. In three groups of 15, each bean plant that grew was measured in centimeters and recorded (the dependent variable). With a control group of 15 plants with plain soil, the plants were watered regularly and given a light period between 6 am and 5:30 pm- to simulate the sun rising and setting. Over a course of 3 or so months, the measurements showed that the hypothesis was correct, that the plants grown with compost grew the tallest. While the experiment was being executed, one flaw that appeared is that the plants were not watered every day, sometimes only being watered once a week.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).

1724C10

Plant Sciences
1700

LCPS RSEF OFFICIAL ABSTRACT - 2011

The Effects of the Capillary Attraction of Water on the Percent Moisture Content of Wood

Jordan Wilhelm-Wenzel

Loudoun County High School (LCH)

The experiment tested which type of wood(s) would be better suited in either fresh or salt water environments if left unsealed or sealed with a caulk, primer, and paint. Based on previous research the Red Oak (hardwood) would experience rapid absorption of water molecules and an increase in the upper layers percent moisture content at a faster rate than the Douglas Fir. The Douglas Fir will experience a greater number of deformities because of hardwoods ability to gain and lose moisture at a faster rate than softwoods. The experiment was thirty days. Boards were placed vertically in 8.5 centimeters (3 inches/4 Liters) of either fresh or salt water. Some boards were also sealed with acrylic exterior grade enamel paint. Every day the boards were taken out of containers and the measured for percent moisture content at three different heights on the board. While paint and proper sealing slow the process of water absorption into wood it does not completely block water. If placed in salt water then sealed and unsealed woods experience faster physical degradation of wood compared to woods placed in fresh water. Red Oak wood was also found to experience faster absorption of water in both top and middle layers as compared to Douglas Fir. Douglas Fir had more abnormalities such as larger pealing and bubbling of paint, as well as greater cupping along the board. The Regression statistical test had a p-value of 2.45 E-12 which means that it has a significant difference and thus the data supports the hypothesis.

I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work (digitally signed).