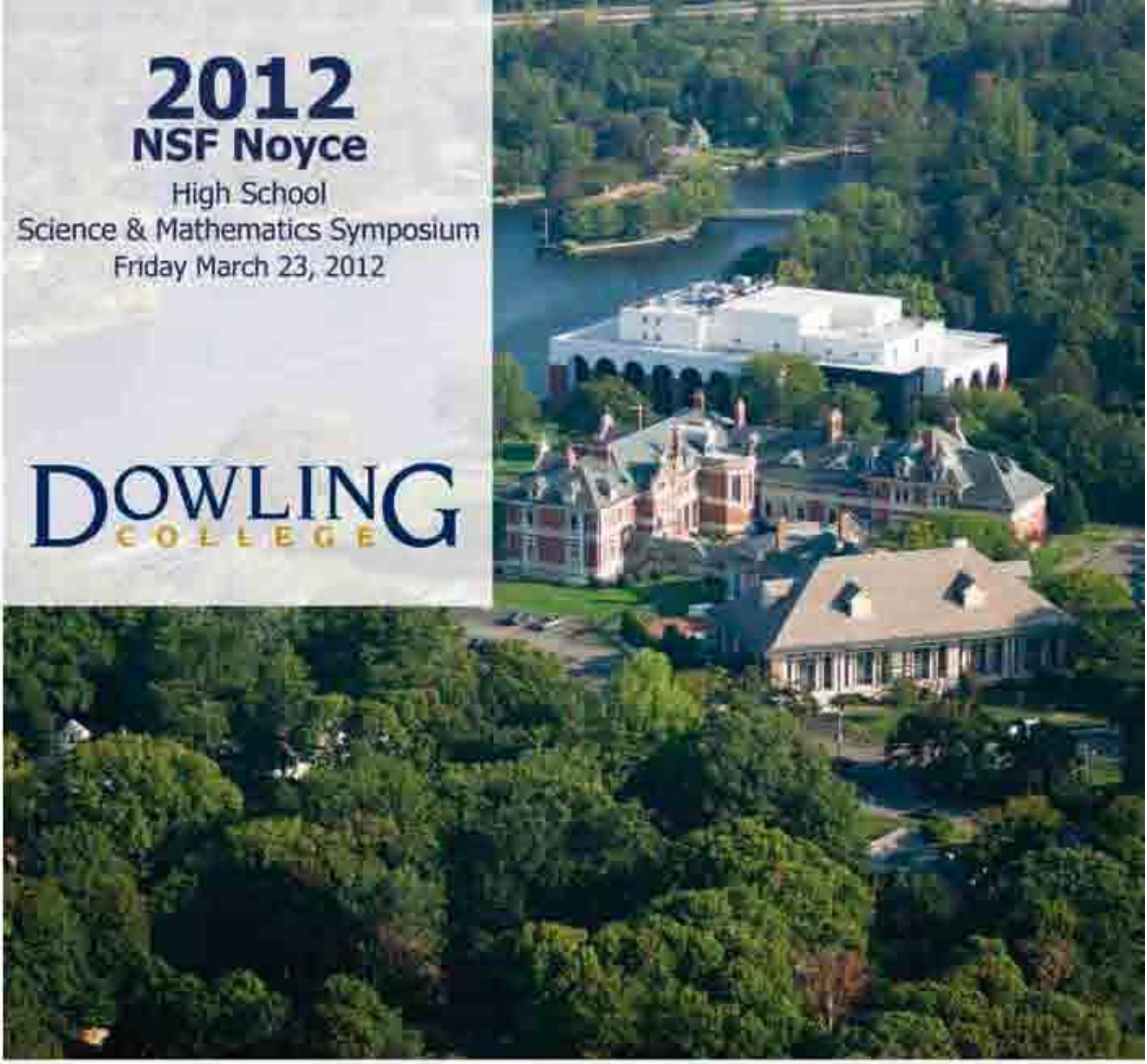
2012
NSF Noyce

High School
Science & Mathematics Symposium
Friday March 23, 2012

DOWLING COLLEGE



National Science Foundation (NSF) Noyce High School Science and Mathematics Symposium

Taking place on the South Shore Estuary along the banks of the Connetquot River

Dowling College's Rudolph Campus at Oakdale

1-800-DOWLING

www.Dowling.edu

Friday, March 23, 2012

8:00 a.m. to 2:30 p.m.

For additional information, please visit us at:
https://sites.google.com/site/nsfnoyce/

Sponsored by

National Science Foundation

NSF Award #09-34814

New York State Marine Educators Association

Organized by

Dowling College Faculty:

Kevin McDonnell, Associate Professor of Computer Science and Mathematics
Lou Siegel, Adjunct Associate Professor of Natural Sciences
Lori Zaikowski, Chemistry and Physics Department Chair

Co-organized by Dowling College Robert Noyce Scholars funded by the National Science Foundation:

Brian Daniels, West Islip H.S. Biology teacher
Brad Kenedy, Bay Shore H.S. Physics teacher, NSF Master Teaching Fellow
Christopher Tam, Islip High School Math teacher, NSF Master Teaching Fellow
Marissa J. Scholl, Wyandanch High School Biology teacher

SCHEDULE

8:00 a.m.	Breakfast and Registration Teachers and Students: Conservatory Judges: Kramer Science Center KSC 104
9:00-2:00	Workshops Kramer Science Center
9:00-11:30	Science and Mathematics Poster Session Judging Ceremonial Rooms: Fortunoff Hall Ballroom, Study, FH 110, Conservatory
11:00-2:00	Posters Available for Viewing Ceremonial Rooms: Fortunoff Hall Ballroom, Study, FH 110, Conservatory
11:00-1:00	Judge's Lunch KSC 104
11:00-2:00	Lunch (assigned sessions)
1:00-2:00	Awards Ceremony Fortunoff Hall Hunt Room

Welcome Address
Michelle T. Nohs Scholarship Awards
Outstanding Educator Award Presentation
Awards Presented to the Best Posters

Michelle T. Nohs Scholarship Fund
2011-12 Awards to April Anderson and Grace Cappadona

Michelle T. Nohs was a senior majoring in Chemistry at Dowling College, and she was preparing to become a teacher. As a student-teacher, she had a gift for relating chemistry to the everyday lives of her students. Her enthusiasm for the subject was contagious. The loss of Michelle and her contributions to the College were recognized at Dowling's Commencement Ceremony on May 16, 2009. Family and friends were in attendance as Dowling College posthumously awarded Michelle's Baccalaureate degree in Chemistry. Michelle's sister Deanna, also a Dowling College graduate, accepted the degree on her family's behalf.

Through personal donations and a graduation celebration, the Michelle T. Nohs Scholarship Fund was established. The Michelle T. Nohs Scholarship Fund serves as a lasting memory and honors Michelle's hard work during her time spent at Dowling. The scholarship assists deserving students to achieve their goals. The scholarship is awarded to full-time/part-time undergraduate/graduate students majoring in chemistry (or a related science) and who are preparing to become chemistry (or science) teachers. Priority is placed on returning students, students who are also employed, and single parents. Applicants must demonstrate the promise of becoming an innovative teacher, must have demonstrated service to the community, and must have financial need.

April Anderson and Grace Cappadona are awarded the Michelle T. Nohs Scholarship for 2011-12 at the 2012 NSF Noyce High School Science & Mathematics Symposium to help them achieve the goal of becoming a math or science teacher.

For more information on the Michelle T. Nohs Scholarship or to make a contribution please contact the Office of Institutional Advancement at 631-244-3377.

Awardees

2012 Grace Cappadona
2011 April Anderson
2010 Genan Holder

2012 Outstanding Educator Award
Sarah Richards, Saint Ann's School, Brooklyn, NY

The Outstanding Educator Award is given to teachers who exhibit excellence in the following:

innovative classroom teaching that serves as a model to others
extension of teaching/learning into the world beyond the school walls for the benefit of the larger community
inspire students to become lifelong learners
significant contributions to the profession

Sarah Richards has taught science at Saint Ann's School in Brooklyn, NY for the past 25 years. During her tenure there, Sarah has taught General Science, Earth Science, Anatomy and Physiology, Oceanography, Marine Biology, and Meteorology. She has also served as Chair and Associate Chair of the Science Department. Sarah is always looking for new and fun ways to engage students in science. She started a two-week Summer Science Camp for middle schoolers at Saint Ann's ten years ago, and has coached a team for the National Ocean Sciences Bowl for the past twelve years. Sarah believes in the importance of experiential learning, and has designed and led many field trips for her students. From 1989-2001, she took her high school students on a week-long trip each spring to the Hofstra University Marine Lab in Jamaica, and since 2002, she's been leading comparable trips to the Florida Everglades and Newfound Harbor Marine Institute on Big Pine Key. Sarah was selected to participate in the Sea Experience for Teachers sponsored by the Sea Education Association in 1991, and the Down Under, Out Yonder program sponsored by the Gulf of Mexico Foundation in 2009.

Sarah received her B.A. from Oberlin College, and her M.S. in Science Education from Oregon State University. She has been an active member of the NY State Marine Education Association since 1993, and currently serves as NYSMEA's Treasurer and Annual Conference Coordinator. She was awarded NYSMEA's Kinghan Service Award in 2004, and the SCONYC's (Science Council of New York City) Science Education Award in 2005. In 2006, Sarah served as co-chair of the annual National Marine Educators Association Conference, which was held in Brooklyn, and was elected to the NMEA Board of Directors in 2008. In her spare time, she is the principal second violinist of the Brooklyn Symphony Orchestra. Sarah enjoys cooking, reading, and traveling - especially to destinations where she can SCUBA dive with her husband Clive and 13-year-old son Thomas!

Prior Recipients:

2011 Phil Medina, R.C. Murphy Junior High School
2010 Maria Brown, Sayville High School
2005 Allison Chanin-Bermudez, The Wheatley School
2004 Paul A. Lichtman, Uniondale High School
2003 Philip Sheridan, Patchogue-Medford High School
2002 Lou Siegel, John Dewey H.S., Beach Channel H.S., Oceanside H.S.
2001 Arthur P. Cooley, Bellport High School

WORKSHOPS

1. Tuna: A Love Story

Richard Ellis, Renowned Conservationist, Marine Artist, Author
http://richardellis.info/biography.html

Mr. Ellis will discuss the future of tuna and the oceans which he explored in his recent book. The author of The Book of Sharks, Imagining Atlantis, and Encyclopedia of the Sea turns his gaze to the tuna–one of the biggest, fastest, and most highly evolved marine animals and the source of some of the world's most popular delicacies–now hovering on the brink of extinction. In recent years, the tuna's place on our palates has come under scrutiny, as we grow increasingly aware of our own health and the health of our planet. Here, Ellis explains how a fish that was once able to thrive has become a commodity, in a book that shows how the natural world and the global economy converge on our plates. Experts warn that the fish are dying out and environmentalists lobby for stricter controls, while entire coastal ecosystems are under threat. The extinction of the tuna would mean not only the end of several species but dangerous consequences for the earth as a whole ... this book will forever change the way we think about fish and fishing.

2. The Underwater World of Samson the Frogfish

Ed Jameson, Diver, 3-D Photographer
http://lab.dce.harvard.edu/~environment/ed-jameson.html

We will view the unique and stunning 3-D imagery of Ed Jameson, an innovative underwater photographer who has designed and built his own equipment for capturing 3-D underwater images. A widely acclaimed worldwide presenter, Ed has won numerous awards for his work, and his presentation for us is nothing less than spectacular. His images jump off the screen in full three-dimensional representation, as we follow the latest exploits of the Frogfish, ™Samson,ʃ across the reef and meet a variety of his ™friends.ʃ A truly one-of-a-kind presentation,.

3. Midway Island: A Vision of Restoration and Hope for the Natural World

Mr. Doug Schmid, Adjunct Professor of Environmental Science, Nassau Community College; President of the Long Island Science Education Leadership Association
http://www.midwayjourney.com/

Once the site of WWII battles and cold war military activity, Midway Island is now a wildlife refuge. Recovering populations of nesting seabirds number in the millions, and the atoll's pristine reefs and rebounding biological communities show us the abundance that once was, and can be again, the natural world. Through a presentation on science research at Midway today, from monitoring endangered monk seal populations to restoring native plant communities, we will discuss the resilience of nature and the results of restoration efforts. During this workshop participants will ™dissectʃ albatross boluses and see firsthand the effects of plastics in the oceans upon seabirds!

4. EARNING HIGHER GRADES USING INFORMATIVE MAPS

David Stolarz, Ph.D. Student, Earth and Environmental Science Program, CUNY Graduate Center

If a picture is worth a thousand words, then maps are worth ten thousand. Learn how to create, obtain, describe, and insert maps into homework assignments, term papers, and presentations in order to finish faster and earn higher grades. Throughout college, the capability to use maps effectively will continue to generate higher grades with rapid deployment. Furthermore, the benefits of map literacy extend beyond the classroom into life-long rewards of empowerment. Online mapping can help plan a vacation, pick a great place to live, or participate effectively in community issues. In addition, a wide variety of careers now use geospatial analysis for creative solutions to complex opportunities.

5. What's All the Buzz?

Thomas Vitti, Teacher, West Islip High School, Long Island Beekeepers Club
http://longislandbeekeepers.org/

Did you know that to make one pound of honey, it takes 556 worker bees collecting nectar from 2 million flowers? Come and learn the ecology of honeybees, how to start your own apiary, and the worldwide historical and cultural importance of honeybees. Mr. Vitti will bring along some of his little friends.

6. What is the Concentration of a Solution? Performing Beer's Law Investigations

Joanne DiNovis, Adjunct Assistant Professor of Chemistry, Dowling College

Have you ever wondered what the free chlorine content of your swimming pool water or tap water is? What is the concentration of iron in a multivitamin tablet? What about the relative red or yellow dye concentrations in soft drinks or the albumin concentration in egg whites? During this workshop, you will use a spectrometer, which will allow you to gather data to determine the concentration of solutions. A light beam penetrates the solution, strikes a photocell and is used to compute the absorbance of each solution. Beer's Law shows a direct relationship between absorbance and concentration for a solution.

7. SPLASH: Action Stewardship of your Environment

Captain Don Harris, Education Director, Stop Pollution, Littering and Save Harbors (SPLASH)
http://operationsplash.net/

Operation SPLASH is a very successful volunteer non-profit organization started in 1990. It provides a solution to the growing problem of waterfront pollution through public awareness and individual participation. The hundreds of dedicated, active members take SPLASH boats out at least once daily and actually remove debris from the local waterways and shorelines. During this presentation you will learn about the problems associated with storm water run off and the effects of water pollution on the local bays. Students gain a better understanding of how ™The Power of One∫ can make a difference on our planet. Operation SPLASH Makes that difference!

8. FISH!

Dr. Merryl Kafka, Former Curator of Education, New York Aquarium
http://www.nyaquarium.com/

This dynamic speaker will combine audio visuals, and models to introduce students to the behavior,biology and adaptations of one of the most successful and diversified groups of vertebrates ± Fish!

9. Limulus in the Limelight: The Horseshoe Crab, a species 450 million years in the making

Dr. John Tanacredi, Chair, Department of Earth and Marine Sciences, Dowling College
http://www.dowling.edu/school-arts-science/earthmarine/horseshoe.shtm

Learn all about this living fossil through a dynamic presentation followed by a visit to Dowling College's Horseshoe Crab Research Laboratory. You will learn about the experimental Horseshoe Crab Network which monitors the current Long Island population of these important organisms.

10. Plants from the Sea

Lisa Breslof, Supervising Museum Science Instructor at the American Museum of Natural History
http://www.amnh.org/learn/musings/SP01/h_hwMuseum.htm

How do sea plants differ from those that sprout from the land? This workshop explores the biology and ecology of a variety of local and exotic specimens from the sea, and the art of preserving seaweed specimens. Learn how sea plants from single-celled algae to underwater kelp forests reaching 50 feet to the water surface sustain and enrich our lives with oxygen, food, medicine and commercial products including puddings, toothpaste, and non-dairy creamers! Students will have the opportunity to identify and press sea plants.

11. Hunting For Dinosaurs

Joseph C. Rezza Jr. Islip Public Schools
http://www.mrfdigs.com/

The Marmarth Research Foundation is a non-profit organization that organizes fossil hunts for 8 - 10 weeks every summer. Under the care of Tyler Lyson, volunteers get to find, prepare and curate fossils. Some important finds that will be discussed include the finding of ™Dakotaʃ, a duck-billed dinosaur mummy from the Late Cretaceous time period and the finding of several important turtle fossil sites. These specimens are extremely important to modern day paleontology because of their close proximity with the K/T Boundary - the approximate time the dinosaurs were thought to go extinct.

12. Bone Physiology and Adaptation in Response to Mechanical Loading

Minyi Hu, Ph.D. candidate, Department of Biomedical Engineering, Stony Brook University

The basics of bone physiology will be discussed followed by specific topics regarding tissue adaptation in response to mechanical loading. Specific promising examples will be given of Dynamic Hydraulic Stimulation (DHS) experiments on disuse bone. DHS has been shown to enhance bone structure under in vivo disuse conditions. This is an interesting and exciting topic highlighting state of the art biomedical engineering research.

13. Invasive Plants on Long Island: Legislation, Species, and Native Alternatives

Jane Montague Jackson, Associate Director of Stewardship, North Shore Land Alliance
http://www.northshorelandalliance.org/home.htm

Invasive species are, after habitat loss, the biggest threat to native plants and animals. They also take a toll on our economy, costing the U.S. over $100 billion every year through losses in agriculture and forestry and other management costs. In response to these concerns, Nassau and Suffolk Counties in 2007 passed legislation that forbids the sale and distribution of dozens of invasive plant species. This workshop will explain the problems caused by invasives and the Do Not Sell legislation enacted on Long Island, and help students identify common invasive species as well as native species that can be planted as alternatives.

14. Math meets Music: Ideas for Classic Geometry of Sound Graphic Pattern

C. Chris Peters, Founder of ™Music Meets Scienceʃ

This presentation is based on sound and music as it relates to geometry. Topics discussed will include: the harmonograph (popular in the 1890s), a device that mechanically generates Lissajous patterns (curves that describe harmonic motion) by varying the frequencies of swinging pendulums; and Cymatics (modal phenomena), the study of visible sound and vibration.

15. Biodiversity and the Search for Alien Invaders

Dr. Christopher Boyko, Assistant Professor of Biology, Dowling College
Dr. Richard Wilkens, Associate Professor of Biology and Natural Science, Dowling College

Current interest in biodiversity of regions and worry over introduction of alien species with possible negative impacts requires accurate identification of organisms. In this workshop, demonstrations will be given on varied techniques used in identification of native and exotic animals primarily insects, using compound, dissecting, and scanning electron microscopy, as well as dichotomous keys.

JUDGES

Mrs. Patricia Aitken
Friends of the Bay

Mrs. Andrea Beatty
Commack High School

Mr. Michael Bilecki
National Park Service- Fire Island National Seashore

Dr. Matt Bird
Brookhaven National Laboratory

Ms. Lisa Breslof
American Museum of Natural History

Ms. Maria Brown
Sayville High School

Mr. Tobias Daempfle
West Hempstead High School

Mrs. Doreen DeAngelo
The Wheatley School

Ms. Loretta Dionisio
Nassau County Dept. of Public Works

Ms. Maureen Dolan Murphy
Citizens Campaign for the Environment

Mrs. Valerie Eagen
Nassau County Dept. of Public Works

Ms. Karen Eichelberger

Ms. Marla Ezratty
Paul D. Schreiber High School

Mrs. Tina Gallagher
Paul D. Schreiber High School

Mrs. Erin Garland
Bay Shore High School

Mr. John Gollisz
Mineola High School

Mr. Bob Goodwin
Mineola High School

Mr. Peter Guastella
Manhasset High School

Mr. Joseph Haberstroh
Wall Street Journal

Dr. Barbara Hillery
Old Westbury

Ms. Minyi Hu
Stony Brook University

Mrs. Kristy Jaeger
North Babylon High School

Dr. Merryl Kafka
New York Aquarium Education Director, retired

Mrs. Janet Kaczmarek
Sayville High School

Dr. Arthur Kopelman
Coastal Research and Education Society of Long Island, SUNY, Dowling

Ms. Kathy Krause
National Park Service-Fire Island National Seashore

Mrs. Mary Kroll
West Islip High School

Mr. Richard Kurtz
Commack High School

Mrs. Annette Kuruc
North Babylon High School

Mr. Richard Lemke
Sachem H.S. East

Mrs. Kelly Mackey
Islip High School

Dr. Ellen McGlade-McCulloh
Mineola High School

Ms. Annie McIntyre
NYS Office of Parks and Historic Preservation

Dr. John R. Miller
Brookhaven National Laboratory

Ms. Elizabeth Moore
Writer

Dr. Melvyn Morris
Brookhaven National Laboratory

Dr. Robert Nuzzi
Suffolk County Department of Health Services-retired

Mr. Robert Nyman
U.S. Environmental Protection Agency

Ms. Jennifer Porcheddu
City University of New York

Mr. Robert Purdy
West Islip High School

Dr. Ralph Richart
Columbia University

Mr. Ernie Rossano
Environmental Resources Management

Mr. John Schineller
Schreiber High School

Dr. Gregory Shkuda
Environmental Resources Management

Mr. Lane Smith
New York Sea Grant

Mr. Russell Taragan
Museum of Natural History

Mr. Sal Trupia
West Hempstead High School

Dr. Michael Vaccariello
Sachem H.S. East

Mr. Thomas Van Bell
The Wheatley School

Ms. Jaime Van Dyke Doran
Town of Oyster Bay

Dowling Judges

Mr. Juan Carlos Alicea
Ms. April Anderson
Ms. Kostandina Bardhi
Ms. Grace Cappadona
Dr. Steven Farenga
Mr. Nick Felton
Dr. Yumiko Iwasaki
Mr. Steven Jasuta
Ms. Brianne Karten
Ms. Alyssa Liguori
Ms. Aimee Iuliucci
Dr. Kevin McDonnell
Ms. Samantha Montemurro
Mr. Daniel Moscato
Dr. Dan Ness
Mr. Minh Ngo
Ms. Allison Olsen
Dr. Phil Ratner
Dr. Fred Rispoli
Dr. Alexander Smirnov
Ms. Erica Spanhake
Ms. Megan Sullivan
Dr. Richard Wilkens

ABSTRACT TITLES

Commack High School Research Teacher: Mr. Richard Kurtz

1. **Comparison of the Heat Shock and Cold Shock Genes *Hsr-omega* and *Frost* from *Drosophila melanogaster* of Different Regions**
   Rachel Aitchison, Scott Massa, and Chantel Yang

2. **Regional Effects on Recovery Duration of Cold-Induced Hibernation in *Drosophila Melanogaster***
   ZanAsif

3. **Determining the Rate of Occurrence of Novae in the Andromeda Galaxy**
   Peter Brennan and Will Furst

4. **Effect of Various Liquids and Additives on the Prominence of the Marangoni Effect**
   Robert Delgado

5. **Determining the Effects of Magnetic Activity on Meteors Using FM Radio Waves**
   Charles Eder

6. **Transformation of *Arabidopsis thaliana* by the Over Exposure of Specific Transfer Proteins of *Agrobacterium***
   Samantha Galina

7. **Historical Snowfall and Temperature Records at Erasmus Hall, NY in the early 19th Century as Compared with Modern Climatic Normals**
   Lisa Kim

8. **Is there Genetic Variation Present in Cellar Spiders (*PholcusPhalangiodies*) from Different Geographical Regions?**
   Daniel Kowalsky

9. **Effect of the Absence of Gluten on the Taste and Characteristics of Pie Crust**
   Lindsay Marano

10. **Prevalence of Type 1 Diabetes Mellitus between Africa and Europe**
    Patryk Piascik

11. **Phototropism vs. Gravitropism in the Growth and Orientation of Radish Seeds**
    Melanie Shayowitz

12. **Study of a Honey Bee Pest: The Lesser Wax Worm (*Achroiagrisella*) and its Food Preference**
    Jacqueline Marie Tumminello

13. **Effect on Developmentof Brine Shrimp (*Artemis salina*) Cysts Exposed to an Electrostatic Field**
    Young Soek Yoon

Huntington High School — Research Teacher: Mrs. Lori Kenny

14. Study of the Extracellular Matrix in Dental Pulp Stem Cell Differentiation with and without Static Magnetic Fields
Holly Flores and Austin Wild (South Side H.S.)

15. Chronostratigraphy Studies of Hurricane Over-wash Deposits from Long Island, New York Using Sediment Cores
Jacob Roday

16. Effect of hCG, Progesterone, and Estrogen on the Differentiation of Terminal End Buds in Sprague Dawley Mammary Glands
Josh Solomowitz

17. Effect of Ascorbic Acid on *Rana Catesbeiana* Growth Through Metamorphasis
Julian Carrollo

18. Effect Of Cell Phone Radiation on *Drosophila melanogaster* Lifespan
Molly Prep

19. Comparison of Various Insect Repellents on *Drosophila melanogaster*
Frank Yeh

20. Optical Brighteners in Laundry Detergents: Assessment of Photodegradation and Potential Endocrine Disruption
Megan Hansen

21. Effects of Capsaicin on *Escherichia Coli* colonies
Ben Kaplan

Manhasset High School — Research Teacher: Mr. Peter Guastella

22. Effects of Superoxide Dismutase on *C. elegans* with Amyotrophic Lateral Sclerosis
Karalyn Pappas and Adiel Rothstein

23. Determining the Correlation Between the Brightness and Diameter of Type Ia Supernovas Using the Inverse Square Law
Sarin Dutt, Archie Kong

24. Biodegradability and Mechanical Properties of Polylactic Acid/Starch Bioplastic Blends
Caroline Juang and Catherine Maccaro

25. Effects of Chantix and Lobelia on Post-Nicotine Treated *C. Elegans* in Regards to Locomotion Behavior and Fat Deposition.
Patricia Lin and Juliet Paterek

26. Evaluating the Effects of a Nonsteroidal Anti-Inflammatory Drug and Different Rest Intervals in Training on the Memory of the UAS-APP Strain of *Drosophila melanogaster*
Kayla Feeney and Vivian Liu

27. Effects of Different Kinds, Wattage, and Wavelength on Solar Cell Output
Matthew Peng, Shivam Mukherjee

28. Effect of Ultra-High Frequency Radio Waves on *Drosophila melanogaster* Learning
Austen Te

29. Effect of Blade Mass and Amount on the Wind Turbine Efficiency.
David Kim

30. Dimple Location and its Effect on Lift and Drag of a NACA 0012 Airfoil
John Furlong

31. Effects of UV Induced Oxidative Stress on the Locomotion of *Drosophila melanogaster*
Noel Lau

32. Effects of Antioxidants on Fruit Flies While Exposed to UV Radiation
John (Yanni) Ziozis

33. Effect of *Syzygiumaromaticum, Lavandulaangustifolia*, and *Origanumvulgareon Saccharomyces cerevisiae* and Planaria Regeneration
Sydney Blanche

34. Effect of Heat Stress on the Longevity of *Drosophila melanogaster*
Sydney Canfield

35. Effects of Varied Activities on Laptop Power Consumption
Matthew Ehrlich

36. The Usage of the Golden Ratio and Eigenfaces in Facial Recognition Programming
William Juang

Mineola High School Research Teacher: Dr. McGlade-McCulloh

37. Designing a Wind Turbine to Capture Winds Gusts in Urban Canyons
Daniel Correia and Razvan Tohanean

38. Effect of 5-Fluorouracil, a Collagen Inhibitor, on the Regeneration of Planaria
Vineeth Varghese and Sujith Maracheril

39. Effect of Honey on *Escherichia coli.*
Joyce Rhim

40. Motor Oils Effect on Algae Survival
Michelle Senra

41. Effect of Bisphenol A on the Avoidance Behavior of *Lumbriculus variegatus*
Kristen Sze-Tu

42. Harvesting Electricity from the Wind for use in Automobiles
Raymond Agrelo

43. Effects of Magnetic Field on the Growth of Wisconsin Fast Plants
Mallory Brady

44. Effect of Benzothiazole on Brine Shrimp Survival and Development
Caroline Mueller

45. Effect of Copper (II) Sulfate on *Artemiasalina*
Joyce Hwang

46. Can Indolebutyric Acid (Auxin) Replace Gibberellin's Role in Gravitropism in Gibberellin-free Mutated Wisconsin Fast Plants?
Sarah Lee

North Babylon High School Research Teacher: Mrs. Annette Kuruc

47. Assessment on the Effectiveness of Various Cleaning Protocols on Wrestling Mat Surfaces
Max Servetas

48. Effect of Acidic Precipitation on the Survival Mechanisms of *Dictyostelium discoideum*
Bryan Montes

49. Effects of Ocean Acidification on the Development of *Limulus*
Anthony Gilman

50. Detecting the Migration of Hydrocarbons using an Ultraviolet Light
Cassandra Giannakakis

51. Effects of Ocean Acidification on the Development of *Mercinaria*
Alex Lopez

52. Effect of Ferrofluids on the Internal Temperature and Performance of a Loudspeaker
Michael Aufiero Jr.

53. Effect of Incense Particulate Matter on Drosophila Melanogaster
Karan Kumar

54. Using Plant Hormone to Increase Grafting Success
Deep Patel

55. Evaluation of Microbial Attachment and Survival on Sharklet-Patterned Surfaces
Alexa Marinos

Paul D. Schreiber High School — Research Teachers: Ms. Marla Ezratty, Ms. Tina Gallagher, Mr. John Schineller, Mr. Anthony Tedesco

56. Inhibitory Effects of Essential Oils from Aromatic Plants on the Growth of *Aspergillus niger.*
Benjamin Lerner and Michael Kuan

57. Effects of environmental humidity on the decomposition of *Pinus* (Pine wood) by *Gloeophyllum Trabeum* (brown rot)
Matt Brandes and Harry Paul

58. Combined Effects of Sunscreen and Temperature Stress on the Bleaching of *Caulastrea furcata*
Julia Zeh and Priyanka Ninan

59. Comparison of Varieties of *Camellia sinensis* in reducing the Heart Rate of *Drosophila melanogaster*
Emily Lipstein

60. Using Spidrons to Create More Efficient Electrical Grids
Evan Kerr

61. Effect of Shear Mapping on the Vibrations of Circular Membranes
Drew Feldman

62. Insulation and Radiant Properties of MultiCeramics Coating
Sophia Jaffe

63. Identification of Plant Root Controls by Soil Water Diffusivities Above a Water Retention Membrane
Rachel Cohen

64. Implementation of a Centralized and Decentralized k-Coverage Protocol to Maximize Wireless Sensor Network Longevity
Seoyoon Park

65. Effects of *Alliaria Petiolata* on Salt Marsh and Forest Ecosystems on Long Island, New York
Kevin Roberts

66. Survey to Assess the Diversity and Speciation of the Bat Population at the Sands Point Preserve
Rachel Ellinger

67. Monitoring NO2 Levels Utilizing Off-Axis Integrated Cavity Output Spectrometry (oa-ICOS) to Display Disparities between Areas of Low and High Traffic Volume
Sen Ninan

68. Efficacy of the Guided Precision Surgical Trephines vs. Standard Surgical Spade Drills in Performing Dental Implant Osteotomies
Kristin Shivdasani

69. Effects of sea urchins and other invertebrates on temperate kelp forests (Macrocystis pyrifera) on the coast of Santa Barbara, California
Amanda Fishbin

70. Combined treatment of microalgae on quorum sensing through AHL-inhibition in *Vibrio fischeri*
Alison Aguiar

Sachem East High School Research Teacher: Dr. Michael Vaccariello

71. Effects of *Commoiphira molmol* (Myrrh) and *Boswellia papyrifera* (Frankincense) on the Inhibition of Bacterial Growth
Maria DePinto and Anthony Mulieri

72. Effects of Lactose on *Drosophila melanogaster*
Christopher Czarnecky and Meaghan Fox

73. Topical Herbal Oil to Reduce Muscle Fatigue
Kayla Jo Gansrow and Cortney Evola

74. Photoreactivation Interferes with UV Mediated Water Purification
Mahad Shah and Haider Siddiqui

75. Effects of Monosodium Glutamate on *Drosophila melanogaster*
Jeffrey Bai, Timothy Jack Tan, Dominick Yeager

76.Dispersal, Germination and Growth of Seeds through Myrmecochory.
Peter Fahey and Maeve Mitchell

77.Biofermentation to Produce Bioethanol from Yard Waste.
Ricky Patel, Rajan Patel, and Matthew Brenes

78.Effects of Tobacco Smoke on House Plants.
Danielle Gonzalez

79.Strengthening Concrete Building Materials for Improved Earthquake Resistance.
Jeremy Conroy

80.Influence of Algal Species on the Formation of Silver
Joseph Lombardo

Sayville High School Research Teacher: Ms. Maria Brown

81.Chiropterid Biodiversity in the Tamishiyacu-Tahuayo Reserve, Peru
Alicia Protus and Derek Hartnett

82.Water Quality Study of Green's Creek Correlated to Surrounding Land Use, Long Island, New York
Sarah Monastero and Dara Hofmann

83.Using Geographic Information System Software to Determine Potential Hominid Fossil Locations in Turkana Basin, Kenya.
Marade Bergen and Kerry Barrett

84.Analysis of Lipid Biosynthesis and Inhibition in *Chlamydomonas reinhardtii*
Jacqueline Kalomiris

85.Haplotype Fingerprinting of the Anisoptera of Suffolk County, New York
Rebecca Monastero

86.Chemical Analysis of Airborne Particulate Matter to Classify Potential Micrometeorites and their Association to Meteorite Showers Using Synchrotron X-ray Fluorescence for Two Locations in Suffolk County, New York
Tiffany Bruno

87. Population Ecology of Ectoparasites of Mormoopid Bats from the Osa Peninsula, Costa Rica
Alexis Brown

88. Effect of Chemical and Physical Factors on the Expression of Parkinson's Disease in a Model Organism, *Caenorhabditis elegans*
Aneri Kinariwalla

89. Analysis of Variance of the Effects of Natural Substances on the Inhibition of Calcium Oxalate Crystallization
Erica Weinberg

90. Analysis of variance of mtDNA in the southern flying squirrel (*Glaucomys volans*), Long Island New York
Gabrielle Pacia

91. Geospatial Analysis of Self-Reported Multiple Sclerosis for Nassau and Suffolk Counties, Long Island, New York
Courtney Mignone

92. Applied Chemistry and Physics in the Study and Restoration of Artifacts from Long Island Shipwrecks
Garrett Boyce

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ABSTRACTS

Commack High School **Research Teacher: Mr. Richard Kurtz**

1. Comparison of the Heat Shock and Cold Shock Genes *Hsr-omega* and *Frost* from *Drosophila melanogaster* of Different Regions

Rachel Aitchison, Scott Massa, and Chantel Yang

The purpose of this investigation was to compare the expression of heat vs. cold tolerance genes of fruit flies, *Drosophila melanogaster*,originating from different regions in the United States to gain further insight on the effect of temperature as a selective pressure and to determine if the same species has different evolutionary adaptations based on geographical climate. Fruit flies contain heat and cold tolerance genes such as *Hsr-omega* and *Frost*. The Fruit flies in this study were obtained from Maine, New York, North Carolina, and Florida, and the DNA of the flies was extracted to compare their genes. PCR was used to isolate and amplify the target genes, and the gene fragments were identified using gel electrophoresis. Additionally, RT-PCR was used to determine if, and at what quantity, each of the genes are expressed by flies of the regional groups. It was hypothesized that all of the fruit fly groups would contain *Hsr-omega* and *Frost* in their genetic sequence with the heat tolerance gene, *Hsr-omega*, being expressed at a larger quantity in groups native to a region that has a high average temperature and the cold tolerance gene, *Frost*, being
expressed at a larger quantity in groups that are native to a region with a low average temperature.
Results thus far indicate that the heat tolerance gene, *Hsr-omega*, was present in the fly groups from Maine, New York, North Carolina, and Florida.

2. Regional Effects on Recovery Duration of Cold-Induced Hibernation in *Drosophila Melanogaster*

ZanAsif

The purpose of this experiment was to determine the ability of fruit flies (*Drosophila melanogaster*) from different geographic locations to recover after encountering freezing temperatures. Fruit flies are widely dispersed insects that cannot control their internal temperature (ectoderms), therefore, temperature has a major effect on their activity and geographic distribution. Fruit flies are ideal organisms to use for scientific studies because they are easy to rear in a lab and they share homologous genes with humans. Fruit flies from different geographic locations are known to have different tolerance to cold temperatures. For example, it has been shown that temperate flies recover faster from cold shock than flies from tropical regions. In this study individual flies reared from stocks from Maine, New York, North Carolina and Florida were put into tubes and put into the freezer (-5°C). After a set time they were removed from the cold and their recovery time and survival was recorded. It was hypothesized that, flies from colder regions would have a higher level of cold tolerance and a quicker recovery from cold shock compared to flies from warmer regions. Cold tolerance is the level of resistance that an animal has to cold weather. Based on results thus far, the flies from Maine have the quickest recovery time compared to flies from other regions

3. Determining the Rate of Occurrence of Novae in the Andromeda Galaxy

Peter Brennan and Will Furst

Novae occur when there are two binary stars (companion stars) whose gravitational pulls have a significant effect on one another. One of these stars is a very hot white dwarf star and the other is a red giant. The white dwarf star pulls material off of the red giant and onto its surface where it reacts explosively due to the temperatures of the white dwarf star. This explosion leads to an increase in luminosity. By using images taken from the WIYN 0.9 meter telescope on Kitt Peak, the rate of occurrence of novae over a 10 year period was determined. This rate could be affected by a number of things such as the number of binaries, the mass of the pre-nova stars, and the population's formation history. These images were observed in different areas, or fields in the Andromeda Galaxy, one at a time to find any changes in the images. Once a Nova candidate was found, it was observed closely to determine if it was truly a Nova, or just an imposter. During the research, the different traits that each nova has were also recorded. Thus far at least 4 Nova have been confirmed. Studying the elements that are required for a Nova to occur may help to predict where another one may occur.

4. Effect of Various Liquids and Additives on the Prominence of the Marangoni Effect

Robert Delgado

With the expanding research in the areas of microphysics, it is becoming imperative that the understanding of the role that particles play under different environmental conditions is further developed. One way to study how particles behave is by observing the Marangoni Effect. The Marangoni Effect is comprised of a set of phenomena related to the motion of liquids by surface tension gradients, which can be generated by changes in any variable that affects surface tension. In this study, the temperature and liquid composition were altered to observe how these changes influenced the Marangoni Effect. When the viscosity increases in a liquid, various properties such as specific heat and resistivity change. This change makes the Marangoni Effect on a specific liquid much more chaotic and unpredictable. The signficance of the data is determined by comparing the amount and rate of change of the altered liquid with respect to the original liquid. This is quantified by comparing how fast and how large a liquid ring (created by the Marangoni Effect) is formed. The rings are made when a liquid drop is heated up, and an inward evaporation and dehydration occurs. This combination of evaporation and dehydration is not constant, and when it slows down a ring forms, due in part to the Marangoni Effect. Thus far, the results indicate that the ring formation is dependent on the purity of the liquid and its temperature.

5. Determining the Effects of Magnetic Activity on Meteors Using FM Radio Waves

Charles Eder

The purpose of this investigation was to determine if magnetic activity in the magnetosphere affects the characteristics of meteors in the earth's atmosphere. This was accomplished by recording the characteristics of FM radio waves reflected off of meteors, a method known as radio echo observation. The duration of the radio signals and their amplitudes are the two main characteristics which were observed. These characteristics reveal the length and density of a meteor. The term meteor describes specifically the streak of light created as meteoroids burn up in the atmosphere and their gases become ionized. Meteoroids are metallic objects, normally composed of iron or nickel, which can range from 100 micrometers to 10 meters in diameter. It has been speculated that a meteoroid's size or speed influences the duration of the meteor which it creates, but the density of the ionized gas is influenced by electromagnetic activity, leading to differences in the amplitudes of radio signals reflected from the meteors. Denser ionized meteor trails reflect radio waves more effectively and the radio waves therefore have greater amplitudes. A radio receiver was connected to a radio antenna and tuned to a frequency of 76.31 MHz. A program called Spectrum Labs was used to analyze the radio reflections which were received. This study integrates and compares data of magnetic activity taken from the United States Geological Survey and the analyzed radio waves. Thus far, a preliminary inspection of the Spectrum Labs analysis has been conducted and a search under way for amplitude spikes.

6. Transformation of *Arabidopsis thaliana* by the Over Exposure of Specific Transfer Proteins of *Agrobacterium*

Samantha Galina

The purpose of this study was to observe the possible changes in transgenic plants induced by the over-expression of a single protein, known to be involved in DNA transport from *Agrobacterium* to the plant cells of *Arabidopsis thaliana*. *Arabidopsis thaliana* is a flowering plant in the Brassicaceae family. It is used in research because of its small size, rapid life cycle, prolific seed production, and many types of possible mutations. *Agrobacterium* was used as a vector to transfer the DNA as it can transfer DNA into plant cells. This bacterium causes the plant disease crown-gall, that results in the formation of ™tumors∫ or galls on the plant. The transfer protein variables included VirE3, VirE3M, and Atu6002. A. *thaliana* plants were grown for approximately 6 weeks. The plants were then dipped into the specific protein *Agrobacterium* solutions. The fruits were cut from the plants, and the seeds extracted and placed on Petri dishes to grow with a B5 and kanamycin agar solution. The B5 contained nutrients necessary for plant growth and the kanamycin was used to determine which plants were transgenic. The plants with the mutation continued to grow and were transferred into soil. The DNA of the leaves of the plants were extracted and analyzed using PCR and Gel Electrophoresis, to determine which seeds were transgenic-either heterozygous or homozygous. Each sample in the first transformation generation of the protein Atu6002, exhibited the presence of the DNA. Further tests are being done to determine whether the samples are homozygous or heterozygous.

7. Historical Snowfall and Temperature Records at Erasmus Hall, NY in the early 19th Century as Compared with Modern Climatic Normals

Lisa Kim

Today climate change is a major global concern. Increasing global temperatures and erratic weather patterns are causing environmental and economic problems. To improve our understanding of climate change it is imperative that more information related to changing weather patterns be collected and analyzed. The purpose of this investigation was to study the historical weather data recorded at Erasmus Hall, Brooklyn, New York, and compare it to the temperature and snowfall of modern data from the same area. Comparing historical weather data to modern data can be used to increase our understanding of climate change and trends that can be used to predict future climate conditions. Historical weather data was obtained from meteorological records taken at Erasmus Hall High School (1826-1857) and compared to modern weather data (1976-2007). The data was digitalized and studied to determine if there were differences in the mean annual temperature and the total annual snowfall. The months between November and March were analyzed. Results showed that there were statistical differences between the historical and modern temperatures for the months of November, December, February, and March, but not January. On average the modern time period was warmer by 3.4°F. There were also a significant statistical difference in the total amount of snowfall between both sets of data for all the studied months. This project illustrates the potential use of historical data to get a clearer view of climate trends.

8. Is there Genetic Variation Present in Cellar Spiders (*PholcusPhalangiodies*) from Different Geographical Regions?

Daniel Kowalsky

The purpose of this study was to explore the genetic variation among cellar spiders (*Pholcusphalangiodies*). Organisms that have similar genomes or are considered the same species may evolve gene differences over time if they are isolated. Natural selection, a process where favorable adaptations are passed down to their offspring, is the driving force for the accumulation of genetic difference among once related organisms. It is thought that allopatric speciation plays a crucial role in evolutionary change at the genetic, physical, and behavioral levels. Allopatric speciation is when a population of the same species becomes isolated due to geographic isolation caused by physical barriers. Cellar spiders offer a unique opportunity to investigate speciation and its relationship to genetic variation, another component to understanding evolution. These spiders are often found in isolated places within a building. The spiders' widespread distribution allows for the comparison of their DNA from a variety of areas. Cellar spiders are sedentary organisms in that they are not known for great dispersal. For example,there may not be a lot of gene flow between a population of cellar spiders in a house vs. another nearby house. Essentially, they may represent small genetically isolated populations. This increases genetic drift within their population. Using a Qiagen DNA extraction kit, DNA was lysed and specific genes were amplified using PCR and compared using Clustal W. Results thus far show that there is little variation between spiders in the COI gene; however, variation was present in the 28s ribosomal gene.

9. Effect of the Absence of Gluten on the Taste and Characteristics of Pie Crust

Lindsay Marano

Gluten is a type of protein found mostly in grains such as wheat, rye and barley. Gluten plays a critical role in the unique baking quality of wheat by conferring water absorption capacity, cohesion, viscosity, and elasticity on dough. It may be described as the rubbery mass that remains after wheat dough is washed to remove starch granules and water-soluble constituents. The proteins in gluten can be divided into two major components based on their solubility in aqueous alcohols: the soluble gliadins and the insoluble glutenins, which work together to form a ™two-component glue,∫ in which gliadins are the solvent for glutenins, and combine to give dough its properties. My investigation explores the properties of dough when gluten is omitted, since gluten is not always a desirable ingredient for health reasons. A gluten-free diet is necessary for the well-being of people with celiac disease, an auto-immune disease caused by intolerance to gluten that affects more than two million people in the United States. The ingestion of gluten triggers the damaging of the villi that line the small intestine, which results in the malabsorption of nutrients. Using both gluten-free flour and regular all-purpose flour, both gluten-free and regular pie crusts were baked. Taste and characteristics of the pie crusts were compared before and after baking. Thus far, it has been found that there is no statistically significant difference between the regular and gluten-free pie crusts in mass, thickness, length, strength, or width after they have been baked.

10. Prevalence of Type 1 Diabetes Mellitus between Africa and Europe

Patryk Piascik

Type 1 Diabetes Mellitus (T1D) is an inflammatory autoimmune disease of the pancreas which prevents the production of the hormone insulin. Insulin is required for cells to take up glucose to form ATP required for cellular metabolism. To increase our understanding of this disease, it is important to analyze data of T1D because currently about 346 million people around the world have this condition which in turn affects our world socially and economically. A comparison of the prevalence of T1D was investigated in terms of demographic, health and economic data of 5 regions in both Africa and Europe. Categories of comparison included the Prevalence of T1D, Child Mortality Rate of children less than 5 years of age, Gross National Income per capita in ID (International Dollars), Healthcare Expenditure per capita, and Percent of GDP spent on healthcare. Data indicated that T1D is statistically more prevalent in Europe than in Africa. There are also regional differences, especially in Europe. However, rates in Africa may be due to economic,rather than epidemiological factors. For example, the data shows that health care systems are very poor in Africa and expenditure on healthcare is substantially less than in Europe. There is also a high infant mortality rate in Africa. These facts may cause an under reporting of actual T1D cases in poorer African countries. The genetic, environmental and social/economic aspects of T1D need to be further studied, especially in these poorer nations.

11. Phototropism vs. Gravitropism in the Growth and Orientation of Radish Seeds

Melanie Shayowitz

The purpose of this study was to determine the relative effect gravity and light has on the growth orientation of germinating radish seeds. The effect of light on plant growth is called phototropism. Phototropism is a plant's orientation response to light and Gravitropism is a plant's growth in response to gravity. Charles Darwin studied both of these tropisms that ultimately led to the discovery of the plant hormone auxin. It was hypothesized that gravitropism will have a more powerful influence than phototropism on plant growth orientation. Roots under natural conditions grow downward and shoots grow upwards. In this study germinating radish seeds were presented with light from either just below or above, from both above and below, and with no light exposure. The growth and the orientation of roots and shoots were observed. Thus far, the orientation of all shoots is straight up towards light, so the stems are displaying negative gravitropism and positive phototropism. Even when there is light coming from below the shoots are not influenced to grow with gravity. This suggests that for germinating radish seeds gravitropism has a greater effect than phototropism in growth orientation.

12. Study of a Honey Bee Pest: The Lesser Wax Worm (*Achroiagrisella*) and its Food Preference

Jacqueline Marie Tumminello

The lesser wax worm is the caterpillar larvae of a wax moth belonging to the Lepidoptera order. A characteristic of these moths is that they tend to feed on the honeycomb of honey bees. The adult wax moth is known to invade and infest hives and stored wax of the honeybee. The adults lay their eggs on beeswax and the emerging larvae consume and destroy honeycomb that is either in the hive, or more importantly,in the stored comb. The purpose of this study was to determine the relative importance of food properties for wax worms, and if the presence of existingwax worm larvae in the food influences the attractionof the wax worm towards the food. Two groups of wax worms consumed two different diets containing bran, glycerin, honeycomb, distilled water, and honey. The wax worms were presented with a choice of different diets which varied by the amount of components it contained, to observe if they can sense the different food properties. It was hypothesized that worms would be attracted to a diet with a greater percentage of honey. Results of the preferred diet was used for a second experiment where larvae had a choice to select either a food area that had other wax worm larvae ora food area with no wax worms present. It was hypothesized that wax worms would be attracted to the food area that had the presence of other worm larvae. Results thus far show that worms do have diet preferences.

13. Effect on Developmentof Brine Shrimp (Artemis salina) Cysts Exposed to an Electrostatic Field

Young Soek Yoon

There has been a debate concerning the possibility of the non-thermal effects produced by electro-magnetic fields (EMF) on biological systems. However, the underlying mechanism of the effects of electro-magnetic fields is unclear because of the lack of research on the exposure of static or Extremely Low Frequency (ELF) fields on an organism at early stages of development. Brine Shrimp were used because they have a short hatching time of 15 to 20 hours, their cysts are only 200 to 300 micrometer in diameterandthe cysts can be stored in a dormant state for long periods of time. The purpose of this experiment was to investigate the effects of electric field exposure on thedevelopmental stage of brine shrimp. It was hypothesized that a brine shrimp cysts, exposed to an electrostatic field, would hatch and grow at a faster rate compared to a control of no exposure. Their

movement and physical features were recorded once a week until they reach the adult stage. Thus far research shows that the cysts exposed to an electrostatic field had 95% percent hatching rate while the control group had 80%.

Huntington High School **Research Teacher: Mrs. Lori Kenny**

14. Study of the Extracellular Matrix in Dental Pulp Stem Cell Differentiation with and without Static Magnetic Fields

Holly Flores and Austin Wild (South Side H.S.)

Dental Pulp Stem Cells [DPSCs], maintain the ability to differentiate into osteoblastic or odontoblastic lineages and show great promise in regenerative medicine. Research has shown that the extracellular matrix [ECM] is critical in regulating cell function, and manipulating the ECM can differentiate cells. The ECM is normally difficult to observe but can be viewed when cells grow on sulfonated polystyrene [SPS], which stimulates ECM fibrillogenesis. Magnetic fields exert influence on ionic proteins, changing both cell signaling and the assembly of the ECM. The effect of a magnetic field was tested on the ECM and cells with or without dexamethasone, a cortical osteogenic inducer. The purpose of this study was to analyze cellular and extracellular responses to SPS and magnetic fields; which were hypothesized to increase the proliferation and differentiation. These responses can provide further insight on how to differentiate DPSCs. This was done by creating an SPS scaffold and testing the cells plated, with or without presence of a magnetic field. Half of the plated samples were exposed to magnets and the remaining samples were not. Microscopy was used to visualize the cytoskeletal structure, biomineralization and ECM formation of the cells in the presence or absence of the magnetic field. Results show that magnetic fields increase growth and biomineralization, and even differentiate the cells to a level past chemical induction on SPS. Future work will include scanning electron microscopy and quantifying collagen deposition and testing for more gene expression.

15. Chronostratigraphy Studies of Hurricane Over-wash Deposits from Long Island, New York Using Sediment Cores

Jacob Roday

Hurricanes are a dangerous force that can wreak devastation. If we are to be able to predict hurricanes in the future, then we must look to our past for answers. Studying ancient hurricanes can lead us to be more aware of their future actions. Our current data is only relevant for a couple of hundred years and the best data is of the last century. The only record of past hurricanes is under our feet, sand deposited by large swells called over wash. By looking at ancient hurricanes, we can develop patterns to their formation. Our current understanding of these occurrences is limited to the brief time humans have been on earth. By studying the geological record, we can be more prepared for the future. This project's goal was to identify hurricane over wash in sites known to have hit by hurricanes and have aerial photography showing the over wash. Over a series of several weeks, five sediment cores where collected, dissected, sampled and studied comprehensively. One of these five collected cores with the best over wash record was compared to a core taken the prior year in order to determine whether the older core had records of a hurricane over wash. After careful analysis of the sedimentology of each core and the suspected over wash deposits, it was shown that the older core had contained an over wash deposit. This project will help future expeditions identify hurricane over washes faster, easier and allow for more precise results.

16. Effect of hCG, Progesterone, and Estrogen on the Differentiation of Terminal End Buds in Sprague Dawley Mammary Glands

Josh Solomowitz

Structures called terminal end buds inside the mammary gland of both humans and rats may become tumorous after exposure to carcinogens, causing the development of breast cancer. If treated with hormones such as hCG, or Human Chorionic Gonadotropin, a pellet containing progesterone and estrogen, or saline control group, the terminal end buds may differentiate into distinctive, harmless and more developed structures called lobules. The rats have a certain window of susceptibility between the ages of 35-55 days old. During this time, the rats are more susceptible to breast cancer development. Different treatments on the rats were used in this research, including saline, estrogen and progesterone, and hCG during this window. This research compared the effects of the treatments on the reduction of terminal end buds, and observed which of the hormones had the best result on decreasing them. After observing the mammary glands of rats, the number of structures that appeared was totaled. HCG was able to reduce the greatest amount of terminal end buds in the treated rats. Out of the three hormones tested, hCG worked significantly better than the estrogen and progesterone and saline. HCG proved it possible to reduce terminal end buds in the mammary glands, which can ultimately reduce the risk

of breast cancer. This research can lead to more experiments, which may include testing other hormones produced naturally from the body. With further testing, there may be a way to differentiate all terminal end buds, thus completely ending breast cancer.

17. Effect of Ascorbic Acid on *Rana Catesbeiana* Growth Through Metamorphasis

Julian Carrollo

Vitamin C, also known as ascorbic acid, is a vital nutrient necessary for life's growth and development.
Vitamin C's effects on humans usually include increased life span and a decrease in diseases such as cancer. Ascorbic acid also increases the human immune response. Vitamin C can affect the growth of *Rana catesbeiana* over the course of metamorphosis. This project looked at the effect of an ascorbic acid supplementary diet on *Rana catesbeiana* growth through metamorphosis. The hypothesis stated that the tadpoles treated with the ascorbic acid supplement would grow to be larger than the tadpoles without ascorbic acid. The control tadpoles lived in chlorinated water. The test group lived in chlorinated water, but was given .04g of vitamin C with their .50g of food. Once they went through metamorphosis, their full body length was measured. The data that was collected and proved that the hypothesis was correct. The tadpoles with the ascorbic acid diet grew to be larger than the ones without ascorbic acid. The results proved that if *Rana catesbeiana* grows with an ascorbic acid diet, than its growth rate would increase. If the ascorbic acid has the same affect in *Rana catesbeiana* as in humans, they should also be less prone to common diseases. With this information there could be further testing to see if ascorbic acid effects life span or mass.

18. Effect Of Cell Phone Radiation on *Drosophila melanogaster* Lifespan

Molly Prep

Much about electromagnetic fields, also known as EMFs, are unknown. As humans in modern society, people are exposed to these wavelengths every day. They are emitted from many technologies, including microwaves, electric lights/products, and cell phones. There are certain kinds of radiation which have been proven harmful. Among these, radiation from CAT scans, in excessive doses, has been hypothesized to be unsafe. Radiation from the sun (in high exposures), x-rays, and gamma rays are proven to be dangerous as well. The exposure time and intensity of these wavelengths determine the immediate, as well as long-term, effects on humans. However, EMF short-term effects are thus far unapparent, and the long-term effects are undiscovered. In this research, the correlation between cell phone radiation emissions and the mortality rate of *Drosophila melanogaster* was made. Over a period of one month the mortality rates of the *Drosophila melanogaster*, both exposed and not, were measured and compared. A statistical analysis of these observations showed that the increase of the *Drosophila melanogaster's* mortality rate was not a direct result of cell phone radiation, proving the hypothesis null. Future experiments will explore the effect of EMFs on plant growth.

19. Comparison of Various Insect Repellents on Drosophila melanogaster

Frank Yeh

N,N Diethyl-meta-toulamide, or DEET, is a common synthetic chemical used to deter insects. As DEET is a synthetic chemical, its properties cause problems to both the human consumer and the surrounding environment. With this stated, it would be keen to discover another insect repellent that is not synthetic, as synthetic things tend to be more corrosive and dangerous in nature. This means that natural chemicals that display insect-repelling properties would be tested to check to see if the chemicals in question could possibly be used as substitute repellents. Since Drosophila melanogaster is closely related to mosquitoes, these fruit flies were used to investigate the effectiveness of each of the chemicals, including pine oil, cedar oil, and clove oil in comparison to DEET. The data showed that clove oil was highly effective in repelling the flies in comparison to the other alternatives. This data suggest that alternative methods of repelling flies is possible and most likely safer for the environment and people.

20. Optical Brighteners in Laundry Detergents: Assessment of Photodegradation and Potential Endocrine Disruption

Megan Hansen

Certain laundry detergents use optical brighteners, chemicals that could potentially harm human and environmental health. When released into natural water systems, they poison organisms like fish and can mutate bacteria. Optical brighteners absorb UV radiation and re-emit blue light, counteracting with dullness and creating the illusion of ™brightened∫ clothing. Light causes optical brighteners to chemically break down and gradually decrease in fluorescence. This is known as photodegradation, and this experiment aimed to determine the rates of photodegradation of the optical brighteners found in five generic detergent brands. At different time intervals, a fluorometer measured the fluorescence of samples of dilutions

of each of these brands. Out of all five brands, Brands One and Two had the greatest initial measure of fluorescence and displayed the fastest rates of photodegradation. It can probably be inferred that Brands One and Two had optical brightening chemicals that were more fluorescent than those of the other brands, but did not contain as great of a concentration of brighteners. A lower amount of optical brighteners with higher levels of fluorescence would allow collective decrease in fluorescence to occur faster. The results showed overall that both exposure to light and greater fluorescence speed up photodegradation.

21. Effects of Capsaicin on *Escherichia Coli* colonies

Ben Kaplan

This project looked at the effect of capsaicin on *Escherichia Coli* colonies, the importance of this research was such that capsaicin, an ultra-potent chemical known as resiniferatoxin, may be able to kill cancer cells. The hypothesis stated that capsaicin would kill *Escherichia Coli* cells after it came into contact with *Escherichia Coli.* Firstly, *Escherichia Coli* cells were plated on different concentrations of capsaicin agar. Comparisons of the populations of living cells were made. When the capsaicin came in contact with the *Escherichia Coli* cells they died in each concentration. The cells are proposed to have died because, *Escherichia Coli* cells felt abrasion and burning sensations from the capsaicin, ultimately like they are on fire, and this resulted in the death of the *Escherichia Coli* cells and possible unfolding of necessary proteins for function of the cells. The data showed conclusively that the capsaicin killed the *Escherichia Coli* cells. Therefore capsaicin does not cause *Escherichia Coli* cells to proliferate once added to the cells. T Finally, the importance of capsaicin being able to kill *Escherichia Coli* cells is that an ultra-potent of capsaicin known as resiniferatoxin may be able to kill cancer cells painlessly, which could be a possible cure for cancer.

Manhasset High School **Research Teacher: Mr. Peter Guastella**

22. Effects of Superoxide Dismutase on C. *elegans* with Amyotrophic Lateral Sclerosis

Karalyn Pappas and Adiel Rothstein

Amyotrophic lateral sclerosis (ALS) is a rare neuromuscular disease that is rapidly progressive and affects about 30,000 people in the US. Inherited ALS is caused from a mutation in the SOD1 protein and results in organisms that develop motor neuron degeneration. The normal SOD1 gene provides instructions for making an enzyme called superoxide dismutase. This enzyme neutralizes supercharged oxygen molecules which can damage cells. N2 *C. elegans,* strain AM263 (human SOD1 gene) and strain AM725 (mutated human SOD1 gene) were treated with 50 μL and 100 μL of a superoxide dismutase (SOD) solution at a concentration of .62μM. Body bends per 30 seconds were recorded, longevity was calculated, and GFP pictures were taken. The results show that with the addition of 50 μL SOD solution that the number of body bends per 30 seconds significantly increased on all days in the worms with ALS. Additionally, the data concludes that 100 μL of SOD was the best volume for strains N2 and AM263 and significantly increased the number of body bends. The data suggests that because strain AM725 has the mutated form of the SOD1 gene, the worms were unable to create the necessary enzyme superoxide dismutase and therefore, the addition of a superoxide dismutase solution at day 0 did reverse the symptoms.

23. Determining the Correlation Between the Brightness and Diameter of Type Ia Supernovas Using the Inverse Square Law

Sarin Dutt, Archie Kong

The purpose of this study was to determine the $\Sigma - D$ Relation for Supernova Remnants. Supernovas are stars that suddenly increase in brightness because of catastrophic explosion that ejects most of its mass. There are two basic types of supernovas, type Ia and II. Type Ia occurs in binary systems while type II occurs in regular stars during the white dwarf stage. The goal of this study was to provide further verification on the $\Sigma - D$ Relation for Supernova Remnants and to determine the correlation between the surface area and brightness of different supernovas. The supernovas were collected from the different range of catalogues found on the internet. Then the data was put into excel. The right ascension, declination, and absolute magnitude were collected from the various catalogues. The right ascension and declination helped get the apparent magnitude. The distance of the different supernovas can be derived from the apparent magnitude and absolute magnitude. The distance and absolute magnitude were plotted against each other to form the correlation. Results showed that the correlation determined was the opposite of the inverse square law. The correlation was not a drastic change but it was shown that the correlation had an increasing trend.

24. Biodegradability and Mechanical Properties of Polylactic Acid/Starch Bioplastic Blends

Caroline Juang and Catherine Maccaro

The current oil-based plastics that dominate the plastics industry are growing rapidly, but these plastics are non-recyclable, and cause health and environmental issues when disposed of through incineration or landfilling. Biodegradable plastics that are earth-friendly and industrial-standard are therefore in demand to replace the current plastics. Polylactic Acid (PLA) and Thermoplastic Starch (TPS) are two biodegradable plastics that were blended together in varying ratios of PLA to TPS, in order to find the best combination of mechanical strength and biodegradability. It was hypothesized that the PLA/TPS blend in an 80/20 ratio would produce the best biodegradability without a significant loss in mechanical strength. Plastics were blended using methods to simulate industrial-setting equipment. Fractural testing, tensile testing, biodegradability, and thermal degradation and degradation by water were tested using methods that are also used to simulate industrial settings. Results revealed that increasing TPS in blends increased the biodegradability of the samples, but no significant difference was found in thermal and water degradation. Mechanical strength was maintained in blends containing TPS in comparison to pure PLA. The 80/20 blend of PLA to TPS ultimately contained the most optimized balance between mechanical strength and degradation, which supported the hypothesis. A limitation is that the thickness of the polymers varied slightly from molding. Future studies could be done to test for a broader range of concentrations of PLA to TPS, or to test the biodegradability and strength of a blended polymer of PLA, TPS.

25. Effects of Chantix and Lobelia on Post-Nicotine Treated C. *Elegans* in Regards to Locomotion Behavior and Fat Deposition.

Patricia Lin and Juliet Paterek

According to the CDC, a smoker's heart beats 10 times more per minute and causes extra stress on the heart. This is approximately the same amount of stress on the heart as 90 pounds of extra weight. When one stops smoking, heart rate slows down, causing metabolism to decrease. The purpose of this research was to observe the effects of Chantix and Lobelia on post-Nicotine treated C. *elegans* in regards to locomotion behavior and fat deposition.The alternate hypothesis stated that in post-Nicotine treated worms treated with Chantix and Lobelia locomotion behavior and fat deposition would decrease.There were five groups: N2 (non-treated), Nicotine treated, Post-Nicotine Chantix treated, Post-Nicotine Lobelia treated, and Post-Nicotine non-treated. Locomotion behavior was quantified by counting body bends under a Motic camera for a minute. Fat deposition was calculated after fat lipids were stained with Sudan Black; pictures were taken on the Carl Zeiss Axiovert, and evaluated using Image J. Results show a difference between the body bends of a Nicotine treated worms to those of post-Nicotine treated worms with addition of Chantix and Lobelia. It can be inferred that metabolism increased as Nicotine treated worms locomotion increased. The fat deposition data suggests that worms indeed gained weight after weaning
off nicotine, but Chantix and Lobelia suppress the gain of weight because these anti-smoking products mimic nicotine.

26. Evaluating the Effects of a Nonsteroidal Anti-Inflammatory Drug and Different Rest Intervals in Training on the Memory of the UAS-APP Strain of *Drosophila melanogaster*

Kayla Feeney and Vivian Liu

An estimated 5.3 million Americans of all ages have Alzheimer's disease. Alzheimer's is a progressive brain disease that is irreversible and slowly destroys memory and afflicts an estimated 8% of people age 65 years and older. (Small, 2000) The cases of Alzheimer's disease which can be inherited have been found to be
involved in Alzheimer's disease pathogenesis of extracellular deposition of beta amyloid-A˚ and intracellular accumulation. (Hirth 2010) A non steroidal anti-inflammatory drug such as Pioglitazone have been found to have modest effects on Aβ levels within the brain. (Yan, et.al, 2003) Flies that passed a locomotor assay of 8 cm were treated and placed in specific vials depending on the variable either containing the drug treatment at a dosage of .02, .08, mg/ml pioglitazone hydrochloride or trained with rest intervals of 5 or 10 minutes during training. Flies were then tested for their memory in an Aversive Phototaxis Suppression Assay where a lighted vial which flies were attracted to is replaced with a .1 M stock solution of quinine hypochloride (aversive stimuli). After 6 hours of training an APS without quinine was run to see if flies would avoid the light. The performance index (PI) was calculated. Results show both variables don't have a large effect on WT flies, but do have therapeutic effects on the short term memory of UAS-APP flies which would be impaired with the progression of AD.

27. Effects of Different Kinds, Wattage, and Wavelength on Solar Cell Output

Matthew Peng, Shivam Mukherjee

The sunlight that hits the Earth every hour carries enough energy to meet the world's entire energy demand for a whole year. Photovoltaic cells, when exposed to light, can convert that light into electricity. The purpose of this experiment was to determine if wattages, wavelength, and different kind of light bulbs had an effect on the output of a solar cell. The hypothesis was that the higher the light bulb wattage the higher the output, because the higher the wattage the more light, leading to a higher output, and if the wavelength is longer it will be able to reach the solar panel from far away producing a greater output at all heights. The fluorescent bulb will cause the greatest output, because fluorescent bulbs are the most efficient. This experiment was done by having three different wattage incandescent bulbs(100-watt, 150-watt, 200-watt) and having three different types of bulbs(incandescent, halogen, fluorescent) and seven, colored bulbs from the visible light spectrum. The solar cell was exposed to a light bulb for ten minutes and using aXplorer's GLX, the current and voltage produced by the cell was recorded every thirty seconds. This was repeated ten times for accurate data. Results showed that the 150-watt incandescent bulb caused a higher output than the 100-watt incandescent bulb, and the Orange bulb at 6 inches had the highest output. Further data collection must be done for more accurate results.

28. Effect of Ultra-High Frequency Radio Waves on *Drosophila melanogaster* Learning

Austen Te

The purpose of this experiment is to show that *Drosophila melanogaster* have decreased amounts of learning when exposed to UHF (Ultra high frequency) radio waves. Over 4.6 billion subscriptions of cellphones have been issued at the end of 2009 and wireless routers have become common in public areas like airports and malls. Cellphones emit low frequency radio waves, and wireless routers emit UHF radio waves. Various other experiments have exposed UHF waves to rats. Many results show that there is a decrease in learning or behavioral changes in rats when exposed to UHF radio waves. This project exposed *Drosophila melanogaster* to UHF radio waves by a wireless router during the *Drosophila melanogaster*'s teaching sessions, and time between testing and teaching sessions. The frequency is 2.8 GHz. Then they have been taught with the technique, aversive phototaxic suppression. This technique is to teach flies to associate quinine, a chemical *Drosophila melanogaster* doesn't like, with light, the usual choice of the fly between light and dark. They were tested and taught in a T-maze where four teaching sessions, and four testing sessions were given. Light and darkness vials alternate so that flies don't associate direction with quinine. There are three groups: non-exposed flies taught (Control), non-exposed flies not taught and exposed flies that have been taught. Results so far have been inconclusive, but further research is being made.

29. Effect of Blade Mass and Amount on the Wind Turbine Efficiency.

David Kim

The purpose of this experiment was to determine if varying masses and amounts of blades have significant effects on the efficiency of the wind turbine. It was predicted that a lighter blade mass and the blade count of 3 would be more efficient because lighter blade mass makes it easier to move and 3 is known as the most ideal number. The blades were made out of cardboard and angled at 45 degrees and put inside a wind turbine. Some materials include wind turbine, cardboard, and wind tunnel. At a constant speed of 11.8mph the amount of 2, 3, and 4 blades was tested with lighter mass produced 0.032, 0.049, and 0.054 amount of voltage. Then the same amount of blades was tested but this time with double the mass, the results are as follows, 0.049, 0.052, and 0.065 amounts of voltage, meaning that the blade amount of 3 and double the mass produced the most voltage. In conclusion, the blade count of 3 and double mass produced the most voltage. In future studies, the testing of more blades and more masses will be conducted.

30. Dimple Location and its Effect on Lift and Drag of a NACA 0012 Airfoil

John Furlong

Piston-powered airliners were at least twice as fuel-efficient as the first jet-powered aircraft. As air moves faster over a wing, it creates a zone of low pressure which generates lift, while friction and other forces produce a counterforce that slows down the airfoil ± drag. Dimples can reduce aerodynamic drag by holding the boundary layer. Four variations of the NACA 0012 airfoil were then tested in comparison to the control. The airfoils had the dimples placed on different sections of the leading edge. The airfoils were then tested at 1° angle increments from 1 to 45 in a wind tunnel at wind speeds from 8 mph to 47 mph. These trials were then repeated four times at each of the five speed settings in the wind tunnel.

They were then tested with a fog machine in order to view how the air flows around the airfoils. Images of the boundary layer separation were taken in order to take direct measurements. A one-way ANOVA with a Scheffe post-hoc test ($p<.05$) was then performed on the data. The results of the consistently showed that the dimples placed at the end of the wing had less drag, but at the same time also had less lift, minimizing the effects of the decreased drag.

31. Effects of UV Induced Oxidative Stress on the Locomotion of *Drosophila melanogaster*

Noel Lau

The purpose of this experiment was to determine the effects of oxidative stress and dietary SOD (superoxide dismutase) supplementation (over expression) in the locomotive ability of *Drosophila melanogaster.* The hypothesis is that oxidative stress will affect locomotion of flies and that flies with an increased level of SOD supplement will have greater locomotive ability compared to controls because SOD is known to improve resilience to oxidative stress. Oxidative stress creates ROS in the tissue, however, SOD is an enzyme that assists in the dismutation of harmful free radical, reducing the likelihood of developing tissue damage, resulting in aging. According to the extended free-radical theory of aging, ROS can also cause such oxidative damage. The *Drosophila* were tested under various concentrations of Cu-Zn SOD and fly populations were tracked daily. Control groups were untreated, maintained at room temperature and tracked, along with flight testing and oxidative stress exposure. Control groups were subject to varying durations of constant intensity light, with fly population tracking as well. Locomotion testing was done with the
Negative Geotaxis Assay. Preliminary studies have found that SOD concentrations higher than 1.0 and lower than 2.0 are beneficial, while UVB radiation for more than 7.0 hours is lethal to flies.

32. Effects of Antioxidants on Fruit Flies While Exposed to UV Radiation

John (Yanni) Ziozis

The purpose of this experiment was to determine if antioxidants, such as Vitamins E and Vitamin A have a significant effect on the longevity of fruit flies when they are stressed dueto UVradiation. It was predicted that they would increase the lifespan, even when they were exposed to cell mutating effects such as ultra-violet radiation. *Drosophila melanogaster,* were separated in three groups; Vitamin E and Vitamin A were mixed in with their food. Each vitamin is given to one group, and the third group does not receive any antioxidant, and all of them are exposed to ultra-violet light. The particular UV used is UVB, which is less lethal than UVC, but more so than UVA. Results showed that vials given antioxidants survived longer under UVB than the one group that was not given antioxidants.

33. Effect of *Syzygiumaromaticum, Lavandulaangustifolia,* and *Origanumvulgareon Saccharomyces cerevisiae* and Planaria Regeneration

Sydney Blanche

The purpose of this experiment was to test and compare the antifungal qualities of *Syzygiumaromaticum, Lavandulaangustifolia*, and *Origanumvulgare* oil on Saccharomyces cerevisiae and planaria regeneration. The alternate hypothesis suggests that all oils whichkilled the *Saccharomyces cerevisiae* would be effective at slowing phase lengths of planaria regeneration. Planaria were divided horizontally and placed in 30 mL of water with 2.5 microliters of oil. The regeneration process was captured and compared to the control. Discs of oil were placed on streaked YEAD agar of *Saccharomyces cerevisiae* and incubated at 30°C for 48 hours, at which point the zones of inhabitation were recorded in millimeters. Results for the *Saccharomyces cerevisiae* showed that *Lavandulaangustifolia* had the lowest antifungal effect, with an inhabitation mean of 13.25 mm, while *Origanumvulgare* had a mean of 53.5 mm and *Syzygiumaromaticum* had a mean of 38 mm, showing significantly increased antifungal reactions. The results for the planaria test showed that *Lavandulaangustifolia* had the lowest effect on regeneration in which regeneration was delayed slightly, while *Origanumvulgare* and *Syzygiumaromaticum* had the most dramatic impact in which regeneration was slowed and stopped completely. These results support the alternate hypothesis that *Syzygiumaromaticum, Lavandulaangustifolia*, and *Origanumvulgare* oil slow the regeneration of planaria and are effective fungicides.

34. Effect of Heat Stress on the Longevity of *Drosophila melanogaster*

Sydney Canfield

Heat stress can have many negative effects on animals; however, small amounts of heat stress can be beneficial towards *Drosophila*. The purpose of this study is to see if this statement is true, having a way to extend longevity in an organism, because there could be a correlation between the results of *Drosophila* and possibly humans. Research shows that longevity is linked to stress resistance, which is created by a short heat stress early in life. In this study, it is

determined if heat stress early on in the life of *Drosophila* can result in an extended lifespan. In this study, groups of *Drosophila* were stressed at 34°C for 15 or 30
minutes. Different groups would be stressed at different ages from 1 day to 6 days old. To collect data, the flies were observed daily, recording any dead flies. When heat stressed for 15 minutes later in life, at 6 days old, the flies lived for 13-14 days. Compared to the average lifespan of the control group, which is 10 days, they lived longer. When heat stress was applied on flies that were younger, the data collected
currently in this study shows that when *Drosophila* are stressed when they were 1 day old, heat stressed for 15 minutes, then they live for, on average, 7 days, which is shorter than the control group. At this point in the study, the results show that a short heat stress later in life of *Drosophila* results in an
extended lifespan.

35. Effects of VariedActivities on Laptop Power Consumption

Matthew Ehrlich

In the UK alone, equipment on standby produces a total of 3.1 million tonnes of CO_2 a year. The purpose of this study was to determine the effects of engaging in different activities on a laptop's power consumption. It was hypothesized that activities that utilized the processor would consume more power than activities that were less taxing on the machine. The activities included were the idle desktop, executing an AVI file, copy and pasting a 750mb file from one location on the computer to another, and defragmenting the hard drive disk. A Kill-A-Watt meter was used to record the amount of watts consumed to the nearest tenth, and the software HSinfo was used to record the CPU clock speed. For one minute every five refreshes of the wattmeter was recorded while simultaneously HSinfo logged the clock speed. This was all done for each activity and repeated numerous times. The idle desktop consumed 13-16 watts of power while when the AVI file was running the computer absorbed 19-24 watts of power. This was probably due to the AVI file using many components of the computer at once while the desktop is engineered to run at a low power consumption. In the future, studies could be conducted that tested the power consumption of the same activities but with restricted access to some components.

36. The Usage of the Golden Ratio and Eigenfaces in Facial Recognition Programming

William Juang

The purpose of this project was to create a program in Java by Sun Microsystems based on sample code by KonradDarnok that could compare and identify human faces. People identify other humans based on the shape of their face and the distances between key facial landmarks including the eyes, mouth, and nose. If an adequate amount of sample images of an individual's face were taken and the proportions of the face were averaged to create eigenfaces based on that individual, then a program should be able to identify a person based on these traits. The program relies on the Java Matrix Package to construct ™face spaces;∫ sections of the image that are 4x4 pixels in size that are then compared to the ™face spaces∫ of the other sample images. Thus it is important that the images are the same size and the background does not interfere with the image significantly. The pixels in the ™face spaces∫ are then averaged based on shade and brought into one grayscale image- the eigenface. The input image is then compared to the multiple eigenfaces constructed by the different groups of sample images, and the most similar eigenface to the input image is determined. A multitude of individual faces can be identified using this method, but the program relies on the expressions and angle to be as similar to the samples as possible.

Mineola High School — Research Teacher: Dr. McGlade-McCulloh

37. Designing a Wind Turbine to Capture Winds Gusts in Urban Canyons

Daniel Correia and Razvan Tohanean

Urban canyons, the artificial canyons created by skyscrapers, are a common phenomenon seen throughout large metropolitan areas. One consequence of erecting tall buildings is that the wind patterns in the area are altered. As the wind is forced through the relatively tight spaces between buildings, its velocity will increase; the volume stays the same while the area available is reduced. The plan is to take advantage of the gusts of wind present in urban areas and convert wind energy to electricity. A number of different prototypes and designs, in hopes of finding the most efficient type of wind turbine were evaluated. The two designs tested were variations of an anemometer design, one composed of plastic and another of metal. A hair dryer was used due to its ability to give a directional wind source. The results were 0.105 V for the plastic and 0.220 V for the metal design. When another wind source was added, a 1 horsepower leaf blower, the metal design scaled well. Under the more powerful wind speeds the voltage recorded was 0.568. Currently, a horizontal design

which includes the usage of two motors (in hopes of capturing more energy) is being designed. The goal of this experiment is to find the most efficient wind turbine design, using scale models, in hopes of eventually leading to the placing of such devices at designated

38. Effect of 5-Fluorouracil, a Collagen Inhibitor, on the Regeneration of Planaria

Vineeth Varghese and Sujith Maracheril

Collagen, a type of protein, is utilized to support and connect other tissues and internal organs. Planaria, organisms that are widely known for their ability to regenerate, have collagen in their bodies. The purpose of this experiment was to determine if collagen plays a role in the regeneration of planaria. The collagen inhibitor, 5-Fluorouracil, will be added to planaria to determine its effect on regeneration. 5-Fluorouracil isn't soluble in spring water, but is soluble in Dimethyl sulfoxide (DMSO) and methanol. Solutions of 1% and 0.1% DMSO and methanol were made in spring water and their effects on planarian regeneration were tested. These solutions were put into eight petri dishes, and every two dishes contained 5mL of the same solution (1% and 0.1%). After cutting the planaria and observing their physical conditions after one week, it was noted that there was damage to the bodies of the planaria (and no regeneration occurred) in the 1% DMSO solutions. No notable harm was done to the other planaria and they regenerated. Based on these results, any solutions of methanol (less than or equal to 1%) and DMSO (less than or equal to 0.1%) will be used as solvents for 5-Fluorouracil (planaria survived for 13 days). Planarian regeneration in the presence and absence of 5-Fluorouracil will be tested and analyzed using student's t-test to determine any significant differences in regeneration between the experimental and control groups.

39. Effect of Honey on *Escherichia coli.*

Joyce Rhim

Honey is a sweet food made by bees from nectar. However, in addition to being a food product, it has been recognized as a substance that can treat infected wounds. It was not used regularly in medicine due to lack of scientific support, but is now being rediscovered and gaining acceptance as an antibacterial treatment by doctors and scientists. If E. coli is grown in honey-diffused agar, the growth of the bacteria will be inhibited. Evidence showed that solutions of sugar of the same proportion as honey did not have the same degree of antibacterial activity as honey, indicating that other factors in honey result in its antibacterial properties. Because of the impact *Escherichia coli* (E. coli) has had on humans and the claims about honey having antibacterial properties, this experiment was developed to see if honey can inhibit E. coli growth. Because many strains of E. coli are harmful to people, the harmless K-12 strain was used. A 70% isopropyl alcohol solution, distilled water, and different concentrations of honey will be tested for inhibition using the ring of inhibition method. Preliminary results showed that pure honey resulted in an average inhibition diameter of 9.25 mm. Alcohol showed a 2.59 mm ring. The results indicated that honey inhibits E. coli growth, possibly more so than alcohol. If further experimentation results in similar data, the use of honey as an effective antibacterial treatment of wounds and topical infections may be supported and recognized by doctors and scientists.

40. Motor Oils Effect on Algae Survival

Michelle Senra

The BP oil spill in 2010 in the Gulf of Mexico was disastrous to the wild life in that environment. Leading to the question, what is the effect of oil on algae? If algae are placed in various concentrations of oil then the algae in the highest concentration of oil will not survive as long as the algae in the lower concentrations. A scale was made for one to observe how green the micro-well indicating the survival. There were 6 different concentrations (100ul, 50ul, 25ul, 10ul, 5ul, 0ul) of oil in every 6 wells. This data showed that the higher concentration of oil were significantly more yellow then green. The data collected from the lower concentrations weren't as yellow compared to the control (0ul) that was the greenest. Further observations were made of the algae/oil mixtures under the microscope. By taking picture and looking under the microscope of the different concentrations one can conclude that just after one day the level of green in A1(100 ul) is reduced dramatically and were a 2 on the scale (which is slightly green). The algae will still have small measurable amounts of the color green until about the fourth day where there is little to no amount of green. Algae will be tolerant to oil, when the concentration of the oil is equal or less than 1%. The highest concentration of oil in the set up was .0625%.

41. Effect of Bisphenol A on the Avoidance Behavior of *Lumbriculus variegatus*

Kristen Sze-Tu

The purpose of this experiment was to investigate the plasticizer bisphenol A's effects on the avoidance behavior of *Lumbriculus variegatus*. BPA has been shown to mimic estrogen in various organisms, causing problems within the endocrine system. The avoidance behaviors of *Lumbriculus variegatus* include withdrawal, body reversal (anterior response), and helical swimming (posterior response). If *Lumbriculus variegatus* are exposed to BPA, then their avoidance behavior will be negatively affected. In this study, worms were placed in petri dishes with BPA concentrations of 10μg/mL, 1μg/mL, and 0.1μg/mL, and controls of 100% spring water and 0.1% ethanol (the highest concentration of ethanol used as a solvent for BPA), with 3 worms per dish. The stock solution consisted of BPA dissolved in ethanol, 10 mg/mL, which was then diluted in spring water until the desired concentrations were obtained. The worms were not affected by ethanol (ETOH) < 0.1%. (LD50= 5.5% ETOH) The worms were poked with inoculation loops on either their anterior or posterior ends; worms responded with the avoidance behaviors mentioned above. BPA at 10μg/mL caused a delay in the worms' responses. In addition, the response was more likely to be withdrawal as opposed to body reversal or helical swimming. When the worms had been exposed to BPA for a longer period of time (3 days), their response was delayed and lessened. This demonstrated that BPA had a negative effect on the worms' avoidance behavior.

42. Harvesting Electricity from the Wind for use in Automobiles

Raymond Agrelo

If the amount of electricity a car generates increases, then the amount of fuel used decreases. Currently regenerative braking is used to harvest a small amount of electricity. Regenerative braking is when the brakes are applied in a hybrid vehicle, mechanical energy is converted into electrical energy and it helps charge the batteries in the vehicle slightly. Since regenerative braking only works when a vehicle is slowing down, why not have something that can charge the batteries as it is in motion? That's when the idea to place a group of small computer fans in front of the car was generated. When a vehicle is moving, the air around the car is moving. By placing the fans in front of the vehicle, the fans can spin and generate electricity only by the movement of air. After that electricity is generated, it charges the batteries as they are being used which allows for longer battery run times and less time of a running combustion engine. By placing three fans in front of a car, it was able to generate an average of seven volts at 60-70 mph.By altering the design, an attempt would be made to increase the amount of electricity generated. Increasing the range helps decrease the amount of greenhouse gases produced due to the decreased amount of time a combustion engine is running.

43. Effects of Magnetic Field on the Growth of Wisconsin Fast Plants

Mallory Brady

The purpose of this study examines the effects of a magnetic field on the growth of Wisconsin Fast Plants. If the plants are placed in the magnetic field then they will grow taller. The experimental and control groups each contain six plants. Each plant is placed in an individual cell. The experimental group has 2 neodymium magnets placed 7.8 cm apart. Plants are placed under a 24-hour light bank, 77.5 cm apart. This assures that the magnetic field does not affect the growth of the plants in the control group. The lack of the magnetic field was determined with a compass. The heights of the plants are recorded daily until flowers appear. The average height was calculated and the experimental and control groups were compared and analyzed. Thus far the plants in the magnetic field grow taller and faster. From Day 3-9 the difference between the heights of the plants in the two groups increased from 0.3 cm on Day 3 to 1.2 cm on Day 9. From Day 10-11 the difference decreased from 0.9 cm-0.8 cm. The difference increased on Day 14 to 1.7 cm. The difference in plant height increased, then decreased, and then increased again. It appears that magnetic fields increase the growth of plants. Its possible effect on flowering will be investigated. The current trial is still in progress and the experiment will be repeated to confirm the data.

44. Effect of Benzothiazole on Brine Shrimp Survival and Development

Caroline Mueller

As growing rates of new, improved synthetic turf fields replace natural grass, users need to question the safety of the chemical elements that constitute the surface of the synthetic material. The issue of whether this material poses a health-risk to humans and the environment remains an on-going debate. In-fill, a major component of artificial turf, consists of recycled rubber tire crumbs that contain chemicals, including benzothiazole, which were identified on gas chromatography/ mass spectrographic analysis courtesy of the Connecticut Agricultural Experiment Station. To investigate the possible

health-risk from exposure to benzothiazole, benzothiazole's effect on brine shrimp survival was determined. If brine shrimp are exposed to varying amounts of benzothiazole, then results will show a visible trend in the rates of survival. Brine shrimp (10 per dish) were placed in serial dilutions of benzothiazole in saltwater (ranging from 0% to 10%), for five consecutive days. The benzothiazole solutions of .0001% or greater were lethal to more than half the brine shrimp. The lower concentrations of benzothiazole were not as decimating; however did have a noticeably negative effect on the survival rate of the brine shrimp compared to the control (no benzothiazole). It is a concern that benzothiazole tested positively for leaching potential and there is no available data on cancer, mutagenic toxicity, or developmental toxicity for benzothiazole, which consequently gave the highest response on the gas chromatography/ mass spectrographic analysis of crumb rubber material. The next step in this study is to collect data on benzothiazole's effect on brine shrimp development.

45. Effect of Copper (II) Sulfate on *Artemiasalina*

Joyce Hwang

The aim of this study was to investigate if copper pollution in the marine environment has harmful effects on the organisms in those systems by studying the survival and development of *Artemiasalina*. In the marine environment, copper is used to prevent biofouling. Anti-fouling paint is applied to ships in order to decrease the number of organisms that attach themselves to the ship. Copper has become a pollutant, affecting the reproduction, growth, and abundance of marine organisms.If brine shrimp are exposed to copper (II) sulfate then their survival and development will be negatively affected. In this study, the survival and development of brine shrimp in different concentrations of copper (II) sulfate were examined ± 10%, 1%, 0.1%, 0.01%, and 0.001%. When 6 brine shrimp were placed in each concentration and a control, none survived in the 10% and 1% concentrations of copper (II) sulfate after 24 hours. In the .001% concentration, 4 brine shrimp survived.Development was studied by placing eggs in the same concentrations. The number of eggs and the number hatched in the four quadrants of the petri dish were recorded. The number of nauplii that swam into one field within 30 seconds was recorded. The eggs in the 10% concentration showed no signs of development after 24 hours. In the 1% concentration, 44% of the brine shrimp were hatching or were nauplii. However, 60% in the 0.001% showed development and 70% in the control. These results support that copper pollution does have a very harmful effect on marine organisms.

46. Can Indolebutyric Acid (Auxin) Replace Gibberellin's Role in Gravitropism in Gibberellin-free Mutated Wisconsin Fast Plants?

Sarah Lee

Auxin and Gibberellin have similar roles in plants; both induce cell elongation and division. Stem elongation affects gravitropism. But, can indolebutyric acid (auxin) replace gibberellin's role in gravitropism in gibberellin free mutated Wisconsin fast plants? First, the natural growth of the mutated and non-mutated plant were compared. Four seeds are placed on filter paper in petri dishes, and after germinating the seeds, the dish is placed on a stand where it is on a 90 degrees angle. For gravitropism, the petri dish is rotated 90 degrees. After taking pictures and observing for several days, it was determined that the mutated plant exhibited much less gravitropism than the original fast plant. The root gravitropism will be further observed using a computer program for root image-analysis, ™Kine Root∫. The second experiment consists of adding concentrations of indolebutyric acid to the gibberellin-free plant (100 uM, 10 uM, 1 uM). There will be three sets of gibberellin-free plants while having one set of the non-mutated plant, (16 seeds). The third experiment will be similar, with indolebutyric replacing gibberellin (100 uM, 10 uM, 1 uM). Pictures will be taken throughout; Kine Root will be used to analyze the degree of gravitropism in the plants, allowing for comparisons between the effect of indolebutyric acid and gibberellin. If indolebutyric acid replaces gibberellin in gibberellin-free Wisconsin plants for gravitropism, then the degree of gravitropism of the plant would be similar to the degree of gravitropism in the gibberellin added gibberellin-free plants.

North Babylon High School **Research Teacher: Mrs. Annette Kuruc**

47. Assessment on the Effectiveness of Various Cleaning Protocols on Wrestling Mat Surfaces

Max Servetas

Methicillin Resistant Staphylococcus aureus (MRSA) is a bacterium that is resistant to antibiotics such as methicillin. Treatments using penicillin-based antibiotics are ineffective, although some antibiotics, such as sulfas are used. MRSA is commonly found in hospitals, athletic fields, schools, prisons and other areas where contact with surfaces without proper

sanitation is found. In wrestling rooms and hospitals, infections are common due to skin contact with the surface. There is a difference between MRSA in the community and MRSA in hospitals. Hospital-Acquired MRSA tends to be a bit more virulent due to its exposure to cleaning agents, creating very resistant strains. The effectiveness of various cleaning protocols was questioned, and an investigation was devised. In this investigation, models of wresting mats were created and the surfaces were sanitized using 70% alcohol swabs. MRSA was impractical to test with, so Staphylococcus epidermidis, a non-pathogenic species of Staphylococcus was used instead. S. epidermidis colonies were placed on each of the mats and treated with a solution of varying cleaning agents, including a bleach solution, Lysol disinfecting spray and CVS brand disinfectant wipes. RODAC plates were then used to pick up any remaining bacteria colonies. The plates were incubated for 24-48 hours at 37° C and observed for bacteria growth. Any colony counts were then recorded. Several trials have been conducted and final results are pending.

48. Effect of Acidic Precipitation on the Survival Mechanisms of *Dictyostelium discoideum*

Bryan Montes

Dictyostelium discoideum is a social amoeba that grows in soil. They feed on bacteria and help regulate bacteria populations. *Dictyostelium* can control the number of bacteria in an ecosystem by consuming them to help decrease the population. With increasing levels of pollution contaminating the atmosphere, many smaller ecosystems are being affected with the decreasing pH levels within the rain. Precipitation is
becoming more acidic and some ecosystems can be largely affected by this. Because precipitation is becoming more acidic, *Dictyostelium* will be directly affected by the shift in pH of the soil. Through research, it is predicted that the acidic environment will affect the growth mechanisms of *Dictyostelium*. In this investigation, *Dictyostelium* was placed on media with a pH of 6 representing a slightly acidic environment, and a pH of 4.4 representing a highly acidic environment. They were left to incubate at room temp (25°C) for 48 hours. After several trials, the *Dictyostelium* placed on the highly acidic plates did not grow at all while the *Dictyostelium* on the slightly acidic plates grew well and colonized. This concludes that *Dictyostelium* will not be able to survive under these conditions and they will eventually die off. Further research may include making serial dilutions to discover the threshold of acid that can be endured by the slime mold. Without *Dictyostelium*, there would be fewer consumers of bacteria in the soil which may disrupt the food web.

49. Effects of Ocean Acidification on the Development of *Limulus*

Anthony Gilman

The purpose of this experiment was to determine the effects of ocean acidification on the development of Horseshoe crabs. Ocean acidification occurs when carbon dioxide (CO_2) is diffused into the ocean causing the pH of the water to dramatically decrease. This would make the ocean water more acidic. It is predicted that the shells of the *Limulus* would be thinner than normal because they are made from chitin, a modified polysaccharide that contains nitrogen. The lowering of the pH would make the shells thinner and possibly deformed. To conduct the experiment, two 10 gallon saltwater tanks were set up. The pH was kept at 8.1 and the salinity at a constant 30ppt. Twenty-five eggs were placed in each tank for 1 week before the acidity was lowered in the experimental tank (tank A). The pH of tank A was gradually decreased to reach the target pH of 7.8 over the course of 2 weeks. Data was collected on the size and the appearance of the eggs, as well as viability. Data will continue to be collected over the next several weeks to determine if lowering the pH will negatively affect the development of *Limulus.*

50. Detecting the Migration of Hydrocarbons using an Ultraviolet Light

Cassandra Giannakakis

Hydraulic Fracturing is a hazardous method of extracting hydrocarbons. Hydrocarbons can potentially cause cancer, severe chemical burns, pollute the air, and water. Hydraulic Fracturing is a process that involves drilling through Marcellus shale, which can be found in the state of New York. They inject fracking fluids consisting of sand, water, fuel and other chemicals into the ground. The purpose of injecting fracking fluids into the ground is to create cracks in the shale that can free up the natural gas. The problem with this is, fracking fluids can seep into the ground. Fracking fluids contain many things, such as a harmful hydrocarbon called benzene. Many argue that hydrocarbons dodn't migrate upward to contaminate ground water or soil. In this study, the migration of a hydrocarbon (vegetable oil) was measured. A layer of oil was placed below a column of sand and the migration to the top was measured using a black light to fluoresce the oil. Many trails will be conducted before final results can be recorded and graphed. Further research would involve using various substrates to record the migration times.

51. Effects of Ocean Acidification on the Development of *Mercinaria*

Alex Lopez

Ocean acidification is a problem that will take hold of our oceans in the future. It will change the way an ocean ecosystem works. An experiment was conducted to demonstrate how the more acidic water will affect the look and growth of *Mercenaria* (hard shell clam). It was predicted that the shells would become deteriorated and the overall growth would be stunted. Two tanks were set up, a control with a pH of 8.1 and salinity of 30ppt, and an experimental, with a pH of 7.8 and a salinity of 30ppt. The effect of ocean acidification was observed. Data was collected on the appearance of the shells, clam growth, and the overall survival of the clams. Past studies have indicated that this type of environment would lead to noticeable weight loss and thinner looking shells. The reasoning behind this would be how the shells reacted to the lowered pH of the water. The lowered pH may react with the calcium carbonate of the shells to cause negative effects on the clams. Data collection will take place on the clams for the next several weeks.

52. Effect of Ferrofluids on the Internal Temperature and Performance of a Loudspeaker

Michael Aufiero Jr.

Power is applied to a speaker and the voice coil and suspension move the large cone (driver) back and forth to push the air to produce sound. They do so by pushing on and off from the magnetic field produced by the permanent magnet in the speaker. However, sometimes too much energy is dumped on the voice coil at once instead of the driver and it overheats, causing the temperature to rise and the sound to be less clear and distorted. To solve this problem, ferrofluid was inserted into the gap between the pole piece and the voice coil where the thermal energy transfer took place. Because of the composition and properties of these particles, ferrofluid directed the transfer of energy away from the voice coil and toward the driver. Thus, it made the transfer of energy smoother. As a result, voice coil-operating temperature was lowered and sound was clearer and less distorted. This experiment involved the demonstration of two speakers. A specific ferrofluid designed for this experiment was placed in the gap between the voice coil and pole piece in one loudspeaker, and the other one did not have ferrofluid inserted. Over the next few weeks, power will be applied to both speakers and the temperature and sound quality will be recorded during several trials. Results will indicate whether or not ferrofluids add to the overall quality and performance of speakers.

53. Effect of Incense Particulate Matter on *Drosophila Melanogaster*

Karan Kumar

Incense use is becoming increasingly popular, many people burn incense for worship and for leisure. Past studies suggest that the inhalation of incense smoke may lead to cancer, but the specific cancer causing carcinogen has not been identified. An experiment was conducted using a particulate matter air aspirator. It was predicted that the higher the level of incense solution, the lower the survival and reproduction rate in the *Drosophila*. Smoke from the burning incense was converted from a gas phase to a liquid phase. The collected water was combined with media used to feed the Drosophila. Using five different incense solution concentrations, an experimental setup was designed. Five vials were prepared with the four different concentrations of incense solution and one with distilled water to serve as the control. The observed data suggested that the highest concentration proved lethal but, the concentrate below it had an increase in the number of larvae for each generation. The findings may suggest that exposure to incense solution causes an increase in the reproduction of the *Drosophila,* opposite of what was originally predicted. This outcome points to further research which may lead into an investigation as to why certain levels of incense will cause an increased reproduction rate, while other levels cause death or a decrease in reproduction rates.

54. Using Plant Hormone to Increase Grafting Success

Deep Patel

The purpose of this experiment was to determine if grafted tomato plants would grow faster and longer with plant hormones in comparison to plants which are grafted without plant hormones. Two different species of tomato plants were used in this investigation. The rootstock used was Maxifort and the top plant used was Capello. Both groups were grown in seed starters using a typical plant soil and a green house light. At 4 weeks, the plants were grafted together using the splice grafting method. The experimental group had a plant hormone applied to the grafting site, while the control group had water applied to the grafted area. Both groups will be allowed to grow in identical settings for 3 weeks where data will be recorded on plant height, the number of leaves and success of grafting overall. Adding this simple, inexpensive step may increase productivity and success rate of the grafting.

55. Evaluation of Microbial Attachment and Survival on Sharklet-Patterned Surfaces

Alexa Marinos

Antibiotics are often used to kill microbes once they are actually attached. A new type of surface has been invented, called Sharklet. Sharklet is based on the microscopic texture of a shark's skin, called dermal denticles. The pattern is designed for preventing colonies of microbes from attaching and growing, as well as reducing the amount of bacteria that is transferred to one's hand after touch. It can be used on things like doorknobs and medical equipment to prevent bacterial growth. Sharklet patterned surfaces may also be used in the kitchen and bathroom; for example, kitchen counters, toilets, etc. In order to test the effectiveness of Sharklet technology, Staph epidermidis was introduced to a Sharklet patterned surface and smooth surface in order to compare effectiveness. It is expected that the Sharklet patterned surface would not allow the staph epidermidis to continue growth, while the smooth surface would. Final results are pending completion of all trials.

Paul D. Schreiber High School Research Teachers: Ms. Marla Ezratty, Ms. Tina Gallagher, Mr. John Schineller, Mr. Anthony Tedesco

56. Inhibitory Effects of Essential Oils from Aromatic Plants on the Growth of *Aspergillus niger*.

Benjamin Lerner and Michael Kuan

The purpose of this experiment was to ascertain the effectiveness of three different essential oils in curbing the growth of the pestilential fungus *Aspergillus niger*. It was predicted that Geranium would have the highest antifungal potency due to its superior ability to mitigate microbial growth in an agar broth, as compared to the other oils. This experiment sought to test the effectiveness of these oils using the disc diffusion method rather than the various other methodologies that have been employed to determine their inhibitory efficacy. The plants from which the essential oils were derived were *Origanum vulgare*, *Lavandula stoechas, Pelargonium graveolens*, and *Syzygium aromaticum*. In each trial, *Aspergillus niger* was grown on plates filled with potato dextrose agar: one control, and then four groups, one for each essential oil. Within each plate, discs soaked in different concentrations of essential oil were placed: 50, 100, 250, 500, 750, and 1000 μL/ml-1. After inoculating the fungus onto these plates and allowing them to grow around the discs for one week, the sizes of the inhibition zones were measured. The results indicated that the oils from S. *aromaticum* and P. *graveolens* exhibited the largest inhibition zones at the lowest concentrations. Each of the essential oils tested were able to completely inhibit growth at concentrations of 1000 μL/ml-1. Therefore, S. *aromaticum* and P. *graveolens* demonstrated the highest potential as natural fungicides.

57. Effects of environmental humidity on the decomposition of *Pinus* (Pine wood) by *Gloeophyllum Trabeum* (brown rot)

Matt Brandes and Harry Paul

In today's housing and construction industries a debate is currently at hand discussing. These industries are encountering that many building materials are susceptible to rot from various different types of brown rot. The aim of this study was to see if there is a correlation between increased relative humidity and the percentage of original wood sample decayed *Gloeophyllum trabeum (G. trabeum)*. *G. trabeum* is very common type of brown rot common in many areas. By testing the growth and metabolism at differing relative humidity's it can be concluded in what areas of our country, based on average yearly moisture, it is cost affective and worthwhile to use wood, versus another more rot resistant material. Relative humidity, the relationship between amounts of water vapor in the air compared to the total amount of water vapor the air could hold, is a highly useful tool for the measurement of moisture in a non-solid. *G. Trabeum* was obtained from Rita Rentmeester, at the National Forest Products Laboratory of the National Forestry Service. A closed system was specially designed and built for this project in order to control all variables other than those tested. This study has indicated that there is a correlation between relative humidity and the decay and growth of *Gloeophyllum Trabeum*.

58. Combined Effects of Sunscreen and Temperature Stress on the Bleaching of *Caulastrea furcata*

Julia Zeh and Priyanka Ninan

Recently, global climate change has had a detrimental effect on marine life, especially coral, which is the foundation of these ecosystems. In addition, the use of sunscreen has increased in coral reef areas, which are popular vacation spots. Studies have shown that in reef areas around the world, both contaminants in sunscreen along with heat stress can cause

coral bleaching. These stressors cause the expulsion of the coral's symbiotic algae, zooxanthellae, which results in the loss of pigment and photosynthetic processes. This experiment was designed to determine if there is a synergistic effect on *Caulastrea furcata*, candy cane coral, when stress from sunscreen and heat are combined. The results showed that sunscreen caused more rapid bleaching than did thermal stress. In addition, when there was a combination of sunscreen and temperature stress, the coral displayed symptoms of both stressors and bleached more rapidly and extremely than the other two experimental groups. The possibilities for recovery were also examined. Hopefully further studies will serve to help create safer sunscreen for coral.

59. Comparison of Varieties of *Camellia sinensis* in reducing the Heart Rate of *Drosophila melanogaster*

Emily Lipstein

Multiple varieties of tea (*Camellia sinensis*) have been consumed for hundreds of years around the world. Some teas are beneficial for those who have an irregularly fast heartbeat due to stress, nerves, or non-severe cases of tachycardia. A handful of performers, musicians, and others use heart rate reducing drugs to quell their nerves, but if they overdose, the effects could be lethal. This experiment provided natural alternatives to heart rate lowering drugs including beta blockers and Ivrabradine. Since tea is known to be beneficial to the heart (and calming for the nerves) it can be considered as a possible alternative to these dangerous drugs. Out of the five varieties of tea (green, black, white, oolong, herbal) tested on the model organism *Drosophila melanogaster,* this experiment proposed that white tea was the most effective in lowering the fly's heart rate. Both concentrations of 10 mL of pure tea and 5 mL of tea and 5 mL of water were mixed with the fly medium to test the effects of both variety and concentration. In order to test the fly's heart rate, a microscope with video recording capabilities captured six seconds of footage from a fly from each vial once every week. The heart rates were compared with that of the control. The half-concentrated white tea vial was proposed as having the greatest decline in heart rate. Further research could test if the effect of tea on humans is the same and compare that to the effects of beta blockers.

60. Using Spidrons to Create More Efficient Electrical Grids

Evan Kerr

This project was completed in order to understand spidrons, a type of spiral in polygons and determine if they could be used in a practical manner. Spidrons have not been previously studied this extensively. Spidrons are hard edged spirals that are found in all polygons starting with the pentagon. These spirals are interesting as from one base regular polygon the spiral can be extended either inward or outward. This allows for a base regular polygon to be extended outward or inward in a proportional manner while still maintaining a calculable spiral. To define the spidrons this project examined six different polygons and their respective spidrons in order to better understand the properties of spidrons and see if there were any patterns between different spidrons. The six shapes that were used were regular polygons from the pentagon to the decagon. These were chosen as they are simple enough to fully explore their patterns without becoming too complex. Using trigonometry and Geometers sketchpad the various side lengths and areas were compiled and then were used in order to make trend lines depicting the prediction of more complex spidrons. For an application of these spirals the idea of a new electrical grid was used as a test for the application of these shapes. From a practical point of view the spidrons could in fact create a fully functioning and efficient electrical grid that would cover more area proportional to how much land was used in the generation of electricity.

61. Effect of Shear Mapping on the Vibrations of Circular Membranes

Drew Feldman

This research focuses on the vibrations of circular membranes, particularly how they are affected by the shear mapping of the stationary boundary. Shear mapping is the horizontal mapping of any point right or left proportionally to its distance above or below the x-axis, respectively. Because the resulting shape after the circle has been mapped is an ellipse, partial differential equations in elliptic coordinates were used to analyze the frequencies of the vibrations. After separation of variables was completed, three equations remained, one of which is identical to the simple harmonic oscillator equation. The other two are only able to be solved using Mathieu functions. Several instances were examined, where different constants of shear mapping (m) were used to create ellipses of different eccentricity. Using a computer, the zeros of each Mathieu function were found. Then, frequencies produced by these vibrations were plotted against different components of the resultant ellipses and trend lines were found for each plot. Then, a final equation, originating as a trend line, was established that compared the m values to the ratio between the zero of the corresponding Bessel function and the produced frequency. This is useful because the frequencies correlating to each m value can be solved more quickly Bessel

function zeros rather than that of Mathieu functions.

62. Insulation and Radiant Properties of MultiCeramics Coating

Sophia Jaffe

MultiCeramics coating is a newly developed coating material consisting of nanoparticles of ceramics in an acrylic base. This study tested the impact of radiant and insulation properties of MultiCeramics coating as a building insulation material on energy usage. Roof and attic simulation tests were performed using wood painted with the MultiCeramics, white acrylic paint, black acrylic paint, and unpainted wood as a control. A heat lamp was used as the source of heat, and temperatures were recorded using an infrared thermometer over 60 minutes for the roof simulation test. In the attic simulation test, model attics were constructed, and temperatures underneath were measured over 75 minutes. A flammability test of the MultiCeramics was also performed. Results of the roof simulation test showed that the MultiCeramics and the white acrylic paint were the most effective reflectors of heat, performing essentially the same. The control was less effective and the black paint was the worst reflector. Results of the attic simulation test showed that the white acrylic and MultiCeramics attic models stayed cooler than the black and control attic models. The flammability test showed that the MultiCeramics coating is fire resistant. In conclusion, MultiCeramics coating is a valuable energy saving building material.

63. Identification of Plant Root Controls by Soil Water Diffusivities Above a Water Retention Membrane

Rachel Cohen

Poor water retention in soils throughout the world presents a series of long-term problems. Lack of moisture in much of the earth's soils prevents use of the land for agricultural purposes, limiting crop growth. Rapid drainage of water through soil also requires larger volumes of water to maintain plant growth, exhausting supplies of high quality water. This research studies a newly patented Subsurface Water Retention Technology (SWRT), which uses plastic membranes placed beneath the soil surface to slow water drainage. By increasing the volumes of water available in the root zone, SWRT allows plants to efficiently absorb the water needed for greater above ground growth. Tomato plants grown in a greenhouse lysimeter treated with SWRT membranes were monitored. Measurements of above and below ground plant growth and of soil characteristics were taken over several weeks. The data collected suggests that a high hydraulic diffusivity in the root zone may be a factor in allowing more efficient water absorption. Plants grown over a U-shaped barrier showed higher diffusivities than those grown over a V-shaped barrier, while requiring fewer root numbers to grow to an equal height, implying that their water absorption and transportation were more efficient. These results contribute valuable knowledge regarding efforts to maximize the effectiveness of SWRT barriers.

64. Implementation of a Centralized and Decentralized *k*-Coverage Protocol to Maximize Wireless Sensor Network Longevity

Seoyoon Park

Although there have been numerous advancements in the field of wireless communication and the areas of wireless sensor networks, network longevity still exists as an immense obstacle. The limited battery life in sensor nodes requires an implementation of a protocol which effectively utilizes the battery. In order to maximize network longevity, both centralized and decentralized *k*-coverage protocols were implemented. These protocols achieve such a task by slicing a field of sensor nodes once the location of each node is determined. After completing the field slice, the central node selects k sensors to be left on in each slice, accounting for the nodes with the highest battery life. To implement these protocols, the nesC programming language was utilized. Upon implementing and testing the created protocols, the sensors autonomously turned on and off. However, the exact increase in battery life could not be measured because of its fairly long longevity. Through the use of such k-coverage protocols, network longevity can be significantly increased and practical applications of wireless sensor networks will see more success in the future.

65. Effects of *Alliaria Petiolata* on Salt Marsh and Forest Ecosystems on Long Island, New York

Kevin Roberts

The impact of introduced, invasive species on the communities and ecosystems they inhabit is one of the largest global environmental problems. *Alliaria petiolata*, colloquially referred to as garlic mustard, is a biennial herb in the family Brassicaceae. Garlic mustard was introduced to North America in the 1860's by settlers on Long Island, New York. One reason for the immense success of A. petiolata is its ability to grow where other species cannot; not requiring a disturbance to become established. It was hypothesized that EM root tip biomasses in invaded areas would be far lower than coarse root tip biomasses and that due to the presence of greater amounts of water, the negative effects of the species in salt

marsh ecosystems would be less than that in forest ecosystems. Ectomycorrhizal fungal root tip biomass and coarse root tip biomass measurements were taken from each. This study further supported the previous research conducted which found that A. petiolata decreases the presence of ectomycorrhizal roots in invaded areas in a forest environment. EM root tip biomasses in salt marsh ecosystems proved statistically greater than in the forest environment. Further research will be conducted to assert the lessened affect of A. petiolata in this environment.

66. Survey to Assess the Diversity and Speciation of the Bat Population at the Sands Point Preserve

Rachel Ellinger

Little is known about the species of bats present on Long Island. Therefore, by using a binary acoustic frequency detector, the high frequency calls used by bats for feeding and navigation were able to be recorded and later analyzed using its complementary computer software, the SPECTR III© and SCANR© computer programs. This study served to examine the Sands Point Park and Preserve with a focus on ponds and forests found within the area. To assess the population, a static survey was performed at the peak hours of activity. From these surveys, Lasiurus borealis (red bat) was found to be most prominent, representing 67% of the population size. By performing this study, future research can be done to compare and track this species of bat, as well as other species found throughout Long Island. Any changes in the population and habitat based on shifts in climate, food availability, and human disturbance can also be accurately assessed.

67. Monitoring NO2 Levels Utilizing Off-Axis Integrated Cavity Output Spectrometry (oa-ICOS) to Display Disparities between Areas of Low and High Traffic Volume

Sen Nina

The use of laser absorption spectroscopy to study nitrogen dioxide concentrations in the atmosphere is an extremely accurate and beneficial way to calculate the differences of nitrogen dioxide concentrations in areas of high and low traffic volume. Monitoring nitrogen dioxide emissions would result in increased awareness of ozone and photochemical smog, acid rain, and of the depletion of the stratospheric ozone and hopefully lead to environmentally conscious organizations creating stricter standards on NO2 concentrations. Once having procured the samples of air from areas of high and low traffic volume, one will perform tests and observations on the sample using an Integrated Cavity Output Spectroscopy (ICOS) technique. Using ICOS is truly beneficial as it increases the weak detection usually observed by a Direct Laser Absorption Spectroscopy by significantly increasing the interaction length using mirrors in the cavity to create a long path length for the species. Using this technique will allow one to display the disparities in nitrogen dioxide concentrations of areas of high and low traffic volume. In order to analyze the data, the absorbance and transmittance are calculated to observe the accuracy of the laser and the results obtained. In order to show the disparities in nitrogen dioxide concentrations, statistical tests, or t-tests will be utilized to show whether or not the results are significant. Displaying these results could be vital to the implementation of new standards on nitrogen dioxide concentrations and reducing pollution worldwide.

68. Efficacy of the Guided Precision Surgical Trephines vs. Standard Surgical Spade Drills in Performing Dental Implant Osteotomies

Kristin Shivdasani

This research aims to evaluate the effectiveness of the new, recently patented line of surgical tools, called the Guided Precision Surgical (Meisinger) Trephines, in performing osteotomies, by analyzing how its performance equates to that of the currently used technology, known as spade drills. In this situation, the problem is to determine the GPS Trephines' performance accurately and precisely. In order to evaluate performance of a tool in conducting an osteotomy, the mass of salvaged material, in grams, is noted. The more mass salvaged by a certain surgical instrument, the better that instrument performed the task at hand. The data collected incorporates several incision diameters to accurately compare the versatility of each surgical instrument. Quantitatively, the new line of surgical tools, the Guided Precision Surgical (Meisinger) Trephines, showed to be more proficient in performing an osteotomy at all incision diameters tested than its predecessor. This new medical technology will hopefully soon replace the comparatively disadvantageous technology and stake out its proper place in the field of advanced surgical technology.

69. Effects of sea urchins and other invertebrates on temperate kelp forests (Macrocystis pyrifera) on the coast of Santa Barbara, California

Amanda Fishbin

Phase shifts occur in temperate marine ecosystems when kelp forests undergo rapid changes in biota due to overgrazing by sea urchins and other herbivorous invertebrates. In this study, the abundance and biomass of sea urchins and other invertebrates, along with kelp abundance was observed in the temperate marine ecosystem of Santa Barbara, California. However, this study suggests there is no significance between the mean densities of sea urchins and other invertebrates and the mean density of kelp (Macrocystis pyrifera). Macrocystis pyrifera density was not found to be dependent on time ($F_{1,49}=2.329$, $P=0.134$), invertebrate density ($F_{1,49}=0.263$, $P=0.611$), or invertebrate phylum ($F_{4,49}=0.057$, $P=0.994$). Invertebrate densities were significantly different among phylum ($F_{4,49}=77$, $P<0.001$). Phylum Annelida had significantly higher densities (23.93 individuals/m2) than Arthropoda (0.07 individuals/m2), Chordata (4.05 individuals/m2), Echinodermata (6.54 individuals/m2), and Mollusca (8.78 individuals/m2). This suggests that although phase shifts do have an impact on the temperate marine ecosystem of Santa Barbara, California, other environmental factors have a greater effect on the rapid changes in biota. Other possible alternative factors affecting kelp density are discussed.

70. Combined treatment of microalgae on quorum sensing through AHL-inhibition in *Vibrio fischeri*

Alison Aguiar

Currently there are many problems occurring in the field of medicine concerning bacterial resistance to common antibiotics. Since resistance have developed, researchers have looked towards quorum sensing as a method of disrupting the virulence factor in bacteria. There are many ways to disrupt quorum sensing systems, one possible way being the use of micro-algae due to its ability to produce halogenated furanones, which inhibits the production of signal molecule acyl-homoserine lactone. Synergy has also proven to be successful in that a combination of treatments has shown success in eliminating the bacteria. It was hypothesized that the combination of various types of micro-algae on *Vibrio fischeri* would produce a synergistic effect that would allow for better disruption of quorum sensing than the use of one type of micro-algae on the bacteria. *Vibrio fischeri,* a close relative of pathogenic Vibrio harveyi, was subjected to combined treatments of micro-algae and was stained using crystal violet, and safranin as a counter stain. A scale made according to the darkness of the stain was an indicant of the population density. The results demonstrated that the combined treatment of *Chlamydomonas reinhardtii* with *Chlorella vulgaris* produced the most success in killing the bacteria. Future research includes subjecting drug-resistant bacteria to other types of micro-algae in conjunction with other successful treatments, such that the combination will yield less bacterial growth.

Sachem East High School **Research Teacher: Dr. Michael Vaccariello**

71. Effects of *Commoiphira molmol* (Myrrh) and *Boswellia papyrifera* (Frankincense) on the Inhibition of Bacterial Growth

Maria DePinto and Anthony Mulieri

The purpose of this study was to see if myrrh and frankincense would effect the growth of different types of bacteria. Biblical and archeological information reference health benefits and recent reports have shown that when these two herbs were turned into an essential oil they helped with skin issues. It was thought that if extracts of myrrh and frankincense were made, then they would negatively affect the growth of bacteria. This project was conducted by first plating lawns of bacteria (*Escherichia coli* or *Streptococcus mutans*) onto nutrient agar in 10cm Petri dishes. Five different mixtures (frankincense with water, frankincense with 10% ethanol, myrrh with water, myrrh with 10% ethanol, and a combination of frankincense and myrrh as oil) were individually applied to sterile 6mm blank paper and then placed onto the bacterial culture. After 48 hours in a 37°C incubator, clearing zones around the paper discs were recorded (disk diffusion assay). Sterile water and sterile water with 10% ethanol served as negative controls, while erythromycin and tetracycline disks served as positive controls. All plates were set up in triplicate and averages were calculated. Results showed that myrrh, with average clearing zones of 2.3cm2 (water) and 2.1cm2 (water, 10% ethanol), was more effective than frankincense, with average clearing zones of 0.2cm2 (water) and 0.5cm2 (water, 10% ethanol). Frankincense & myrrh oil had an average clearing zone of 5.9cm2, which was similar to the positive controls. Further tests will explore the influence on other bacterial species.

72. Effects of Lactose on *Drosophila*

Christopher Czarnecky and Meaghan Fox

The purpose of this study was to determine the effects of lactose on *Drosophila*. It was believed that the lactose will increase the life span and reproduction rate of *Drosophila* positively. Test contained different genders of drosophila, lactose concentrations, water, and instant *Drosophila* Media (Carolina Science). It was discovered that the addition of lactose to the drosophila's diet increased the reproduction rate. The reproduction rate increased by 50 percent in the concentration of 50 gram of lactose per 100ml. the lethal dose is at 100 grams per 200ml. It also caused the flies to live longer under low concentrations. Based on the t- test created the *Drosophila* preferred the lactose solution over the control of distilled water. Three flies of the six flies in the test preferred the lactose solution at a high concentration. Experiments were being set up to eliminate human error and test the effect of the lactose on the *Drosophila* further.

73. Topical Herbal Oil to Reduce Muscle Fatigue

Kayla Jo Gansrow and Cortney Evola

The purpose of this project was to determine the effects of herbal topical muscle oil on the treatment of fatigued muscles. It was predicted that the combination of various herbal oils, could increase strength and/ or aid in the recovery process of muscles involved in hand-grip. Muscular fatigue and exhaustion increase the risk of physical injury. As a 100% natural product, an herbal remedy is a safe, non-toxic alternative without the side effects of pharmaceutical medicines prescribed for physical pain. A combination of 32% Tea Tree Oil (anti-inflammatory), 25% Vitamin E (increases rate of muscle recovery), 20% Eucalyptus (alleviates muscular pain), 18% Lavender (used for its healing and fragrance properties) and 5% Myrrh and Frankincense (increases circulation) were used to make a solution (Solution Y), and olive oil was used as a carrier to match the total percentage of the other combined ingredients. Subjects were randomly given Solution X (control of olive oil) or Solution Y to massage into their arm before using a hand dynamometer (Vernier Probeware) to test rate of fatigue. Thus far, Solution Y was proven to work on 60% of the test subjects. Extraneous variables, such as environmental noise, are currently being controlled for to produce more conclusive results.

74. Photoreactivation Interferes with UV Mediated Water Purification

Mahad Shah and Haider Siddiqui

Some water purification methods employ Ultraviolet light as a means of killing microbes. The phenomenon known as photoreactivation may interfere with this process. Photoreactivation results when an enzyme, activated by visible light, is able to repair UV damaged DNA in bacteria. The purpose of this study was to determine if UV-C (253nm) killing of bacteria could be compromised by brief light exposure. E. coli suspensions were diluted into sterile water, and then 10 mL was plated into each Petri dish. Lids were removed and plates were exposed to UV-C for 10 minutes. Afterwards, one plate was put immediately in the dark, one was put under compact fluorescent light for one minute, and one plate was exposed for 10 minutes; then 100 uL was spread onto sterile nutrient agar for colony counting. Results showed that the E. coli exposed to UV-C and put in the dark all died. Post exposure to artificial light showed survival of some colonies (12 for 1 min and 4 for 10 minute incubations). It was noticed that when the cover was left on the dish, the bacteria was not killed by the UV-C because the plastic was able to block the harmful energy. Our results show that the UV-C light, at 10 min exposure, kills all bacteria. The artificial light helps a small percentage of bacteria to survive and this may have a negative impact on water sterilization.

75. Effects of Monosodium Glutamate on *Drosophila melanogaster*

Jeffrey Bai, Timothy Jack Tan, Dominick Yeager

The purpose of this experiment was to determine the effects of monosodium glutamate (MSG) on *Drosophila melanogaster*. Monosodium glutamate is a food additive found in many fast food restaurants and packaged foods, but there are many claims that overuse is harmful (links to diabetes, obesity, headaches). Our hypothesis was that the monosodium glutamate would have a negative effect on *D. melanogaster.* MSG (monosodium glutamate) was administered to the food (instant Drosophila media, Carolina Science) of *D. melanogaster* the (100mg/mL, 10mg/mL, and 1mg/mL). A control group was also used which had no MSG in the food. Toxicity testing showed that the *D. melanogaster* exposed to 100mg/mL MSG had 100% lethality. MSG contaminated food at 10mg/mL and 1mg/mL showed degradation in coordination when *D. melanogaster* were introduced into a 10cm climbing test chamber; as they were not able to balance or cling to surfaces as well; and movement was also drastically slower when compared to controls. Further work is investigating the influence of MSG on population growth curves.

76. Dispersal, Germination and Growth of Seeds through Myrmecochory.

Peter Fahey and Maeve Mitchell

There are numerous methods of seed dispersal in nature. Abiotic factors include wind and water, while biotic factors involve many species of living organisms. Myrmecochory is the dispersal of seeds by ants. The purpose of this study was to determine whether ants prefer elaiosome bearing seeds or non-elaiosome bearing seeds; and whether ants will disperse the seeds and if they will germinate and grow. It was predicted that the ants will prefer the elaiosome bearing seeds, they will be dispersed further and grow because previous studies determined ants prefer elaiosome. A plastic container was constructed having regularly spaced holes with connecting tubes for seed storage. Then, 50 Pogonomyrmex ants were put into the container with commercial potting soil; and 25 seeds of each Viola, Dicentra, and Pepper (non-elaiosome). They were fed a slice of potato as a source of starch and sugar to supplement their dietary needs. This experiment resulted in germination of only Viola and Dicentra. Seedling growth showed that Viola was dispersed an average of 11 inches with 68% germination, and Dicentra had only 36% germination and dispersed an average of 3 inches. Seeds from the non-elaiosome group were dispersed, but 0% germinated. Currently, experiments are underway using other species of elaiosome bearing and non-elaiosome bearing seeds with Pogonomyrmex ants.

77. Biofermentation to Produce Bioethanol from Yard Waste.

Ricky Patel, Rajan Patel, and Matthew Brenes

The purpose of this project was to find new ways to make biofuels, which would be cheaper and produces a larger quantity of ethanol. Grass and radish were the two feedstock that were used to see if they produced more ethanol than the conventional feedstock via fermentation with Saccharomyces cerevisae. For the project there were two experiments, one was with a grass biofermention chamber and the other was radish fermentation. In the grass fermentation chambers there was one beaker filled with grass pretreated with cellulose and another not pretreated with cellulose. For the radish there was only one beaker which had no cellulose. Before the actual fermentation the beakers needed to be in a 40°C incubation chamber. For the experiment the beakers were on a 40°C heating mat After the experiment took off the bubble counters that we used to count the amount of CO_2 bubble released from fermentation. The beaker with grass pretreated with cellulose had gotten 0 CO_2 bubbles over a period of 3 weeks. The beaker with grass and no cellulose had 213 CO_2 bubbles. The beaker with radish and without cellulose had gotten 4416 CO_2 bubbles indicating a much higher rate of biofermentation. Micro-distillation is being performed on the samples to quantify total ethanol yield.

78. Effects of Tobacco Smoke on House Plants.

Danielle Gonzalez

Many studies have been conducted demonstrating the harmful impacts of second-hand tobacco smoke. The carbon monoxide from cigarettes kills microorganisms in the soil which produce hormones and enzymes that are used for plant growth. The purpose of this project was to determine if the chemicals in the smoke of cigarettes would have a negative affect on plant growth and development. Growth chambers were constructed from 2 liter clear plastic bottles containing 1000 cc of commercial potting soil, 10 seedlings of *Brassica rapa*; and water and lighting were also controlled for. Smoke from one burned cigarette was aspirated into the test chamber. It was found that Plants not exposed to cigarette smoke grew at an average of 5 cm with a survival rate of 70% after 20 days. The plants exposed to cigarette smoke grew an average of 5.25 cm, but had very weak stems and a survival rate of only 30%. Germination studies in petri dishes showed a delay in *B. rapa* germination of 2-3 days, but percent germinated was not effected.
Currently, the influence of second-hand smoke on plant development (flower and seed formation) is being investigated.

79. Strengthening Concrete Building Materials for Improved Earthquake Resistance.

Jeremy Conroy

The purpose of this project was to test what is the best material to add to concrete to make it more earthquake resistant. Materials needed were: concrete to create concrete slabs for testing, experimental materials (rubber and plastic polymer fibers). To quantify strength, a ™durometer∫ was constructed using a can lid, a nail, tape; small weights in grams (ranging from 5 ± 1000 grams); two small pieces of wood to support the concrete slabs; and clamps (four to hold the wood down, and one to support the can lid with the nail). To test the resistance of the concrete to earthquakes required the measurement of how much weight, added to the durometer, to break the concrete and measure the amount of pressure it takes. Concrete was mixed and poured into 7x10 cm plastic molds to a thickness of 0.5 cm. Rubber or polymer fibers were mixed in before casting, and controls consisted of a basic concrete slab with nothing done to it. Results so far have shown

about a 20% increase in the amount of force required to break the concrete slabs of the experimental groups over controls.

80. Influence of Algal Species on the Formation of Silver

Joseph Lombardo

The purpose of this project was to understand the role of microorganisms in precious metal formation. Recent published studies have shown that metal deposits may be influenced by biotic as well as abiotic factors. It was predicted that certain species of algae could help transform ionic silver (Ag+1) to its metallic state (Ag0) and be observed as microscopic silver crystals. Silver chloride was put in a solution with sterile deionized water to a final concentration of 1% (wt. /vol), and then algae suspensions (*Chlorella, Nostoc, Scenedesmus* or *Ulothrix*) were introduced. Controls had no introduced algae, and all samples were set-up in triplicate using sterile 24 well plates and incubated under fluorescent grow lights in an environmental chamber, at room temperature (23 °C). The well plate was put under a digital stereomicroscope with a Moticam 352 for analysis. Compared to controls (1 Ag crystal/ mm2), results showed that algae increased silver precipitates (*Scenedesmus* >*Nostoc*> *Ulothrix* at 6, 5 and 2 Ag crystal/ mm2, respectively), while *Chlorella* seemed to inhibit silver formation. Future experiments will investigate other microbial species and environmental conditions on silver crystal formation.

Sayville High School — Research Teacher: Ms. Maria Brown

81. Chiropterid Biodiversity in the Tamishiyacu-Tahuayo Reserve, Peru

Alicia Protus and Derek Hartnett

Chiropterid biodiversity in the Peruvian Amazon is not well understood as it is difficult to sample wild bats in the field. The Tamshiyacu-Tahuayo Reserve is located 50 miles downriver from Iquitos and then an additional 40 miles downstream in the Tahuayo tributary. The purpose of this study was to establish baseline information on the biodiversity of bat species utilizing the areas within the Tamshiyacu-Tahuayo Reserve using non invasive techniques. A full spectrum, bioacoustical monitor (Binary AcousticAR-180) was used to record sounds at high frequencies (180Hz), which is high enough to eliminate sounds of birds and amphibians. The advantage of full spectrum monitoring is that it allows for better species differentiation given that all properties of the original sound are recorded including multiple harmonics and amplitude. Subsequent visualization and analysis was conducted using the SPECT'R software which performs spectral analysis, digital tuning, and hard-disk recording. The high performance digital tuner translates high frequency ultrasonic signals down to the human audio range. Two methods were employed to collect data; incidental field location and fixed location where the monitor was attached to the side of the field station, protected by a rain guard for dusk to dawn surveys along the path-line adjacent to the field station. As a result of this sampling, a preliminary species list has been assembled for the Reserve. Future studies will include return visits to collect data during both the wet and dry seasons and additional dusk to dawn surveys.

82. Water Quality Study of Green's Creek Correlated to Surrounding Land Use, Long Island, New York

Sarah Monastero and Dara Hofmann

The purpose of this study was to correlate ™hot spots∫ within the Green's Creek Watershed where water quality degradation occurs to surrounding land use. Green's Creek is located within the South Shore Estuary Reserve. Nonpoint source nutrient and coliform bacterial loading have been identified in the Long Island South Shore Estuary Reserve Comprehensive Management Plan as primary causes. Water samples were collected for a 16-month period at five locations; two residential (Stations TN and 4), a preserve (Station 6b), and two commercial (Stations 3 and 2). Variables measured included DO, temperature, salinity, pH, nitrate (NO_3), phosphate (PO_4), and total and fecal coliform (Fcol) bacteria. New York State Water Quality Standards (1994) were used to evaluate conditions. All stations experienced DO sags during the months of July and August, failed to meet NO_3 standards more than 35% of the time, and failed to meet PO_4 at least 64% of the time. Fcol measurements failed to meet state standards at three stations (TN, 4, & 2). Surrounding land use is suspect to be contributing to degraded water quality due to fertilizer applications on residential and commercial properties and compromised septic systems releasing coliform bacteria. Spikes in PO_4, NO_3, and Fcol loading were observed immediately following storm events too. As a result of this study, a Pilot Study utilizing Smart Sponge Technology has been proposed to Islip Town and the research team is collaborating with Peconic Bay Keeper to recommend that Green's Creek be placed on the New York State Impaired Waterbodies List.

83. Using Geographic Information System Software to Determine Potential Hominid Fossil Locations in Turkana Basin, Kenya.

Marade Bergen and Kerry Barrett

The purpose of this experiment was to create maps to show geological formations of the Turkana Basin, Kenya so that known hominid fossil locations could be added to the geologic basemap. This will allow for the determination of where future expeditions should be conducted for hominid fossils and will help to determine whether ArcGIS will be a useful tool in projecting future sites for hominid fossil exploration. Geographic Information System (GIS) is a software system in which layers, formations, and geographic strata can be constructed for analysis and research. It has been used by government to plan military missions, track disease clusters and indicate public health, analyze land, ocean water, wildlife, patterns of wildlife and monitor vegetation patterns. ArcGIS Version 10 was used to create geologic map layers to predict target sites for hominid research. Through peer reviewed literature, hominid fossil locations were identified and bedrock correlated to construct a geologic map for the basin. Future work will include data sets provided by Mave Leakey and the Turkana Basin Institute to best identify high potential rock strata likely to possess hominid remains in Kenya. This work is important because limited stratigraphic geologic maps are available in Kenya presently, and those that do exist have not been field verified or geo-rectified.

84. Analysis of Lipid Biosynthesis and Inhibition in *Chlamydomonas reinhardtii*

By Jacqueline Kalomiris

The global energy crisis is peaking and without creative and effective research being done today there may not be a solution for the future. By researching the genetic transformation of *Chlamydomonas reinhardtii* and the functional genomics of lipid biosynthesis a partial solution may be in reach. By inserting plasmid DNA, treated with an enzyme digestion of HindIII, into the cells of the lab strain of *C. reinhardtii,* cells were transformed. Transformed cells were analyzed for lipid content using the Red Nile Dye. During the analysis of Part I of the project, where high fluorescence levels (high lipid content) were measured, four samples out of approximately 5,000 were found to have a significantly higher amount of lipid accumulation. These samples were further tested with PCR. During Part II of the project, where low fluorescence values were measured, approximately 0.70% of all samples were subjected to TLC, but the study of those strains was halted due to contamination. An ANOVA for Part II of the experiment was generated to see if a significant difference existed for groups of algae treated with hygromycin, and with zeocin. A significant difference exists, $F = 300.76$ when $p = 8.7E298$. Boxplots revealed no overlap between any of the groups tested. Zeocin provides the best treatment of *C. reinhardtii* when trying to identify where inhibition of lipid production occurs within the gene. The ultimate goal for this research was to provide baseline information of
functional genomics for lipid synthesis and inhibition in of *C. reinhardtii*.

85. Haplotype Fingerprinting of the Anisoptera of Suffolk County, New York

Rebecca Monastero

The objective of this experiment was to create a ™genetic fingerprint∫ and establish evolutionary relationships for the Anisoptera of Suffolk County, Long Island and to identify the common mitochondrial DNA haplotypes of the 47 species of Anisoptera identified in Suffolk County by the New York State Department of Environmental Conservation (NYSDEC) Natural Heritage Program Atlas. Methodology followed that of Saux, Simon, & Spicer (2003). Samples were obtained through field work as well as provided by the New York State Museum and consisted of clipped leg samples or wing samples for DNA extraction. DNA samples were lysed, purified, and placed in the PCR machine to amplify the DNA, which was then viewed through gel electrophoresis. All samples that displayed crisp, bright bands during gel electrophoresis were purified further and sent to Stony Brook University for sequencing and trimming. Bioservers, NCBI, and Sequencher Freeware (Version 4.9) facilitated haplotype analysis and the production of phylogenetic trees. Future work will involve continued sampling to establish unique species haplotypes to better understand population dispersion of the species utilizing Suffolk County habitats.

86. Chemical Analysis of Airborne Particulate Matter to Classify Potential Micrometeorites and their Association to Meteorite Showers Using Synchrotron X-ray Fluorescence for Two Locations in Suffolk County, New York

Tiffany Bruno

Micrometeorites are less than 100 um in size and can fall to earth if trapped in precipitation. To test if micrometeorites act as the condensation nuclei in precipitation, collections following target meteor showers and precipitation events were conducted in late fall and early winter at two locations in Suffolk County, New York using a filtration method and a bucket method. Neodymium magnets were used to extract magnetic particulate matter from the samples. The National Synchrotron Light Source (NSLS), beamline X26A, was used to differentiate terrestrial from extraterrestrial dust based on an accepted Fe:Ni ratio of 17:1 and a known micrometeorite control (pallasite). Thirteen samples were classified using the analytical software program IDL 7.1. Statistical analyses showed that the method of collection (t-test p-value of 0.089; chi square analysis p-value of 0.4161) and sampling location (t-test p-value of 0.089; chi square analysis p-value of 0.4161) both had no effect on the Fe:Ni ratios. There exists a distinct difference between the Fe:Ni ratios among the metallic particle samples (t-test p-value of 5.38E-05) as well as the samples from each meteor shower studied (CV box plot shows no overlap). The sample size was extremely limited due to the proposal process involved to gain access to NSLS. Future work should include an analysis of the additional 35 samples collected using NSLS and further identification of potential sources of the metallic airborne particles (terrestrial) to better protect human health and natural resources.

87. Population Ecology of Ectoparasites of Mormoopid Bats from the Osa Peninsula, Costa Rica

Alexis Brown

Infection of bat flies, spinturnicids, and ™other∫ ectoparasites have been observed on tropical bats (Pteronotus), habitants of Central and South American caves (Gannon, Kurta, Rodriguez-Duran, & Willig, 2005). This study was conducted at Proyecto Campanario, Costa Rica during the wet and dry seasons. Collection of ectoparasites was conducted by the field station's chiropterology team who captured bats at dusk and extracted ectoparasites using duct tape. Bat characteristics were correlated to ectoparasite data for species, time of emergence, sex, relative age, lactation, and forearm length using nationally established protocols. Ectoparasites were identified and enumerated at the station's laboratory. Statistical tests suggest that a significant difference exists between Pteronotus species for infection of ectoparasites (N=91, Fbatflies = 26.75365 at p=0.0000, Fspinturnicids = 6.90319 at p= 0.0000, Fother = 6.43209 at p = 0.0050). A correlation was established for ectoparasite infection and forearm length for *P. parnelli* and *P. gymnonotus* (N=51, r=0.30661 for spinturnicid infection and r=0.41216 for batfly infection at p=0.028643 and N=28, r=0.34770 at 95% CI, respectively). An additional test involved the difference between parasite infection rates in lactating and non-lactating female bats and was based on a previous study by Krichbaum, Perkins, & Gannon (2009), but did not yield results that matched those of the previous study as was inferred from the insignificant p-value (p=0.028643). These findings are also important to better understand ecological relationships between *Pteronotus* species and their ectoparasites to protect bat habitat and sustain their ecosystem services, which will ultimately protect human health from tropical vector-borne diseases.

88. Effect of Chemical and Physical Factors on the Expression of Parkinson's Disease in a Model Organism, *Caenorhabditis elegans*

Aneri Kinariwalla

Parkinson's disease (PD) is a neurodegenerative disease with ambiguous etiology. It is suspected that PD may have both genetic and environmental causes (Chen, 2001). *Caenorhabditis elegans* was used to examine the effects of coffee, caffeine, and heat (physical stress) on the expression of PINK1 and PDR-1 genes. PINK1 is a mitochondrial kinase linked to autosomal recessive parkinsonism (Ghandi, 2006). PDR-1, which encodes for proteins that block the detoxification of cells, is another gene that shows correlation with PD (Springer, 2005). Decreased expression of PINK1 and increased expression of PDR-1 are associated with the onset of PD. *C. elegans* wild type and mutated PINK1 were exposed to coffee, caffeine, and heat. Reverse transcription PCR was used to analyze the DNA for PINK1 and PDR-1 expression. Compared to untreated *C. elegans*, those exposed to caffeine or heat showed decreased PINK1 and increased PDR-1 expression. Coffee treatment resulted in the reverse expression. The results imply that while pure caffeine and heat (physical stress) may lead to PD, coffee may play a role in diminishing the likelihood of the disease. Both treatments (coffee and caffeine) had the same concentration of caffeine, which indicates that other agents in coffee may counteract the deleterious effects of caffeine and warrants further research.

89. Analysis of Variance of the Effects of Natural Substances on the Inhibition of Calcium Oxalate Crystallization

Erica Weinberg

The purpose of this project was to determine which natural substances, if any, can prevent the formation of calcium oxalate, the main component of kidney stones. Juices of orange, lemon, and grapefruit, extracts of gravel root, hydrangea root, and chanca piedra, and Mona Vie™, a popular nutritional drink were tested. Solutions of calcium chloride and sodium oxalate were created and combined to cause crystallization of calcium oxalate to occur. For each trial, a different experimental substance was added to a cuvette containing the agitated combined solutions. A colorimeter was used with the *Vernier* Logger Pro system to measure the light absorption (635 nm) over a 30-minute interval. Measurements were taken 3-times per minute and recorded at a constant temperature of 37°C (body temperature). A lower absorption of light was indicative of less calcium oxalate crystallization due to the inhibitory effect of the particular test substance. A single factor ANOVA was used to determine whether or not the mean absorption for each test substance differed significantly from that of the control (no substances added). The results from this test concluded that a significant difference existed between different test substances and the control. Gravel root, hydrangea root, and chanca piedra extract showed the greatest inhibitory effects on the crystallization of calcium oxalate. Lemon juice and Mona Vie™ showed increased crystallization suggesting that they promote kidney stone formation. Further investigation of gravel and hydrangea roots and chanca piedra is warranted as they show promise for kidney stone prevention through diet.

90. Analysis of variance of mtDNA in the southern flying squirrel (*Glaucomysvolans*), Long Island New York

By Gabrielle Pacia

The southern flying squirrel (*Glaucomys volans*) inhabits the eastern seaboard of North America. Previous studies have shown that the southern flying squirrel has low genetic variability across its North American extent. Southern flying squirrels have a small population and are geographically isolated, thus it is important to determine the genetic variability within the population for the future conservation of the species. In Upton, New York there is a population of southern flying squirrels. Southern flying squirrel DNA from this population was taken from the DNA Repository at Brookhaven National Laboratory. Eleven DNA samples (N=11) were then extracted and purified using Qiagen QIAmp DNA Minikit, underwent PCR, and were then sequenced at a certified laboratory for analysis. The results showed that two distinct haplotypes (two rare haplotypes: 31L and 37R and one common haplotype: 29L) were found. The Clustal W analysis revealed that SNP occurs at bp201 C replaced T (31L). The phylogenetic tree visually shows how closely related 29L, 37R, and 31L are, yet still shows a distinct difference. A statistical analysis was not yet conducted because not enough samples were collected. Future work includes obtaining more samples from Long Island in the summer of 2012 and determining through bioservers how many haplotypes exist from other research and compare. An additional 40 samples were collected and analyzed following this initial analysis.

91. Geospatial Analysis of Self-Reported Multiple Sclerosis for Nassau and Suffolk Counties, Long Island, New York

Courtney Mignone

Multiple Sclerosis (MS) is an autoimmune disease where the immune system attacks the central nervous system (Williamson, 2006). Environmental exposure may be a factor for MS onset (Williamson, 2006 and Ingalls, 1986). This project aims to identify whether MS patients cluster geographically. Geospatial analysis and statistical testing of patients with MS for Nassau and Suffolk Counties, New York, was conducted using de-identified, self-reported data provided by the National Multiple Sclerosis Society using ArcGIS Version 10. The results (N= 5,512) indicate that the proportion of people with MS in Nassau is not greater than that of Suffolk (z= 1.197 at p=0.885), and the proportion of people with MS in any one Town is not greater than that of another. A correlation was established for number of people diagnosed with MS to size of normalized population by town over time (r= 0.988 for 1990; r= 0.985 for 2000; and r= 0.985 for 2010). The conclusion that significant clusters do not exist suggests that genetics may play a greater role than pathways in the environment for the onset and disease prevalence on Long Island. These results do not agree with Williamson (2006) and Ingalls (1986) where clustering related to environmental pollution was suggested. The results of this study support the need for a National Registry for MS. This would provide a way for researchers to access large-scale data sets for geospatial analysis to further support or dispute the model that environmental factors may not be a significant contributing factor to the disease.

92. Applied Chemistry and Physics in the Study and Restoration of Artifacts from Long Island Shipwrecks

Garrett Boyce

The purpose of this study was to apply basic archaeological principles to the recovery, restoration and study of artifacts from Long Island shipwrecks, and to determine whether new information could be obtained about the artifacts' respective shipwrecks. It was hypothesized that new information could be discovered about Long Island shipwrecks, particularly the wreck of a barge that was hit by a torpedo during weapons testing by the US Navy before World War I. Several artifacts were obtained from various shipwrecks, including the liner SS *Gate City* and a torpedoed barge from Nyack Bay. All of the artifacts were properly cleaned, had their oxidation removed through electrolysis or acid baths, and checked for markings or symbols that could lend new information to the wreck. All of the artifacts were thus successfully restored. The artifact of chief interest was a bronze davit from the barge wreck. Half of the davit was warped from the heat of the torpedo explosion. The davit was studied for information on both the explosive power of a pre-World War I torpedo and its location on the barge, since its proximity to the explosion would have determined how badly the davit was damaged during the explosion. Analysis of this artifact and the others have proved there is still new information to be discovered about these Long Island shipwrecks, and new studies are needed to continue the proper studies of these valuable resources related to Long Island's
history.

South Side High School Research Teacher: Mr. Herbert Weiss

Listed as abstract #14. Study of the Extracellular Matrix in Dental Pulp Stem Cell Differentiation with and without Static Magnetic Fields Holly Flores (Huntington) and Austin Wild (South Side H.S.)

West Hempstead High School Research Teacher: Mr. Tobias Daempfle

93. Comparison Of Sailboats Made In The Past To Modern Day Sailboats

Maria Zambuto

In this experiment, the main sail of a sailboat and its curvature were studied to determine the relationship between the sail curvature and movement. The curvature controls the shape of the sail. When the leech line was set normal, the jib sail has a flatter plane as it lets the air travel faster over it, causing the sailboat to move faster. When the leech line was pulled tighter, the sail had a dramatic curvature and its trailing edge had a deeper curve causing the air to travel slower on the sail, making the sailboat move slower. I had predicted that this would occur and the dramatic curvature proved to be less effective. My research concurs with Bernoulli's principle, which explains the airfoil that is formed around the sails and the association of low pressure-high speed, and vice versa. It is the combined effort of the sails, rudder, keel, and the wind that makes a sailboat travel anywhere. The sails use the wind to create a lift; the upward pull is held down by the heavy keel and these two appendages work together to create the forward push. By observing the direction of the wind and the angle of the sail to the wind, sailors can set their sails at the best angle to make the most efficient airfoil and allow the sailboat to travel at increased speeds.

94. Which Acne Medication is Most Effective in Preventing the Proliferation of Bacteria?

Morgan Cinnamo

Acne results when a clogged pore on the skin fosters the growth and proliferation of *Propionibacterium acnes* (also known as P-acnes), the bacterium responsible for causing the local inflammation around the blocked pore. Medications produced to help prevent the occurrence and spread of acne contain various active ingredients in their formulas, the most common ones being benzoyl peroxide, salicylic acid, and resorcinol and sulfur (the latter only work best when combined). Five brands of acne medications (Neutrogena, Clean & Clear, Clearasil, AcneFree, and a CVS pharmacy brand) were applied to agar plates coated with E-Coli in order to determine which product worked best. It was predicted that the AcneFree brand medication would be most effective because it contained the highest concentration of benzoyl peroxide (10%). Sterile 6-mm paper disks were dipped in each medication and placed on the surface of the agar plates. Disks dipped in sterile water were used as a control. Three trials were performed. After 96 hours, the plates were observed and the zones of inhibition (clear area surrounding the disk amid a lawn of bacteria) were measured. The results showed that the CVS

pharmacy brand medication stopped the proliferation of bacteria most efficiently due to the fact that it created the largest zones of inhibition around the disks. Further research in this study includes devising an experiment that will distinguish between the acne medications that are bacteriocidal (those that kill bacteria) and bacteriostatic (those that temporarily inhibit bacterial growth).

An Inconvenient Truth: Is Al Gore's Hypothesis upon the Correlation of Carbon Dioxide Gas and Atmospheric Temperature correct?

Samantha Gambino

Based on a graph from Al Gore's An Inconvenient Truth, the purpose of this experiment was to study the relationship by which carbon dioxide gas levels affect the atmospheric temperature. In an empty fish tank, carbon dioxide gas was released, measured, and tested with the use of a PASCO carbon dioxide sensor. Carbon dioxide gas was released ten times at five second intervals. The amount of gas inside the closed tank gradually increased with each trial. A PASCO temperature probe was used during these same intervals to test the temperature inside the tank. Data Studio software was used to collect and record data. In Al Gore's graph, there is a distinct pattern by which temperature levels fluctuate in correlation to carbon dioxide levels. Results of the closed fish tank showed that temperature levels did not increase as carbon dioxide increased. Since the fish tank did not represent all the necessary elements found in nature, the experiment was conducted once again, but with the addition of water, plants, and an ™aquarium and plant F15∫ light. Smaller fish tanks were used to create microcosms of the environment. One tank contained solid carbon dioxide and the F15 light; a second tank contained CO_2, light, and water; and a third tank contained CO_2, light, water, and a small house plant. The ten intervals of measurement, PASCO probes and Data Studio were once again applied. Results showed that although the smaller fish tanks had overall warmer temperatures, the temperatures did not oscillate due to carbon dioxide levels.

96. Combined Effects of 2-Butoxyethanol (dispersant) and Oil on *Artemia Salina*

Laura Boehm

The BP oil spill was a detrimental accident has wreaked havoc on the Gulf. In an attempt to clean up the oil, BP released hundreds of thousands of gallons of the chemical dispersant Corexit, the main ingredient being 2-butoxyethanol, into the Gulf. To start, I obtained 15 portions of brine shrimp and placed them in a tank with 1 gallon (approx. 3785 milliliters) of sea water. Then I added 150ml of motor oil to cover the surface and observed for 5 days. Then under a fume hood and while wearing goggles and gloves 30 ml of 2- butoxyethanol was added to a new batch of shrimp for another five days in the same amount of oil and conditions and the same with 60ml and 90ml respectively while taking notes in my lab notebook. Since all of the shrimp were dead after five days I concluded that the combination of oil and dispersant did shorten their live spans. For the first trial, the control with oil only, 100% were alive on the first day, and then 55.13% dead on day 2 and 100% were dead on the fifth day. In 30 ml of dispersant, 100% were alive, then 69.96% dead on day 2 and 100% dead on day 5. In 60ml of dispersant had 100% alive, then 86.90% dead and 100 percent dead. Finally in trial 4 there was 100% alive, then 98.99% dead and 100% dead.

97. The Best Way of Treating a Water Problem.

Xavier A. Roberts

The purpose of this experiment was to determine which method of water treatment would be most beneficial, based on the detected contaminants from three different Long Island water sites: the North Shore Bay, the South Shore Bay and a sample from the local town ground/well water. It was hypothesized that each body of water sample would fair differently, after being exposed to various water treatment methods. Control samples, from each area, were first tested to determine their specific level of chemical contaminants/pollutants. It was determined that each site was polluted within various parameters of the water. Each of the samples, from the different water sites, was then subjected to treatment through the use of Granulated Activated Charcoal (GAC), Nitrifying Bacteria or Potassium Permanganate. Samples were later put through a series of water tests to determine the change in the levels of chemical contaminants/pollutants. It was concluded that the effectiveness of Nitrifying Bacteria, GAC and Potassium Permanganate treatments varied depending on the source of the samples. After treatment and testing, the levels of chemical contaminants/pollutants--as well as other environmental factors--varied at each site. Water quality and the potential for support of aquatic life, also varied, therefore, the most beneficial treatment methods depended mainly on the composition of the waters and the goal of the treatment. These results have inspired further research to determine how the environment surrounding each body of water could influence water quality, as well as research of more natural, environmentally friendly methods.

98. Counterfeit Guitar String Quality

Alex Sabella

My project was created in order to discover the trend in the vibrations of guitar strings and to test real, American made guitar strings alongside Chinese counterfeits. I hypothesized that if a tuning machine (knob at the top of the guitar) was turned to tighten one string, then the tension of the guitar would cause other strings to be loosened, in turn, lowering the frequency of the strings. The counterfeit strings were also believed to be poorly manufactured and therefore less reliable and more random, and less easily calculated than the real strings.The experiment used the same guitar to test both sets of strings, real and counterfeit. All strings were set to 440Hz (tuned) using a tuner that was plugged straight into the guitar. A string was tightened to 470Hz. Data was recorded regarding the frequency of the other strings. Then the strings were all set back to 440Hz and the process was then repeated for every string. The data showed that the other strings were loosened by the tightening of the selected string. Overall, there was not a lot of change in the strings after an increase of 30Hz, but the trends were still clear. These trends could be used to design a guitar neck that is not as flexible or strings that can be tuned easier. It could also be used to aid in the design for a guitar that tunes itself. Also, this experiment has shown that counterfeit strings are not reliable. They snap and are not up to the standards of true guitar string manufacturers, causing a potentially dangerous situation to whoever purchases them. In the future, the initial tightening of the single string (independent variable) will be more drastic and an experiment to test the effect of loosening a string will be used.

West Islip High School **Research Teachers: Ms. Mary Kroll, Mr. Robert Purdy, Mr. Van Bell**

99. Effect of Vent Flow Rate on the Efficiency of Hydrogen Purifiers

Joseph Byington

Hydrogen has been regarded as a viable alternative fuel source, but can only be used in the purest form. An extensive purification process is used to obtain pure hydrogen, and the last step uses a purifier with a palladium membrane. The purpose of this experiment was to eliminate the previous steps of the purification process by putting in a mixture of gas that had a much higher CO concentration and to determine if a relationship exists between the vent flow rate and the amount of hydrogen that was purified. It was hypothesized that a higher vent flow rate would not purify as much hydrogen. After performing a t-test on the data, it was evident that there was no significant downward trend of the data. The range for the average of all three trials was between 38% CO and 41% CO. Difficulties arose while changing the vent flow rate, most likely caused by carbon buildup on the membrane from the large amount of CO inside the purifier. This showed how the purification process cannot be streamlined and the gas must be processed before being inserted into the palladium purifier. Due to this carbon buildup, changing the vent flow rate is not the most efficient way to maximize the hydrogen output.

100. Household Factors Affecting Asthma Development and Frequency of Attacks

Caitlin Dolan

Asthma can be triggered by various irritants found in the home including dust, mold, mildew, cockroaches, pet dander, strong odors, and smoke. This experiment was an attempt to link the development of asthma and the frequency of attacks to the frequency of cleaning one's house for these factors. It was hypothesized that the respondents would be unaware of the effects of the selected household factors on asthma; therefore, they would not clean their houses as often as recommended by the Environmental Protection Agency. A survey was created and mailed to three hundred residents of a local town asking them questions about their families' history of asthma and how often they clean their houses for the factors listed above. A 43% return rate was reached and 33.6% of the respondents had at least one family member with asthma. Of this 33.6%, 45.2% had environmental asthma. The majority of the houses with family members having environmental asthma cleaned their houses on a weekly or bi-weekly basis which eliminates these factors as possible sources of asthma. These houses were also free from cigarette smoke proving that this factor was not affecting the asthma either. However, cleaning chemicals with strong odors were used in the majority of these homes, and cosmetic products with strong odors were used every day in most of these houses. Therefore, it is necessary to educate the public of the harmful effects of these strong odors.

101. Pediatrician's Role in Prevention of Alcoholic Liver Disease

Allison Dowling

A diagnosis of Alcoholic Liver Disease (ALD) is irreversible, making prevention the best cure for this disease. Pediatricians may be good advocates for prevention because teenagers can tell the doctor their drinking habits and it remains confidential. It was hypothesized that many pediatricians do not stress ALD as a long term effect of underage drinking; that patients are not asked about their alcohol use; and doctors will discuss ALD more after completing the initial survey. Initial and follow up surveys were created with cover letters. Included with the follow up survey were talking points that doctors could use to discuss ALD. Doctors were chosen randomly using a NY medical directory and on-line searches, and the same doctors were used for the follow up survey. From the initial survey, analyzed with Survey Gold, it was determined that pediatricians would be good advocates for the prevention of ALD. 95% of doctors answered that they ask patients about alcohol use, and believe that binge drinking is a big health problem. However, only 3% of doctors thought that future health issues were a concern. In the follow-up survey, 25% reported that they discuss ALD more with their patients after having taken the initial survey and 58% reported making an increased effort to include it in their discussion, which can impact many patients. In the initial survey it was determined that pediatricians would be good advocates for prevention, and the follow up survey confirmed that 25% more pediatricians have since accepted this responsibility.

102. Identification of Genes on Chromosome II Necessary for *C. elegans'* Gonadal Sheath Formation, Using RNAi

Michael Sigouros

C. elegans is a model worm commonly used in RNA interference. This investigation studied how the genes found on chromosome II control the development of the gonadal sheath. This has yet to be researched using RNAi. It was hypothesized that the introduction of RNAi on the *C. elegans* genes will code for the GFP protein, resulting in fluorescence, indicating the presence of the functional gonadal sheath in the worm. Each plate of a specific gene from the 2nd chromosome was inoculated with frozen E. coli (containing an RNAi construct). An egg prep was performed to break up the worm body to release the eggs. Harvested eggs were screened under a microscope with fluorescent light. Most of the worms not glowing meant the gonadal sheath was not present after the introduction of RNAi. 23% of the 192 genes tested were positive, meaning the gonadal sheath was not present. These genes on chromosome II function in the proper formation of gonadal sheath. These genes were then categorized based on the role that each gene plays in the worm: Receptor, Signal Transduction, and Cell Cycle & Repair. These genes will be examined more closely for altered fertility. Understanding what goes wrong during these vital cell processes will be more achievable.

103. Determining the Common Basis Eating Disorder Specialists Use to Diagnose Patients with Anorexia Nervosa

Alyssa Singer

According to Dr. Wheatland (2005), underlying endocrinological factors are relevant to the cause and treatment of anorexia. Studies have shown that after treating anorexics with hypocortisol, their eating disorder symptoms have been significantly reduced or disappeared. This project examined the common basis Eating Disorder Specialists (EDS) use for the diagnosis of anorexia as well as their awareness of a possible endocrinological cause. It was hypothesized that a majority of EDS would indicate their basis for diagnosis has developed from a psychological/psychosocial cause of anorexia. A survey questioning the causes and diagnosis of anorexia was created and sent to 72 EDS across the US. Results indicated that 39% of those surveyed conducted research regarding adrenocortisol insufficiency as an underlying cause of anorexia. This suggests that although the other 61% of specialists may be well-versed in the societal aspects of the cause, they do not have sufficient background in the endocrinological factors that may contribute to the disease. This lack of sufficient research could also account for the 43% of specialists surveyed who were unsure if it could be a cause, and explains why more specialists indicated a belief that anorexia is caused more by society than biology. Results of a follow-up survey indicated that the original survey inspired the specialists to research adrenocortisol insufficiency as a possible cause of anorexia. They further stated that their curiosity on the matter had increased, and that after reading an excerpt of Dr. Wheatland's ™The Endocrine Research Project,ʃ their opinion had somewhat changed.

104. Minimizing the Effect of Acne Medications on *Staphylococcus epidermidis*

Alexa Young

Acne is the most common skin disease. Although acne is not directly caused by bacteria they do play an important role in the development and treatment of acne. *Staphylococcus epidermidis* thrive on the surface of our skin and help eliminate other pathogenic bacteria that can cause acne. Acne is usually treated with over the counter products. This experiment determined which treatment had the least effect on the commensal *S. epidermidis*. It was hypothesized that Tetracycline would have the largest zone of inhibition, Tea Tree oil would have the smallest, and as Salicylic acid concentrations increased, zones of inhibition would also increase. Treatment disks were soaked in their respective solutions for 24 hours, then taken out to dry for another 24 hours. Using aseptic technique, 150ul of bacteria was spread across nutrient agar plates. The treated disks were applied to the agar. The plates were incubated for 48 hours at 37°C. Resulting zones of inhibition were measured. Tea tree oil resulted in the largest zones of inhibition, followed by Tetracycline, then Salicylic acid. The weaker the acid, the less effect it had on the S. epidermidis. Tea tree oil and high concentrations of salicylic acid found in over the counter acne products may result in the reduction of commensal bacteria on the skin. A harsh treatment such as tea tree oil may treat one acne outbreak; however, the harm it causes to commensal bacteria may ultimately reduce the effectiveness of these
treatments.

105. Optimization of Nanoscale Morphology of Electron Donor-Acceptor Channels in Organic Photovoltaic Cells

Eric Metodiev

Organic photovoltaic cells offer an alternative to semiconductor-based solar cells due to their flexibility and cost-effectiveness. The heterojunction active layer of conventional organic solar cells relies solely on randomly phase-separated regions of the P3HT and PCBM. There are many inefficiencies associated with random dispersal, such as lack of pathways to the electrodes and dead zones in the active layer. Polystyrene (PS) was explored as a means to order the bulk heterojunction of organic photovoltaic cells. With the addition of PS, columnar formations of the electron-donor polymer poly(3-hexylthiophene) (P3HT) characterized the morphology of the surface and the interior of the thin film. It was found that the electron-acceptor nanoparticles of phenyl-C61-butyric acid methyl ester (PCBM) migrated to the PS:P3HT polymer interface, forming channels in the PS. The formation of ordered electron-acceptor channels allows for the controlled structuring of the active layer of organic solar cells. The ordering of the active layer significantly reduces the dead zones and inefficiencies that plague the standard bulk heterojunction active layers and allows the efficiency of organic solar cells to increase by up to 35%.

The Wheatley School Research Teachers: Mrs. DeAngelo, Mr. Van Bell

106. The Effects of Internet Usage on Academic Performance

Maria D'Iorio and Nicole Tomei

The presence of the Internet in our everyday lives is increasing rapidly. The effects of the Internet on academic performance is a topic of which little conclusive research has been performed. The purpose of this study is to determine a correlation between Internet use and academic performance, specifically how the Internet is used to aid in learning. How the Internet is used plays a big role in its effect on academic performance. This study aims to prove that the Internet can negatively impact one's grades when not used for academic purposes, but can improve academic performance when used for studying, researching, and other school related activities. A survey was compiled and distributed to approximately 120 eleventh grade students at a small suburban high school. The results from were collected and analyzed. Specifically searched for were correlations between Internet use and academic performance. Factors included in the research as sources of error were hours of sleep, socioeconomic status and amount of time spent at extracurricular activities. The research is on going and results are still being tabulated at this time.

107. Mitigating the Effects of the Morphine Signaling System- A Novel Treatment for Diabetes

Charles Yu

Many studies have demonstrated that sugar intake can cause elevation of dopamine production and alter dopamine receptor numbers in both animal and human models. But does sugar have any impact on the mu-opioid receptor, another major pathway linked to drug addiction? In this experiment, we tried to address this question. A human colorectal adenocarcinoma cell line (COLO32DM) and a neuroblastoma cell line (SH-SY5Y) were used in this study. The cells were

incubated with 12 and 18 mg/ml of glucose for 1 hour, 4 hours, and 24 hours and were then harvested for RNA isolation. RT-PCR techniques were used to study the mu-opioid receptor gene expression. The results showed that gene expression of the mu-opioid receptor was up regulated by glucose after a 1 hour incubation; glucose down regulates mu-opioid receptor gene expression in a dosage dependent manner after 24 hours incubation. After a 4 hour treatment, the mu receptor was down regulated by the high concentration of glucose, but up regulated by the low concentration, suggesting that at first sugar up regulates the mu receptor, but over time begins to down regulate it. This experiment also has found that glucose can stimulate endogenous morphine release. This study was the first to demonstrate that sugar has the ability to regulate mu-opioid receptor gene expression in human cell lines. These novel findings suggest that the sugar can be addictive; it shares many addictive properties and mechanisms with other drugs, such as cocaine, morphine, nicotine, and alcohol.

108. Bortezomib and Nitric Oxide on Suppression of NF- κB

Allison Chowdhury

The purpose of this experiment was to see whether proteasome inhibitor Bortezomib worked through cNOS derived nitric oxide in order to suppress NF- κB activity. It was predicted that Bortezomib works to suppress NF- κB through nitric oxide because nitric oxide is a well-known down-regulator of NF- κB. The mechanisms through which Bortezomib operated on NF- κB were unknown, so there was a possibility that there could be a correlation. HTB-11 human neuroblastoma cells were treated with different doses of Bortezomib. Some received L-NAME, a common nitric oxide blocker. The control did not receive any Bortezomib or L-NAME. After 24 hours, an RNA isolation was performed and then a reverse transcription. A PCR was also performed with the reference gene of GADPH and COX-2. COX-2 is known to have an indirect relationship with nitric oxide. After examining the gel, it was concluded that there is no link between Bortezomib and cNOS derived nitric oxide. These results were significant because nitric oxide can now be eliminated as a possible factor of which NF- κB B is down-regulated. For future studies, there should be a few more trials done using the COX-2 gene and also some genes from the proteasome itself such as p53. This would show how blocking of nitric oxide would affect the proteasome directly.

109. Behavior of the Fourth State of Water in Relation to Chamber Size

Sara Sakowitz

This research project analyzed the behavior of water in its ionized state as it reacts to the hydrophilic surface, Nafion, in different polycarbonate-glass chamber sizes and in varying concentrations of a marker suspension fluid consisting of 1µm polycarboxylate microspheres in de-ionized water. As the water ionizes, it excludes the marker suspension, dubbing the area the ™exclusion zone∫. The laboratory experiment studied the size of the exclusion zone in relation to increasing chamber diameters, using four different concentrations of the microsphere suspension fluid in concentrations of 1:100, 1:500, 1:2000, and 1:5000, and five polycarbonate-glass circular chambers of diameters 3mm, 9mm, 27mm, 31mm, and 36mm. For each trial, an exclusion zone was measured around the hydrophilic material of tube Nafion with a diameter of TT-030 and captured using ImageJ in five-minute increments for twenty-five minutes. Graphs were created for each concentration, chamber size, and time period, showing the significant increase in ™exclusion zone∫ size as the chamber diameter increased. The zone represents the ™fourth phase of water∫ as it ionizes against a hydrophilic material. This state of water, as it increases in size, may represent a vast amount of potential energy that raises questions for a possible energy source through future investigation.

110. Garlic extraction promotes animal and human health via Nitric Oxide regulation

Paul Kim

Nitric oxide (NO) is an important cellular signaling molecule involved in many physiological and pathological processes in animals and in humans(*European Bioinformatics Institute*). One of the important functions in the body is to control blood pressure by dilating blood vessels. By relaxing the smooth muscles in the arteries, it allows increased blood flow around the body. Many studies have demonstrated that pathway of NO synthesis and regulation has been preserved throughout the evolution.

In this research, the invertebrate immune cell, nerve cell and heart tissues were used to study the effect of various chemicals on NO signaling. The fact that garlic extractions are able to effect cell activities in invertebrate tissues via regulation of NO production is discovered. Furthermore, the cancerous cell lines were used to see if garlic extraction has similar effects. It has been proved that garlic extractions not only can regulate NO production, but also significantly kill the colon cancer cells and neuroblastoma cells. This study has demonstrated that garlic extractions can promote cardio-

vascular health in animals and humans, and at the same time, it can affect cancer growth. Further study will be focusing on purification and identification of active ingredient of garlic that causes these effects.

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