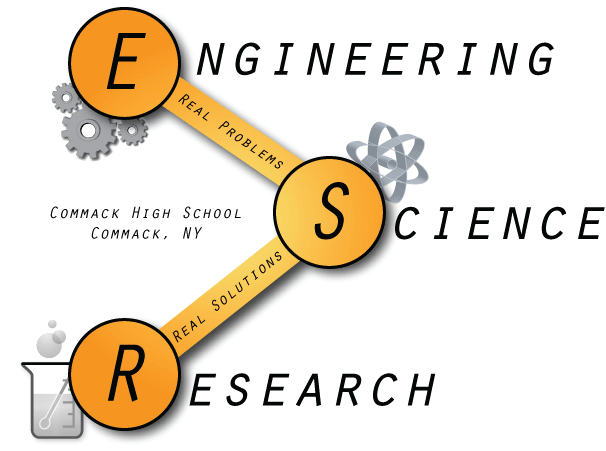
*The Research Dragon*





**Commack High School’s**

**Research Yearbook**

**2013 - 2014**

**A Celebration of Research at Commack High School**

**Thursday May 22nd, 2014**

**7:00 pm**

**Evening Events**

Poster Presentation of student projects

Slide Show Presentation… Claire Regan, Samuel Luber

Introduction…………..….Claire Drotman

Opening Remarks….….…Ms. Alison Offerman-Celentano

Director of Science, K-12

Student Reflections…..….Olivia Dubi, Vincent Pennetti

Alumni Comments……….Laura Jao

Guest Speaker………….. Mary Ellen Coglianese

Manager, Regional Network Clinical Research Memorial Sloan-Kettering Cancer Center

Special Recognition……..Christina Cabana, Joshua Zweig

Honoring Our Seniors…...Ryan McCaffrey, Chantel Yang

Closing Remarks…..…….Claire Drotman

Welcome to our Celebration of Science Research. This evening, we pay tribute to the creativity, hard work, and success of our students over the past school year. Participating in the science research program requires a personal commitment, dedication to the completion of a project from start to finish, and the enthusiasm to overcome the obstacles and enjoy the success along the way.

At each science fair that we have participated in, our students represented the Commack community in a respectful and professional manner. They were all well prepared and eager to share their efforts and results with science fair judges.

This evening, we honor each one of our science research students for their involvement and participation in the Commack High School science research program.

Ms. Jeanette Collette……………Science Teacher

Mr. Richard Kurtz………………Science Teacher

Dr. Lorraine Solomon…………..Science Teacher

Ms. Andrea Beatty……………...Lab Assistant

Ms. Alison Offerman-Celantano………….. Director of Science, K-12

*With gratitude we would like to thank the following who have helped our staff and students in so many ways all year to make our research program work so well.*

Susan Abbot, Carolyn Campbell, Susan Fanwick, Carolyn Gallogly, Paul Giordano, Dolores Godzieba, Mindi Goonan, Camille Horak, Elizabeth Koelzer,

Dr. Barbara Kruger, Dr. Fred Kruger, Dr. Susan Lee, Eileen Rogers,

Genny Sebesta, Gary Shaw, Elizabeth Smith, Victoria Stack, Judy Titolo,

and Frann Weinstein.

Ed Storck and our fabulous custodial staff.

Ms. Nolan, Ms. Shapiro, Ms. Boritz, Mr. Keltos, and the administrative staff for their continued support.

Dr. James, Dr. Pecora, Ms. Newman and Ms. Ryan, and the members of our Board of Education, for their support and recognition of our program.

**Science Fair Participation**

**Intel Science Talent Search**

Joshua Zweig - National Semifinalist

**Intel International Science and Engineering Fair**

**Justin Cheung**

**Scott Massa**

**Matthew O’Connell**

**Joshua Zweig**

***Awards to be Announced***

**The DuPont Challenge Science Essay Competition**

Isabella Daquita

Lucas Marmorale

**InnoCentive Challenge**

David Li – Proposal Accepted, $2,000 Award

**Long Island High School Psychology Fair**

Marissa Mathew

Rakia Syed

*Students were selected after a competitive process to present their research at the conference.*

**Pediatric Academic Society Annual Meeting**

Stephanie Badir - Student Presenter

**Stony Brook Research Day**

Stephanie Badir – Student Presenter

**Toshiba/NSTA ExploraVision Program**

Brianna Delgado

Olivia Dubi -Honorable Mention

Vincent Giannilivigni -Honorable Mention

Samantha Gray -Honorable Mention

Helen Koukoulas - Honorable Mention

Joshua Mann - Honorable Mention

Tara McCaffrey - Honorable Mention

Olivia Messina - Honorable Mention

Kyle Mitra - Honorable Mention

Cassandra Onal - Honorable Mention

Vraj Shah

Amy Uthup - Honorable Mention

Peter Yu

*Honorable Mention represents the top 10% of nationwide student participation*

**New York State American Physics Association Symposium**

David Li – 1st Place, High School Category

**2013 International Pharmaceutical Federation Conference**

Matthew O’Connell – Student Presenter

**Ability One Design Challenge**

Xiaoxuan Chen

Brianna Delgado

Jonah Haber

Anthony Jao

Vraj Shah

Peter Yu

**MIT Zero Robotics Competition**

Christopher Huaman

Ibrahim Khan

Andrew Kim

David Li

Matthew O’Connell

Alinur Rahim

Joshua Zweig

**Junior Science and Humanities Symposium**

*Students must apply to the symposium and be selected to present their projects*. *First Place finishers return for Round 2.*

Anthony Bisulco - 1st Place, Engineering

Justin Cheung

David Li

Scott Massa

Matthew O’Connell – 1st Place, Medicine and Health

Joshua Zweig - 2nd Place, Computer Science

**Junior Science and Humanities Symposium, Round 2**

*First and Second Place finishers advance to the National levels of competition.*

Anthony Bisulco – 2nd Place, Engineering

Matthew O’Connell - 1st Place, Medicine and Health

**Junior Science and Humanities Symposium, National Level**

*92 students nationwide are invited to present their research at individual lectures at the symposium.*

Anthony Bisulco – National Presenter

Matthew O’Connell – National Presenter

**Long Island Science and Engineering Fair, JV Division**

Allyson Britt

Abbigayle Cuomo – Honorable Mention, Environmental Science

Isabella Daquita

Victoria Ferlauto – 3rd Place, Biology

Gina Ferrera

Vignesh Gunasekaran – 3rd Place, Biology

Sara Kurten

Megan Padgett

Kelly Page

Caitlin Passaro

Vincent Pennetti

Elizabeth VanLoon - Honorable Mention, Environmental Science

**Long Island Science and Engineering Fair, Round 1**

*(Round 1 finalists advance to LISEF 2 for awards)*

Stephanie Badir

Justin Cheung

Brian Huang

Greta Huang

Andrew Kim

David Li

Scott Massa

Matthew O’Connell

Mehtaab Sawhney

Chantel Yang

Joshua Zweig

**Long Island Science and Engineering Fair, Round 2**

Stephanie Badir – 3rd Place, Medicine and Health

Justin Cheung – 2nd Place, Materials and Bioengineering

Greta Huang – 2nd Place, Materials and Bioengineering

- US Metric Association Award

David Li – 2nd Place, Electrical and Mechanical Engineering

- US Metric Association Award

Scott Massa – 1st Place, Cellular Biology

-Society for InVitro Biology Award

-Society for Health and Human Services Award

Matthew O’Connell – 2nd Place, Medicine and Health

Mehtaab Sawhney – 2nd Place, Mechanical and Bioengineering

- US Metric Association Award

Joshua Zweig – 1st Place, Computer Science

- INTEL Award for Excellence in Computer Science

*All First Place winners advance to International Competition in Los Angeles, California*

**New York State Science and Engineering Fair, INTEL Division**

Stephanie Badir – Honorable Mention, Medicine and Health

-Surgeon General’s Special Science Award

Justin Cheung – 3rd Place, Materials and Bioengineering

* Advancing to International Fair in Los Angeles

Brian Huang

Greta Huang – 1st Place, Materials and Bioengineering

-ASM Materials Education Foundation Award

Andrew Kim – Honorable Mention, Environmental Science

David Li

Scott Massa \*

Matthew O’Connell – 1st Place, Medicine and Health

-Surgeon General’s Special Science Award

-Society for InVitro Biology Award

-Advancing to International Fair in Los Angeles

Mehtaab Sawhney

Chantel Yang

Joshua Zweig \*

*\*Students previously accepting First Place Grand Awards at LISEF are not eligible for awards*

**WAC Lighting Foundation Invitational Science Fair**

Rachel Aitchison

Daniella Azoulay

Jason Bak - 1st Place, Earth and Environmental Science

Eric Bass – 3rd Place, General Biology

Christina Cabana – Merit Award, Biochemistry and Molecular Biology

Xiaoxuan Chen

Gabrielle Cooper

Monica Cramer

Jianna Cressy – Merit Award, General Biology

Brianna Delgado – 2nd Place, Prototype Engineering

Claire Drotman – Merit Award, Prototype Engineering

Olivia Dubi - Merit Award, Prototype Engineering

Colleen Flynn - 1st Place, Earth and Environmental Science

Samantha Gray

Gabriel Green - 3rd Place, General Biology

Jessica Hastings

Christopher Huaman

Daniel Hosseinian – 1st Place, Earth and Environmental Science

Brian Huang – Honorable Mention, General Biology

Greta Huang – 1st Place, Prototype Engineering

Aryana Javaheri

Ibrahim Khan - Honorable Mention, General Biology

**WAC Lighting Foundation Invitational Science Fair (Continued)**

Andrew Kim – 2nd Place, Earth and Environmental Science

Helen Koukoulas

Sarah LaMorte

Scott Massa – 1st Place, Biochemistry and Molecular Biology

Marissa Mathew - Honorable Mention, General Biology

Ryan McCaffrey

Tara McCaffrey - Merit Award, Prototype Engineering

Nicolette McKeon

Olivia Messina

Kerri Neville

Brooke Novello

Matthew O’Connell

Andrea O’Brisky

Cassandra Onal - Merit Award, Prototype Engineering

Kristen Orrach

Jin Ho Park

Vincent Pennetti – 1st Place, General Biology

Eric Rizzo - 3rd Place, General Biology

Tracey Rosenlicht

Vraj Shah - 2nd Place, Prototype Engineering

Samuel Silverman

Sydney Sirota

Nakul Thampy

Noah Tollin – Merit Award, General Biology

Amy Uthup – Merit Award, Prototype Engineering

Thomas Vetere – Honorable Mention, Behavioral and Social Science

John Voiklis -3rd Place, General Biology

James Whittaker – Merit Award, Earth and Environmental Science

Peter Yu - 2nd Place, Prototype Engineering

**iSWEEEP**

Andrew Kim – Silver Medal, Environmental Division

**Arts and Science Fair at Nassau Community College**

Daniella Azoulay

Ryo Ashida - 3rd Place, 9th Grade

Ryan Chan – 3rd Place, 11th/12th Grade

Xiaoxuan Chen

Anthony Ciccarelli – 1st Place, 10th Grade

Gabrielle Cooper

Jessica Fecht

Jake Finnell – 1st Place, 10th Grade

Aryana Javaheri

Alexa Karadenes

Joo Young Kim

Chimdi Obinero – 3rd Place, 11th/12th Grade

Kristen Orrach

Laxshika Raveendran

Claire Regan

Tracey Rosenlicht

Mehtaab Sawhney

Sydney Sirota

Hassam Syed

Thomas Vetere

Johann Yang – 3rd Place, 9th Grade

**Noyce Symposium**

*Awards To Be Announced*

Jung Soo Ahn

Jason Bak

Eric Bass

Joseph Biondo

Ryan Chan

Abbigayle Cuomo

Gabriel Cutrone

Kyle Dituro

Victoria Ferlauto

Colleen Flynn

Gabe Green

Vignesh Gunasekaran

Kayla Halper

Jessica Hastings

Daniel Hosseinian

Woo Jin Jung

Ibrahim Khan

Angela Kubik

Briana Kubik

**Noyce Symposium (Continued)**

Anthony LaSala

Noah Marinaro

Lucas Marmorale

Nicolette Mc Keon

Chimdindu Obinero

Andrea O’Brisky

Megan Padgett

Kelly Page

Vincent Pennetti

Eric Rizzo

Charity Russell

Emily Shin

Juliana Sikorski

Samuel Silverman

Maeve Smart

Maxwell Sugarman

Elizabeth VanLoon

Douglas Verity

Jeremy Vlacancich

John Voiklis

**Long Island Science Congress**

*Grand Awards To Be Announced*

Nicholas Biancaniello – Achievement

Allyson Britt – Achievement

Jordan Cooper – Honorable Mention

Jianna Cressy – To Be Announced

Jaclyn Dentrone – Meritorious

Joshua Dreilich – Achievement

Marcelo Eisenberg – Achievement

Mikayla Katz – Meritorious

Christine Kim – Achievement

Hyunjoo Kim – Meritorious

Joshua Kravatz – Honorable Mention

Sara Kurten – Achievement

Hyun Seo Lee – Meritorious

Jamey Meiotti - Achievement

Megan Padgett – Achievement

Kelly Page – Achievement

Caitlin Passaro – Achievement

Claire Regan – Meritorious

Emily Shin – Meritorious

Justin Tollin - Achievement

**New York State Science & Engineering Fair, Andromeda Division**

*Awards to Be Announced*

Zan Asif

Katelyn Carone – To Be Announced

Ryan Chan – To Be Announced

Gabriel Cutrone – To Be Announced

Brianna Delgado – To Be Announced

Kyle Dituro – To Be Announced

Vincent Giannilivigni

Maya Glaser-Kshensky – To Be Announced

Jonah Haber

Hugh Han – To Be Announced

Diana Hagedorn – To Be Announced

Austen Izen

Anthony Jao

Angela Kubik – To Be Announced

Briana Kubik – To Be Announced

Anthony LaSala – To Be Announced

Joshua Mann

Noah Marinaro

Lucas Marmorale

Kyle Mitra

Chimdindu Obinero – To Be Announced

Adam Portnoy

Charity Russell – To Be Announced

Vraj Shah – To Be Announced

Zachary Shushan

Maeve Smart – To Be Announced

Rakia Syed – To Be Announced

Erick Vaysman

Douglas Verity – To Be Announced

Peter Yu – To Be Announced

**Molloy College Science Fair**

Jung Soo Ahn

Ryo Ashida

Nicholas Biancaniello

Joseph Biondo

Nicholas Bunnell

Katelyn Carone

Daniel Choi

Anthony Ciccarelli

Jordan Cooper

**Molloy College Science Fair (Continued)**

Abbigayle Cuomo

Isabella Daquita

James Dolan

Joshua Dreilich

Marcelo Eisenberg

Jessica Fecht

Victoria Ferlauto – Top 25 in Fair

Gina Ferrera

Jake Finnell

Maya Glaser-Kshensky

Vignesh Gunasekaran – Top 25 in Fair

Devin Irwin

Daniel Jung

Alexa Karadenes

Mikayla Katz

Christine Kim

Joshua Kravatz

Anthony LaSala

Ryan Lee

Noah Marinaro

Lucas Marmorale

Jamey Meiotti

Megan Padgett

Kelly Page

Vincent Pennetti – Top 10 in Fair, 4th Place Overall

Michael Pont

Charity Russell

Emily Shin

Christopher Siegler

Juliana Sikorski

John Simone

Maeve Smart

Maxwell Sugarman

Justin Tollin

Victoria Turner

Elizabeth VanLoon

Douglas Verity

Jeremy Vlacancich

Ryan vonHof

Matthew Wu

Johann Yang

**PUBLICATIONS**

**Energy and Power Journal**

David Li

Mehtaab Sawhney

**Journal of Emerging Investigators**

Hugh Han

**International Science and Weather Initiative Newsletter**

Anthony Bisulco

**Journal of Wireless Networking and Communications**

David Li

**Oceans Networks Canada Newsletter**

Eric Bass

Gabriel Green

**Journal of Ergonomics**

Tracey Rosenlicht

**ABSTRACTS**

**Seniors**

***Zan Asif***

**Does a Change in Host Affect the Number of *Melittobia digitata* and/or**

***Melittobia australica* Offspring Produced?**

The purpose of this investigation was to determine whether a change in host affects the number of *Melittobia digitata* and/or *Melittobia australica* offspring produced. Also known as “Wow bugs”, *Melittobia digitata* are parasitic wasps mainly found in south-eastern U.S. *Melittobia australica* are parasitic wasps which originated in Australia, and can be found in parts of the U.S. and Mexico. One interesting attribute to both of these species is that they can reproduce asexually and sexually. The type of asexual reproduction they use is called parthenogenesis, in which embryos develop without fertilization occurring. Other attributes include vestigial wings and harmless stingers. To determine whether host change has an effect on *Melittobia digitata* and/or *Melittobia australica,* four different types of cultures were made. Two of the culture types included *Melittobia australica* and the other two included *Melittobia digitata.* Also, two of the cultures included blowfly pupae and two included orchard bee pupae. The life cycle of the *Melittobia* species ranges from 14-21 days therefore efficient reproduction is vital in cultures. The objective of this investigation is to test whether a change in host affects the number of *Melittobia digitata* and/or *Melittobia australica* offspring produced. It is hypothesized that the number of offspring of *Melittobia digitata* and/or *Melittobia australica* will be different for each host. Understanding the reproductive processes of *Melittobia* are essential for a better understanding of the biology of the unique species, *Melittobia digitata* and *Melittobia australica.*

***Daniella Azoulay***

**A Bioinformatic Approach to Visualizing and Identifying Conserved Cardiac Developmental Networks**

Heart malformations occurring during embryonic development account for roughly 30% of all birth defect related deaths. The purpose of this research was to generate a greater amount of information about genetic regulatory interactions that cause the development of the heart in the sea squirt (*Ciona intestinalis*) and the mouse (*Mus musculus*). Another goal of this research was to identify the conserved development between Ciona and mouse. This research will be useful in helping elucidate the genetic regulatory interactions for heart development in humans. These gene interactions remain unknown and are the cause of several life-threatening heart defects. In this study two networks were identified using a multitude of bioinformatics tools and databases such as cytoscape, Cfinder, DAVID gene ID converter, Ensembl, and inferelator. Initially, it was necessary that regulatory interactions, gene identifiers, and expression profiles be created. Second, this data was utilized to create visualizations of the networks, which were then analyzed using a Clique Percolation Method (CPM) algorithm. Transcription factors were found to be the key of their respective clusters in each network. These included FUNDC1/FUNDC2, Mbtd1/L3MBTL2, KH.l170.84, and Invs/Kng1/Kng2 for *Ciona intestinalis* as well as Klf12, MITF, hoxb5, and Klf16 in *Mus musculus*. It was found that these transcription factors regulated 12 or more genes. Results also illustrate that there is an overlap between the networks in *Ciona intestinalis* and *Mus musculus*, indicating that a significant amount of the process of embryonic heart development is conserved between these two species. The conclusions drawn from this research may be applied to humans due to the similarity of embryonic heart development and cardiac (B7.5) cell migration between Ciona and human.

***Stephanie Badir***

**New York State School Nurses' Comfort and Knowledge Caring for Students With Diabetes Mellitus: A Cross Sectional Study**

Diabetes Mellitus is an autoimmune disease that affects 1 in every 400 to 500 children in the United States. A school nurse would be expected to encounter diabetic students during the course of the day. School nurses’ familiarity on how to handle students with diabetes is an important concern. With quickly improving diabetes technology, the question arises; do nurses have the experience and exposure to the new advancements for treating diabetes? If not, what are the best ways to convey new information about new modes of diabetes treatment to nurses? To investigate these issues I administered an online survey through the New York State Association of School Nurses (NYSASN) website to nurses all over New York State. Prior, the protocol for the investigation was Institutional Review Board (IRB) approved. The results of this survey determine the types of care and treatment that nurses give to their diabetic students, as well as find out how nurses typically find out about new diabetes technology. One hundred and seventy surveys were completed within a six week time period from a population of over 700 NYSASN members. Looking at the data, it was noted that most nurses lacked knowledge on some practice techniques and were least comfortable when dealing with insulin pumps and continuous glucose monitors (CGMs). This gives rise to the idea of establishing more educational resources for school nurses on devices such as pumps and CGMs. Furthermore, nurses preferred local conferences as their preferred way of learning.

***Anthony Bisulco***

**The Development of a Practical Notification System to Identify**

**Solar Disturbances**

Solar flares, which are the sudden release of high-energy particles from the sun, are a threat to our vital communication and power networks because they have the ability to disable these systems. In this investigation a method to minimize this threat was developed and evaluated. The central aspect of this method was creating a solar flare early detection system based on identifying the characteristics of a solar flare through its effect on Very Low Frequency (VLF) radio signal propagation. When a solar flare hits the ionosphere it increases the reflectivity of the D layer of the ionosphere. This causes the Very Low Frequency (VLF) waves that propagate through the atmosphere to lose less energy than what would normally be expected. Therefore, a high amplitude VLF signal could indicate a solar flare. The detection and warning system consisted of constructing and using a loop antenna that detects the VLF waves, a preamplifier and sound card, and MATLAB R a software program used for writing the code that processes the signal and identifies the potential solar flare. A smart phone application has been written and implemented to deliver the information about a potentially disruptive solar flare to various communication devices.

***Christina Cabana***

**The Use of Genetic Spike-in Controls to Quantify Absolute Population Abundances**

**In the Bacterial Microbiome**

Various systems of the human body, including but not limited to the digestive, excretive, and immune systems, work in conjunction with myriad bacterial organisms in order to regulate homeostasis and effectively complete bodily processes. Changes in this “microbiome” have been linked to disease states such as gastric cancer and obesity. Current methodology to characterize inter-subject differences is termed high-throughput sequencing (HTS) and involves random sampling of large genomic datasets. This method results in the creation of relative population abundances based on taxonomy. Alarmingly, this method has been continual proven flawed in that sampling is biased (toward longer sequence length and higher GC content) and that the calculation of relative abundances assumes that abundances sum to one, a heinous misconception in J-trend bacterial populations. In order to obtain absolute population abundances, an exogenous internal synthetic construct was designed to be cloned using the Promega pGEMT-easy vector system and spiked into collected samples at three levels. At this point, HTS can be run on the samples and absolute abundances for each bacterial sequence can be determined based on the known quantity of spike-in. HTS and QIIME analysis of abundance data was performed prior to the addition of spike-in as well. After using NCBI-Blast to identify five primer sets for six potential spike-ins which were expected to amplify in HTS with the same efficiency as target bacterial sequences, one optimal primer set was chosen and PCR experiments were performed. Primer sets which amplified DNA from samples were exiled from further experimentation. At the conclusion of experimentation, four sequences and primer sets were identified. Future experimentation will help researchers make more accurate inter and intra subject comparisons and hence better identify disease state genotypes in the gut microbiome.

***Justin Cheung***

**Gold Nanoparticles: Efficient Synthesis of Catalytically Active Nanoparticles using a One-Pot Method**

Gold nanoparticles have recently come to prominence due to increased demand for nanoscale technologies. Just as differently shaped proteins have different functions, nanoparticles of different shapes have unique capabilities. Current methods for nanoparticle shape control require time intensive multi-step procedures. In this study, a single-step, one-pot approach to gold nanoparticle synthesis is developed using poly(glycidyl methacrylate) (PGMA) microspheres as the novel reductant in the synthesis process. PGMA’s reactive functional groups and slow reducing capabilities made it a promising method for single step nanoparticle synthesis. Two reaction parameters (HAuCl4 concentration and reaction temperature ) were optimized for the one-pot PGMA induced gold nanoparticle synthesis (1mM, 90°C-110°C). Transmission electron microscopy and UV-VIS spectroscopy conducted on timed extractions of the PGMA/gold nanoparticle solutions showed evidence of morphological evolution (aggregations → mixture of non-spherical shapes → spheres) and increased particle size over time. Catalysis tests on the nanoparticles found that aggregates and spherical particles had the strongest catalytic properties. These results demonstrate the effectiveness of PGMA as a reductant in the one-pot synthesis of catalytically active gold nanoparticles. Furthermore, this synthesis process takes 1/3 to 1/15 of the time of conventional multistep procedures for the synthesis of gold nanoparticles. The effectiveness of PGMA in this study, along with the speed of the one-pot process enables more efficient synthesis of gold nanoparticles, with the potential to help facilitate their production and implementation in emerging industrial and medical applications such as drug delivery, biodetection, catalysis, and environmental engineering.

***Diana Hagedorn***

**An Investigation of the Effects of Variable Diets in *Drosophila melanogaster***

Over one hundred years of innovative experimentation with the “common fruit fly” or *Drosophila melanogaster*, has earned this organism a place at the forefront of our modern day scientific research. *Drosophila* has emerged as a valuable model organism in the study of both genetically linked, and environmentally induced diseases, such as obesity, and diabetes. Seventy eight percent of American families purchase organic foods. This percentage is expected to rise in the future, as consumers are becoming increasingly aware of the many health benefits that organic foods yield. My plan was to determine the effects of these organic fruit in *Drosophila melanogaster*, or the common fruit fly. Although phenotypically, fruit flies seem to be completely unrelated to humans, certain cellular processes, genes, and signaling pathways, are actually similar between the two organisms. In addition, these flies are capable of performing advanced motor behaviors such as walking, climbing, and flying. Their brain and body movement is complex enough to make these behaviors applicable to humans. The purpose of this study was to determine if differences are present in the Behavior between Wildtype *Drosophila melanogaster,* after being fed variable diets. I hypothesized that if healthy wildtype *Drosophila melanogaster* are all exposed to the same environmental surroundings, the group(s) being fed organic foods will perform better, and move faster in completing the assays, than the group being fed conventional fly food. To carry out this study and observe the behavior of the flies, I have utilized a series of three different assays to carry out my experiments, consisting of tests of vertical movement, travelling to a food source, and a phototaxic T-Maze. Results show that groups being fed organic diets were more successful in completing the assays.

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***Hugh Han***

**The Effects of El Niño-Southern Oscillation on Precipitation Fluctuation and Extremities in**

**Terrestrial Biomes from 1948-2011, Inclusive**

The effects of El Niño and La Niña, warming and cooling phases of the El Niño-Southern Oscillation (ENSO) phenomenon, have been correlated with both extreme precipitation and drought in different regions of the world. The purpose of this study was to compare the precipitation fluctuation within eight (8) terrestrial biomes over time and during all El Niño and La Niña phases between 1948 and 2011. Gridded 0.5° × 0.5° resolution datasets of precipitation were retrieved from the Global Historical Climatology Network (GHCN) and Climate Anomaly Monitoring System (CAMS) and analyzed using algorithms written with MATLAB. By using high-resolution gridded datasets from the last century, the mean monthly and annual precipitation values within each specific biome can be measured. Results showed that the direction of precipitation fluctuation during El Niño phases is opposite of that during La Niña phases in every single biome that was analyzed. Furthermore, El Niño years were correlated to a 3.39% decrease of precipitation in tropical rainforests (p = 0.034) and a 4.52% increase of precipitation in woodlands and shrublands (p = 0.013) from their respective long term means. La Niña years, in contrast, were correlated to a 3.95% increase of precipitation in tropical rainforests (p = 0.029) and a 3.89% decrease of precipitation in woodlands and shrublands (p = 0.041). In addition, La Niña caused subtropical deserts to experience precipitation 5.59% (p = 0.047) higher than its long term mean and all terrestrial biomes on average to experience precipitation 2.64% (p = 0.019) higher than their long term means.

***Greta Huang***

**Synthesis and Testing of a Targeted Drug-Delivery System:**

**The Effects of Surface Coatings on the Drug Delivery Capacity Of Oxidized Graphene Nanoribbons**

Cryptococcosis, caused by the fungal pathogen *Cryptococcus neoformans* (*Cn*)*,* is a fatal disease afflicting over 10% of HIV patients. Current antifungal therapies are not effective, with Sub-Saharan mortality rates exceeding 50%. Recently, a novel drug, BHBM (N’–(3-bromo-4-hydroxybenzylidene)-2-methylbenzohydrazide) has been found to be effective in Cryptococcosis treatment. This study aimed to create BHBM drug delivery agents for treatment of Cryptococcosis. Gold nanoparticles (AuNPs), synthesized using the Turkevich method, were found to be ~16±2nm. 6-Mercaptohexanoic Acid was used as a linker to attach BHBM to AuNPs. AuNPs, BHBM grafted AuNPs, and BHBM were tested in vitro on J774A.1 macrophage-like *Cn* infected cells against an infected control. Results indicated AuNP treated cells had lower *Cn* infectivity than controls, suggesting an AuNP role in the reduction of *Cn* internalization. BHBM’s interaction with the cellular membrane led to nanoparticulate ring formation in BHBM grafted AuNP treated samples, amplifying AuNP *Cn* internalization reduction and resulting in even lower *Cn* infectivity rates. Samples treated with BHBM alone did not noticeably reduce infectivity, demonstrating that the drug alone is unable to penetrate the plasma membrane as effectively as when bound to AuNP vehicles. Future work includes in vivo trials and optimizing drug release.

***Sarah LaMorte***

**Creating a Method for the Detection and Identification of the Unknown Compounds in Resveratol**

With the Food and Drug Administration creating more regulations for the production of supplements, Pharmaceutical companies must now enact stricter procedures when it comes to testing supplements for levels of nutrients. It has been seen in numerous cases that supplements contain ingredients and compounds that can be harmful when ingested, causing people to have adverse reactions. When a supplement is produced, it must be tested before it can be shipped to ensure that the quality of the product is consistent. In addition, it is also tested the presence of heavy metals and other elemental impurities, the acceptable amounts standardized by the US Pharmacopeial Convention. For Quercetin there should be no heavy metals detected and the amount of Vitamin B and D should be no less than .027 and no more than 0.042 (USP, 2013). For Resveratol, there should be no heavy metal detection and the amount of Vitamin B12 should be between 0.31 and .047 (USP, 2013). An HPLC is a chromatographic technique used to separate the components in a mixture, to identify each component, and to quantify each component. To separate these components, the sample is run through a column full of chromatographic packing material. Every element had its own column used to detect it in a mixture. The purpose of this study is to create a standard method for the detection of unknown compounds in Quercetin and Resveratol, and from there, identify the unknown compounds all using a high performance liquid chromatographer. Samples of both supplements were made by dissolving 25 mg of each into 100 ml methanol, diluting 10 ml in 100 ml of methanol and sonication for 10 minutes to ensure all particles were dissolved. The samples were run through HPLC columns that were not normally used to expose any impurities (unknown compounds) in the drug. By comparing chromatograms of the unknown compounds in the sample to the chromatograms of possible compounds that could form in the sample, the unknowns were detected.

***Samuel Luber***

**When is the Cheapest Time to Buy an American Airlines ticket?**

One of the major factors to purchasing an airline ticket is its price. On a given flight, nearly all of the passengers have paid different prices for their seats, and it was studied to determine when is the best time to buy an airplane ticket. Traveling via commercial airlines has been around since 1914; however, after World War Two, the commercial airline industry expanded exponentially. One of the major policies that has helped develop the growth of the industry is the “loss leader” policy. According to Borenstein, airline ticket prices have fallen between 1995 and 2004 as a result of an increase in aircraft space and competition, as well as a decrease in hub premiums. Throughout this study, nonstop round-trip prices from American Airlines’ flight routes from JFK to Miami, San Juan, London, Los Angeles, and Milan were recorded for various dates. December 06, 2013 to December 09, 2013 was chosen to represent a date in which air traffic is not too busy. February 14, 2014 to February 21, 2014 was chosen to represent a “blackout” date in which air traffic is considered high. Finally, April 9 to April 16 was chosen to represent another “blackout” date. The mean and the moving average of the round-trip prices were calculated. The information here is essential in order to determine when the best time to buy an airline ticket in terms of the cheapest price is. Millions of Americans travel each year via commercial airlines, and it will be beneficial to the consumers to purchase their tickets at a cheaper price.

***Marisa Mathew***

**Transcriptional Regulation of miRNA**

The purpose of this study was to explore the transcription factors (TFs) that regulate miR164 expression and test the conservation of TFs from Arabidopsis thaliana and Zea mays that can regulate miR164 expression. Only limited Zea mays transcription factors are used because the maize transcription factor library is small. Zea mays is an important model organism for studies in plant genetics, physiology, and development and microRNAs (miRNAs) are small non-coding RNAs that function in transcriptional and post transcriptional regulation of gene expression and influence plant behavior. For example, the promoter, miR164, is involved in root development and aging. In order to conduct the experiment, the promoter miR164 was screened using the Yeast 1 Hybrid method. In this protocol, the interaction between the promoter and transcription factor was found by in vivo reconstitution of a transcriptional activator, which signaled the expression of a reporter gene. If a positive reaction was present, LacZ reporter would turn blue. Results suggest that for miR164 there is some conservation between Zea mays and Arabidopsis thaliana. It was found that 8 maize TFs can bind to the promoter same as their Arabidopsis orthologs. This investigation is important because miRNA has an important role in the plants development and interactions with the environment. Discovering Levels of conservation between Zea mays and Arabidopsis thaliana can allow agriculturists to allow farmers to grow their crops in effective ways.

***Chimdindu Obinero***

**A Study of the Effect of Various Therapeutic Substances on the Neurophysiological Capabilities Of *Drosophila melanogaster* models of Alzheimer’s disease**

Alzheimer’s disease (AD) is a disease that affects one in eight seniors in America. Current research suggests that AD is caused by an abnormal accumulation of amyloid beta (Aβ) and tau proteins in the brain. A mutation in the amyloid beta precursor protein (APP) can trigger this abnormal buildup of proteins in the brain. For this experiment, a *Drosophila melanogaster* stock with a mutated APP gene expressed was obtained by using the GAL4/UAS system, where the GAL4 protein binds to the Upstream Activation Sequence (an enhancer), which then activates gene transcription of the APP gene. The flies then began to express Alzheimer’s-like behavior. This project was designed to test the effects of the chemical curcumin (present in the turmeric spice) and G*inkgo biloba* plant extract on the AD fly models. First, the wild-type and AD flies’ locomotion, coordination, speed, and responses to stimuli were tested using two assays: upward flight assay with a light source and a light/dark T-maze assay (tests reasoning and response to light stimuli). Following the initial tests, the turmeric spice was mixed into the wild-type flies’ food and the flies went through the same assays again. Finally, the flies’ performances on the assays before and after ingesting curcumin were analyzed. The results indicate that 1) wild type flies respond differently in the assays that AD flies, and 2) both curcumin and ginkgo had a positive effect on AD flies. Although there is insufficient evidence to assess the scope of the effect of curcumin, the results demonstrate the effectiveness of the GAL4/UAS system to replicate human disease in *Drosophila melanogaster*, and imply a positive correlation between curcumin/ginkgo and improved neurophysiological capabilities in AD flies as determined by locomotion/light stimuli response assays.

***Claire Regan***

**The Relationship between the APP Mutation in Alzheimer’s Disease and Ethnic and Geographic Factors.**

The objective of this study was to investigate the importance of genetic causes in comparison to that of non-genetic causes in Alzheimer’s Disease (AD). Mutations of the APP gene, a gene that produces a protein associated with AD, were used to indicate a genetic cause of AD. Statistics of AD from different geographic and ethnic groups were used to find the rate of AD in different populations. It was hypothesized that rates of APP mutations would be similar to the rates of AD in the ethnic and geographic groups. Similar rates indicate APP mutations play a stronger role in the development of AD. Different rates indicate non-genetic causes, such as drug use, geographic location and other environmental factors may be more influential than genetic causes. The APP gene codes for a protein containing the beta-amyloid peptide (Aβ). The buildup of plaques of Aβ in the brain is used for the posthumous diagnosis of AD. Mutations to APP can result in Aβ plaques. Mutations rates were found by analyzing data collected in the 1000 Genome Database. Global, publically available Alzheimer’s datasets were used to obtain statistics related to the rates of the disease among people of different ethnic groups in various geographic locations. Results did not support the hypothesis. When plotted on a graph the R2 value was .20 suggesting the impact of non-genetic causes is larger than that of genetic causes.

***Tracey Rosenlicht***

**Effects of Colored Overlays on Computer Vision Syndrome (CVS):**

**A Comparative Study Through Different** **Interfaces**

The increasing use of computer monitors, smartphones, and electronic book readers have altered the traditional way people observe the printed word. Small screens and fonts require positions at a closer viewing distance than had previously been adopted for hard copy printed materials, such as books and newspapers. Up to 90% of computer users experience the effects of Computer Vision Syndrome (CVS), which are visual symptoms including eyestrain, headaches, and dry eye (Bali 2007). The purpose of this project was to examine the effect of Irlen Spectral Filters on CVS. Fifteen volunteers were tested to determine if the filters reduced symptoms of CVS, by reading aloud jumbled words from a LCD lit desktop screen, sitting 50 cm, to induce CVS, for ten minutes continuously while their voices were recorded (this year, last year they read from a desk top computer). To determine how many mistakes were made per minute, and per trial. Proceeding was a placebo trial, and then the actual overlay. They chose either a green, magenta, yellow, or orange overlay. A questionnaire was distributed to the volunteers preceding every trial, to determine on a scale from 0-10 the severity of their symptoms relating to CVS. Results from using the desktop computer; filters reduced the symptoms of computer vision (at an average of 19.00%). Volunteers who were prescribed by a doctor to wear corrective lenses benefited by 40.00% from using the filters, and volunteers who were not prescribed by a doctor to wear corrective lenses benefited by 5.00% from using the filters. Results from Cellular Telephone (I-Phone 5)- filters reduced the symptoms of computer vision (at an average of 8.01%). Volunteers who were prescribed by a doctor to wear corrective lenses benefited by 22.60% from using the filters, and volunteers who were not prescribed by a doctor to wear corrective lenses benefited by 2.74% from using the filters.

***Zachary Shushan***

**Does a Change in Host Affect the Number of *Melittobia digitata* and/or**

***Melittobia australica* Offspring Produced?**

The purpose of this investigation was to determine whether a change in host affects the number of Melittobia digitata and/or Melittobia australica offspring produced. Also known as “Wow bugs”, Melittobia digitata are parasitic wasps mainly found in south-eastern U.S. Melittobia australica are parasitic wasps which originated in Australia, and can be found in parts of the U.S. and Mexico. One interesting attribute to both of these species is that they can reproduce asexually and sexually. The type of asexual reproduction they use is called parthenogenesis, in which embryos develop without fertilization occurring. Other attributes include vestigial wings and harmless stingers. To determine whether host change has an effect on Melittobia digitata and/or Melittobia australica, four different types of cultures were made. Two of the culture types included Melittobia australica and the other two included Melittobia digitata. Also, two of the cultures included blowfly pupae and two included orchard bee pupae. The life cycle of the Melittobia species ranges from 14-21 days therefore efficient reproduction is vital in cultures. The objective of this investigation is to test whether a change in host affects the number of Melittobia digitata and/or Melittobia australica offspring produced. It is hypothesized that the number of offspring of Melittobia digitata and/or Melittobia australica will be different for each host. Understanding the reproductive processes of Melittobia are essential for a better understanding of the biology of the unique species, Melittobia digitata and Melittobia australica.

***Rakia Syed***

**The Correlation between Technology Use and Self-Perceived Happiness**

The purpose of this study is to investigate levels of self-perceived happiness and technology use and determine whether there is a correlation between the two factors. Technology has become more prominent in the world. The less personal interaction there is, oftentimes the people aren’t as happy as they could be if there was more personal interaction (Janssen et al., 2014). It is hypothesized that the more technology is used by students, the lower the levels of happiness the students will report. The technology survey used to assess the population is called the Student Technology Survey, or the STS, which was intended for students, using a Likert-scale that assesses the different types of ways technology is used, whether it be academically, recreationally, or otherwise. The Oxford Happiness Inventory, or the OHI, assesses the levels of happiness of a person in different situations. This study can create an assessment of the general technology use and happiness levels of the teenagers at Commack High School. The population of the survey was 108 people. The data was separated into groups of low, medium and high levels of happiness, with scores of low from 2.2-3.2, medium 3.3-4.2 and high of 4.3-5.3. the data was then analyzed with different levels of the use of technology. The lowest level of technology use was reported to be checking a phone infrequently, and the use of computers for schoolwork only, the high level of technology use was using smartphones multiple times a day and computer use for work and recreation. The lowest level of happiness was the most significant with the highest use of technology. The study can lead to conclusions made about people, personal/face-to-face interactions, or even public school institutions

***Noah Tollin***

**Dispersal of Resistant Bacteria (Escherichia coli K-12) among German Cockroaches (Blattella germanica)**

The purpose of this study was to examine the spread of Escherichia coli K-12 among German Cockroaches. Cockroaches are known vectors for disease. They can carry diseases such as Salmonella, and bacteria such as Staphylococcus, and Streptococcus. They can also carry antibiotic resistant bacteria from one location to another. Antibiotic resistant bacteria are a major health concern because the antibiotic resistant pathogenic bacteria cannot be controlled with known antibiotics. The objective of this study was to explore if cockroaches can spread resistant bacteria. In this study, cockroaches were exposed to genetically modified E. coli that is resistant to the antibiotic Kanamycin and have the ß-Galactosidase gene. This allowed for the bacteria to be traced on an X-gal and kanamycin agar plate if the bacteria were carried by a cockroach either on its body or through its feces. Any feces or bacteria on a cockroach containing the genetically modified E. coli on an agar plate will grow and appear blue. I hypothesized that if a cockroach is exposed to bacteria, then the bacteria will be spread from one cockroach to another through their bodies or via feces that they eat. The results supported the hypothesis. The bacteria, found in the feces, remained in the cockroaches for approximately 6 days, and were able to spread from one cockroach to another.

***James Whittaker***

**Modeling an Energy Efficient House Influenced by a Natural Design**

The purpose of this investigation was to examine the design of termite mounds and observe if their structure was suitable for use in the design of residential housing for human habitation. Many species of termites build well laid out, intricate series of tunnels and tubes as part of their mounds in order to passively thermo regulate what would be an otherwise unlivable habitat. The termites utilize a heat sink that allows cool air to cycle through their environment naturally. This concept could be applied to man-made structures as a supplement, if not the source of cooling for residential homes. This concept of modeling after nature, biomimicry, is of great interest because of the potential money and energy savings that come with it. The building modeling software, Google SketchUp and energy modeling software, VE-Toolkit were used in conjunction to model and test various building types in the investigation. A control house, representing a form and size of a typical, simple 'cookie-cutter' American home as well as a termite inspired domicile was created with the software. The control house was tested for energy efficiency in various hypothetical geographic locations and compared to the Termite house.. The results of the control house show that energy output of the building itself ranges yearly from 159.4 MBtu to 234.1 MBtu, based upon location. These energy outputs equal a range from 36 to 54 kBtu per square foot every year. The termite inspired design yielded energy outputs significantly lower; 7.6 to 11.9 kBtu per square foot and 32.9 to 52.3 MBtu in total. The average American household uses 44kBtu per square foot. Based upon these results, it can be concluded that the natural design was more efficient and promises a bright future for it.

***Joshua Zweig***

**Classification of Abnormalities in 3-Dimensional Mammograms via an Artificial Neural Network**

Mammograms are the most popular method of early detection for breast cancer, the 3rd leading cause of death among women in the United States. In the United States, about 37 million mammographic images are performed every year, which makes mammography a $2 billion per year industry. Despite the popularity of mammograms, radiologists diagnose 20% of all mammograms as false negatives. This creates the clear need for a robust system to both detect abnormalities (potential tumors) in mammograms and diagnose these abnormalities. This investigation sought to achieve just that by isolating abnormalities and determining the magnitude of the presence of certain features, such as average gray-level and sphericity. These calculated values were then passed into a backpropagation artificial neural network with a 2 node output layer from which a diagnosis was obtained. This approach resulted in 94% of mammograms being correctly diagnosed.

**Underclassmen**

***Jung Soo Ahn, Juliana Sikorski***

**A Spatial and Temporal Analysis Changed the Vocalization of the American Crow (Corvus Brachyrhnchose)**

The purpose of this study was to investigate if the vocalization of the American Crow (Corvus Brachyrhnchose) will differ in different geographic locations and over historical time. Studies have shown that bird calls change over time. The motivation for this study was to gain knowledge of the bird vocalization we hear everyday and to understand how the vocalization of American Crow changes due to spatial and temporal changes. American Crows use calls to defend their territory and as warning signs to protect themselves from predators. We hypothesized that the vocalization of American Crow will change over period of time, and their sound will also be different in different geographic locations (for example, rural v. suburban areas). To carry out this study we listened to bird vocalization from different locations and times by using Internet sites that store bird call databases. Results thus far showed that over time the length of the calls increased and the calls different as the geographical location changes.

***Ryo Ashida, Johann Yang***

**The Effect of Chewing Gum on the Completion of a Finger Maze**

The purpose of this study was to find out how chewing gum affects the ability of a person to efficiently complete a finger maze. The finger maze is a maze in which a blindfolded person uses a finger to feel their way along a path made of rough sandpaper. Based on previous studies, scientists have found that chewing gum increases one’s concentration and scores on tests, such as the SATs. We inferred that the same effect will occur when a participant chews gum while completing a finger maze. We hypothesized that chewing gum will have a positive effect on a participant’s ability to complete a finger maze. This will result in the experimental group (participants who chew gum during the completion of the maze), having shorter completion time and fewer mistakes compared to those in the control group (participants who complete the maze without gum). All participants were given the necessary consent forms prior taking the test. The results showed differences between those participants chewing gum and those not chewing gum during the completion of the maze. Our results showed that gum positively affected the subject’s completion of a finger maze, there were 13% fewer mistakes and a 26% shorter completion time for participants who chewed gum compared to those who did not chew gum. This data supports our hypothesis; gum can be a useful tool for students and adults when completing tasks that require focus, speed, and concentration.

***Rachel Aitchison***

**A Comparison of Beach Refuse Between the North and South Shore of**

**Long Island, New York**

Pollution of the world’s beaches and oceans has become an increasing problem over recent years. Refuse is not only a threat to coastal wildlife, it is also a threat to the human population. Many refuse items are incapable of decomposing completely in the watery environments of coastal areas due to their chemical makeup and properties. The purpose of this investigation is to determine the amount of refuse left on local beaches. To carry out this study, two beaches were visited, one on the north shore and one on the south shore, and all types of refuse found in an area encompassing 100 by 100 feet were collected, recorded, and massed. The most common type of refuse found on the north and south shore was plastic, both by mass and by the number of items found in each sampling area. This is due to the fact that plastic is the most common product due to its durability and it is often discarded by beachgoers. Also, each beach contained the same types of refuse including rubber, glass, metal, and paper products. Thus far it has been found in the area that I sampled, the north shore contains more refuse than the south shore. This data supports the hypothesis that the north shore will contain more refuse than the south shore. The data is important because it can be used to indicate where more cleaning efforts are needed to keep the environment and general population safe and potentially determine the source of this waste.

***Jason Bak, Colleen Flynn, Daniel Hosseinian***

**An Investigative Analysis of the Accuracy of the Encased Thermometer Used Aboard the HMS Plover Between the Years 1852-1854**

The purpose of this investigation was to determine the extent to which the replica thermometer case affects the temperature readings recorded by a thermometer used aboard the HMS Plover (1852-1854). The crew of the HMS Plover recorded an extensive series of air temperature measurements between 1852 and 1854 in Barrow, Alaska. These data offer a possible historical perspective on arctic climate which can be used to increase the understanding of climate change in the arctic region. The thermometer the crew used to record these air temperatures was encapsulated in a thermometer screen which may have led to the air temperature measurements to become inaccurate due to the thermometer being sheltered from the direct environment. To determine the extent of the inaccuracy of the sheltered thermometer, we replicated the thermometer screen based on the description provided by the HMS Plover’s surgeon. The replica was outfitted with standard electronic meteorological equipment including a thermometer and deployed to the NOAA Barrow Observatory in Point Barrow, Alaska in July 2011. By comparing the temperature readings from the encased thermometer with those of the exposed one, it has been concluded with confidence that actual temperature, air pressure, and air speed each affect the encased thermometer’s readings differently. Lower actual temperatures, higher barometric pressures, and lower wind speeds increase the inaccuracy of the encased thermometer. With the findings of this investigation, future research of climate change, in which the climates of two periods of time are compared, can be modified appropriately by taking into account the inaccuracies of these readings at certain weather conditions

***Eric Bass, Gabriel Green***

**The Effects of Environmental and Seasonal Changes on the Diel Vertical Migration of Zooplankton**

Various factors affect the diel vertical migration of zooplankton, including light, presence of predators, endogenous rhythm, and others. Seasonal change is the primary variable influencing the migration of zooplankton. Acoustic profilers operated by Ocean Networks Canada’s Venus Observatory were used to produce graphical representations of the migration of zooplankton at two different locations off the coast of southern British Columbia, Canada. Using these graphical images, the time of day when the zooplankton ascend and descend were measured with a program called Image-J. These times were measured and recorded for each day in 2010 for both locations. The seasonal variation of these times were analyses and compared for the two locations. The daily ascent and descent times as well as the seasonal migration patterns were found to be largely similar between the two locations.

***Nicholas Biancaniello, Justin Tollin***

***Foraging Competition among Asian Shore Crabs (Hemigrapsus sanguineus)***

This investigation is to study the different genders and sizes of Asian shore crabs interacting with each other, competing for food. These species of crabs are invasive, or tend to spread prolifically and undesirably or harmfully. One competition after another we started collecting data. A competition in this case is a fight to see which crab will dominate the other in order to achieve the food. Interactions were videotaped for twenty minutes, and data was collected for observing the crab behavior during that time. Thus far we noticed the larger male seems to be out competing his opponent for food. The smaller crab tends to climb on the larger crabs back. This is a helpful technique used by the small crab because once the large crab notices the situation; the small could make his move for the food. Eventually the large crabs will either get the food or knock the smaller one off his back and then he will achieve the food. The competitions observed seem to pair crabs based on size and gender, where a small male competed against a small Female and the large male versus the large female. This experiment will better allow us to understand crab behavior.

***Joe Biondo, Daniel Jung***

**An Investigation of the Antifungal and Antibacterial Properties of *Aloe barbadensis***

This project was an investigation of the antifungal properties of *Aloe barbadensis. Aloe barbadensis,* commonly referred to as Aloe vera, is a succulent plant found in cultivation throughout hot climates, such as Mexico, the southern United States, and all of Africa. *Aloe barbadensis* is commonly used in skin care products because its pH is close to that of human skin. Another use is as a dietary supplement, mainly to cleanse the digestive system. Currently, bleach, composed of mostly water and sodium hypochlorite, is the most common fungal and bacterial cleaner. Bleach is highly corrosive, which is why a less offensive alternative is needed. *Aloe barbadensis* is readily available, inexpensive, and nearly harmless to humans. *Aloe barbadensis* has been used to eliminate bacteria and promote the growth of healthy new cells. We hypothesized that *Aloe barbadensis* would have antifungal and antibacterial properties, because of its six different antiseptics in it, that kill bacteria, viruses, and some fungi. In this investigation two different types of extracts were used: *Aloe barbadensis* stalks cut directly from the plant and *Aloe barbadensis* already extracted from the plant with 99.5% *Aloe barbadensis* purity which can be found commercially. The two types of *Aloe barbadensis* were then applied to the fungus *Rhohotorula rubra* and the bacteria *E. coli*. The prevention of the growth of the bacteria and fungi was measured using the zone of inhibition. Our data has shown that commercially available *Aloe barbadensis* has inhibited the growth of fungi, with an average zone of inhibition of 1.7 cm. The use of *Aloe barbadensis* on mycelium growth has been very consistent in all aspects of inhibition.

***Allyson Britt, Sara Kurten, Caitlin Passaro***

**The Effect of St. John’s Wort on the Mating and Behavior of Brine Shrimp (Artemia salina)**

The purpose of this experiment was to determine whether or not St. John’s Wort had an effect on the normal mating behavior of brine shrimp, Artemia salina. As more people are taking medication such as anti-depressants, the quantity of these chemicals excreted by humans urinating is resulting in St. John’s Wort going into our water system and then into the habitat of aquatic organisms. This exposure to chemicals can negatively affect a species’ reproductive abilities. Brine shrimp reproduce both sexually and asexually. The asexual reproduction process is called parthenogenesis, which occurs when there is an absence of males who do not fertilize eggs. This process often results in only females. Also, the cysts typically have thinner shells than those created from sexual reproduction. The production of the cysts with sperm, however, is a form of sexual reproduction and allows the brine shrimp to flourish due to genetic variability. It has been found that small amounts of Prozac have been causing mussels and clams to discharge their sperm and eggs prematurely, causing a decrease in the number of their offspring. We hypothesized that the effect of St. John’s Wort on brine shrimp, Artemia, adults would cause them to have irregular mating behavior. To carry out this study, adult brine shrimp were exposed to a 2% solution of St. John’s Wort. Then, we observed the mating process and the results were found using geotaxic and phototaxtic tests. Mating processes and success rates were compared against a control group of brine shrimp that had not previously been exposed to St. John’s Wort. After completing our experiments, we found that the mating behavior of Artemia was affected by St. John’s Wort. In the presence of St. John’s Wort some mating pairs uncoupled and their phototaxic and geotaxis behaviors were negatively affected.

***Nicholas Bunnell, James Dolan***

**A Search for Bacteria that Will Degrade Motor Oil**

The purpose of this study was to find bacteria that are capable of degrading motor oil. Oil-based pollutants are a major source of pollution in the modern world, with most of it coming from burned gasoline and motor oil from vehicles such as cars. These waste oils can leech into the ground and pollute potentially useful groundwater by introducing poisonous hydrocarbons. Certain bacteria, such as Alcanivorax borkumensis, a bacteria commonly found in oil-rich areas, have been found to be very useful in cleaning up oil spills. These bacteria were used to clean up the Gulf of Mexico Oil Spill in 2010. However, bacteria have not been found to degrade motor oil. We hypothesized that bacteria found in soil in a suburban area on Long Island. NY soil will be able to degrade motor oil because the soil is located with heavy traffic and it may contain bacteria that might degrade motor oil. To carry out this study, we took soil samples from various locations in Commack, NY. We then placed the bacteria in petri dishes with different concentrations of oil to see if the samples would grow, which would mean the bacteria found in the Long Island soil samples would be able to survive in oil and perhaps degrade the oil. Our results showed that Commack bacteria can survive and grow in motor oil. This supports our hypothesis.

***Katelyn Carone, Maya Glaser-Kshensky***

**The Tendency of *D. Melanogaster* to Oviposit on Food Laden with Ethanol.**

The purpose of this investigation was to determine if the offspring of *D. melanogaster* oviposited in ethanol were more likely to oviposit on food containing a concentration of ethanol rather than food without it. It was hypothesized that fruit flies hatched in ethanol would tend to lay their eggs in food with ethanol. *D. melanogaster* is often used as a model organism in laboratory studies. This is because fruit flies are easy to work with and reproduce very quickly. In nature, studies found that some fruit flies oviposit their eggs on fermenting fruit. The fermentation in the fruit creates ethanol, which deters predators, such as wasps. In this study, the fruit flies, hatched in normal culture, were first given a choice of either food with ethanol, or normal food. Our data determined that in this control trial, as expected, most of the flies oviposited on the food without ethanol. Thus far, in the experimental trials, fruit flies developed in ethanol tend to lay more eggs on food with ethanol then without. In addition, flies born from parents also born in ethanol have a tendency to lay more eggs on food with ethanol. It was also found that *D. melanogaster* developed in alcohol took a significantly longer time to mature into adult fruit flies than the time it took for flies oviposited in normal ethanol. This experiment’s applications could serve a model to understanding human tendencies in concern of alcohol and what kind of “home” their offsprings will be born into.

***Ryan Chan, Chimdindu Obinero***

**A Study of the Effect of Various Therapeutic Substances on the Neurophysiological Capabilities Of *Drosophila melanogaster* models of Alzheimer’s disease**

Alzheimer’s disease (AD) is a disease that affects one in eight seniors in America. Current research suggests that AD is caused by an abnormal accumulation of amyloid beta (Aβ) and tau proteins in the brain. A mutation in the amyloid beta precursor protein (APP) can trigger this abnormal buildup of proteins in the brain. For this experiment, a *Drosophila melanogaster* stock with a mutated APP gene expressed was obtained by using the GAL4/UAS system, where the GAL4 protein binds to the Upstream Activation Sequence (an enhancer), which then activates gene transcription of the APP gene. The flies then began to express Alzheimer’s-like behavior. This project was designed to test the effects of the chemical curcumin (present in the turmeric spice) and G*inkgo biloba* plant extract on the AD fly models. First, the wild-type and AD flies’ locomotion, coordination, speed, and responses to stimuli were tested using two assays: upward flight assay with a light source and a light/dark T-maze assay (tests reasoning and response to light stimuli). Following the initial tests, the turmeric spice was mixed into the wild-type flies’ food and the flies went through the same assays again. Finally, the flies’ performances on the assays before and after ingesting curcumin were analyzed. The results indicate that 1) wild type flies respond differently in the assays that AD flies, and 2) both curcumin and ginkgo had a positive effect on AD flies. Although there is insufficient evidence to assess the scope of the effect of curcumin, the results demonstrate the effectiveness of the GAL4/UAS system to replicate human disease in *Drosophila melanogaster*, and imply a positive correlation between curcumin/ginkgo and improved neurophysiological capabilities in AD flies as determined by locomotion/light stimuli response assays.

***Xiaoxuan Chen, Aryana Javaheri, Mehtaab Sawhney***

**A Behavioral Analysis of C. elegans After Physical Exertion**

The purpose of this investigation was to determine the effects of physical activity on the behavior of mutant anxiety strains of C. elegans. Anxiety can be described as a restlessness caused by mental turmoil, usually characterized by uneasy movements such as pacing. Physical activity is shown to release “feel good” chemicals such as serotonin, dopamine and norepinephrine, neurotransmitters which increase the rate of contractions in the heart. When C. elegans are “exercised”, these chemicals should be secreted to calm distress caused by defects in the mod-5 gene. To carry out this study, both normal and anxiety mutant worms were exercised by forced swimming in four groups to test four different variables. The normal, wild-type worms were used as a control to compare the results with the mutant strains of worms. After exercising all groups of worms, a head turning assay was conducted to determine the difference in anxiety levels post-exercise. A head turning assay is a method of recording how much stress a worm has. The more anxiety-ridden a worm is, the more frequent it moves in a rapid pacing motion where it turns its head. We hypothesized that exercise would decrease the unusual behavior in the mutant strains of worms that mirror the symptoms of anxiety. Increased movement pumps serotonin and other neurotransmitters through the body of C. elegans to decrease unusual behavior and restlessness. Since the amount of serotonin is increased, the gene expression of the mod-5 gene in the C. elegans should also increase because the mod-5 gene transports serotonin in C. elegans. All worm strains were found to show different reactions to physical exertion. Wild type C. elegans were found to be more energetic, and thus more active, following exercise. Worm strain MT9772 and MT8944 experienced decreased movement which suggests that anxious behavior decreased. After treatment, the mutant worms were weak and died more often than the N2, especially mutant strain MT8944.

***Daniel Choi, Ryan Lee***

**Effects of Simple Sugars on the Regenerative Rate of California Blackworms (*Lumbriculus variegatus*)**

This experiment was designed to determine the effects of simple sugars (mannose, galactose, glucose) on the regeneration rate of California Blackworms (*Lumbriculus variegatus*). California Blackworms are regenerative organisms, which can regrow body tissue after an injury ultimately resulting in an entire, new organism. Research on regeneration is important to scientists because there are many problems that could be solved using this field of research including regeneration of human limbs and recovery of organs. The methods that we used to study the effects of simple sugars on the California Blackworms were as follows: 1) Four worms were cut in half; 2)they were placed them in petri dishes with different solutions; and 3) the regenerative growth was measured over time. Our solutions included a control (100% water), a .25% glucose solution, a .25% mannose solution, and a .25% galactose solution. These concentrations were used because in previous experimentation attempts, the worms died at higher concentrations. Next, we took photos of the worms each week to record growth. Our results indicate that there was no difference in growth in using water and using simple sugars, based on our p-values.

***Jake Finnell, Anthony Ciccarelli***

**Does the Memory of Planaria Transfer After Separation?**

This project was conducted to determine if the memory of a planaria could be chemically transferred through regeneration to to its segmented offspring. Regeneration is restoration of a body part of an organism after it has been injured or lost. The Brown Planaria or *Girardia tigrina* that were used to conduct our experiment are freshwater, non-parasitic flatworms and apart of the Turbellaria class and the Dugesia genus. The planaria have two eyes that can sense the intensivity of light, so to “train” the planaria we used associative learning by shining a flashlight then slightly shocking them so that they would give a reaction to the shock. We would repeat this process ten times and then just shine a light and see for reaction. We discovered that after 9 days of testing the planaria reacted to the light without the shock. Then the planaria were split and then testing was then conducted on the part of the planaria that was severed from the original brain and we discovered that the memory was transferred to the new organism. This project can increase the understanding of segmentation related to the nervous system and can be applied to human body-part regeneration.

***Gabrielle Cooper, Kristin Orrach, Sydney Sirota***

**Dietary Choices: Wild Type *Drosophila melanogaster* vs. Memory Mutants**

The purpose of this investigation is to compare the dietary choices of *Drosophila Melanogaster* (wild fruit flies) compared to that of memory deficient fruit flies. *Drosophila Melanogaster* measures an average of 3-4 mm, and are tan in color. Fruit flies, as implied in their name, are attracted to decaying fruits and vegetables. They need to have a diet that consists of proteins and carbohydrates. The proteins are produced by the fermentation of the carbohydrates in the fruits that are ingested by the flies. Flies are attracted to the nutrients in a similar way that humans are attracted to the nutrients that they have been previously been denied in. Hypothetically, memory deficient flies would not show a preference because they don’t remember what they previously ate. The objective of our study is to see if mutant flies make different dietary choices than wild flies. We hypothesized that if wild fruit flies are denied protein (yeast) for a set amount of time, when given a choice, wild-type flies will go to the protein food, instead of the sugar diet they have been fed with before. Memory deficient flies will not show a preference under the same circumstances. To carry out this study, we need to deny both mutant and wild fruit flies of the protein that they need. We will place flies in petri dishes containing 10% yeast, 10% sucrose, or a 50/50 mix of yeast and sucrose food. Then, both types of flies will be given the choice of the sugary food they have been fed, or the protein that they need, and have been denied. Lastly, we will determine how many wild flies and how many mutant flies were attracted to the protein instead of the sugar, which will be measured by using a choice chamber, a device that allows a fly to enter, but cannot escape. Thus far results collected have shown that *Drosophila Melanogaster*, after being denied protein, have favored protein food, given a choice between protein and sucrose foods.

***Jordan Cooper, Joshua Kravatz***

**Visual Learning in Jumping Spiders**

Jumping spiders (family Salticidae), particularly those of the genus Phidippus, are known to have excellent vision. As was shown in a study conducted by Nakamura et. al. (2000), jumping spiders can discriminate between colors. In addition, Jakob et. al. (2007) established that they can learn to associate light (this study used green) with the stimulation of a food source. This provides a logical basis to assume that they can learn that different colors predict different stimuli. From here we can begin to create an experiment. This study attempted to determine whether or not jumping spiders, in this case Phidippus regius, can learn that one color light predicts the presentation of a food reward (positive), and another color predicts no reward (negative). We hypothesized that the spiders would be able to learn which color is positive and which is negative. We tested this by showing three adult female spiders a positive (red) laser, followed by food, and a negative (violet) laser, followed by being returned to their enclosure, over a total of four trials for each spider. We then tested if they successfully learned by showing them both the red and violet lasers at the same time and observing which they follow over three trials, to see what they prefer. After being conditioned to the meanings of the different colors, the spiders all chose the positive (red) light twice in three final tests, indicating that they had an overall preference for the light that had been associated with food reward. From these results, we can conclude that our hypothesis was supported and that jumping spiders are capable of learning visually. Jumping spiders may have a use as a model organism for visual learning in humans.

***Monica Cramer, Kerri Neville, Brooke Novello***

**Bacterial Growth Rates in Cosmetics**

The purpose of this study was to test the correlation between the age of the makeup and the bacterial contamination of the makeup. In the last 2 years cosmetic companies have had to include expiration dates on their makeup products. Since the makeup industry began putting expiration dates on packaging, the annual revenue has increased (Smart,1971). The expiration dates could be just another source of extra money for the industry because most people use makeup longer than the expiration dates suggest, so when they know about the expiration dates it causes them to buy makeup more frequently (Gagliardi,1984). Our objective was to test the accuracy of these expiration dates and see if they are to help the consumer, the makeup industry or both. We hypothesized that older makeup will have more bacterial contamination than newer makeup. To carry out this study, bacteria growth rates were being monitored by harvesting the bacteria from makeup in Luria broth tubes that were put into an incubator at 38º C, then analyzing the increase in density using a spectrophotometer. Thus far, the results show that the cosmetics that had the most rapid bacteria growth rates were the cosmetics that were opened over 3 months before they were tested, suggesting that there is a direct correlation between the age of the makeup and bacteria growth rates.

***Jianna Cressy***

**The Effect of Various Homeopathic Remedies on Huntington’s disease in *Drosophila melanogaster***

The purpose of this study was to determine to what extent various homeopathic remedies affected Huntington’s disease simulated in *Drosophila melanogaster*. Huntington’s disease is a neurodegenerative disease that has a detrimental effect on the behavior, motor, and cognitive skills of the patient. CBDs (cannabinoids) were the homeopathic remedy utilized in this study. Homeopathy is a medical practice based on the idea that the body can heal itself. In the late 18th century the German doctor, Samuel Hahnemann, believed that minute concentrations of a particular toxin could cure the very same symptoms it would cause in larger doses. These homeopathic remedies were ingested orally by fruit flies engineered to simulate Huntington’s disease. Previous studies suggest that these natural remedies have healing effects on the disease seen in *Drosophila melanogaster.* Using behavioral analysis, locomotive skills were assessed through positive photo taxis, choice chamber, and grid assays. Results suggest that the homeopathic remedy utilizing CBDs have the ability to counteract the impaired locomotive skills of the flies as seen in the positive phototaxis behavioral assay. Future studies could examine the chemical effects of homeopathy on the fruit fly nervous system. Also, a wider variety of homeopathic remedies could be utilized.

***Abbigayle Cuomo, Elizabeth Van Loon***

**The Effect of Climate on Forest Fire Return Times in the United States**

This project was designed to determine the effect that climate (temperature) has on forest fire return times of specific fires in the United States. A fire return time is the length of time between two consecutive fires. With changing climate, forest fires could be occur more or less frequently. Data on fire scars on tree rings was collected from Rincon Peak in Tucson, Arizona, Fourmile Canyon in Boulder, Colorado and Bobcat Point in California east of Crescent Creek. In order to determine if climate had affected the frequency of forest fires, climate data was obtained. The locations were mapped on ArcGIS with the fire dates and data years. The maximum temperatures for the month before a forest fire was compared using a paired T-test to the average same month for ten years with no fires before the forest fire. Results showed that there was no significant difference in the temperatures leading to a forest fire and when there was no forest fire, which means according to our data, temperature does not effect when a forest fire would return. This leads us to conclude there are other factors such as humidity, rainfall, and wind in combination that may have a greater influence of forest fire return times compared to temperature.

***Gabriel Cutrone, Kyle Dituro, Kayla Halper***

**The Effect of Multiple Successive Turbines on the Output of Energy**

Hydroelectric turbines are ordinarily placed singly, and with horizontal source flow. The experiment was primarily designed to determine exactly how effective it would be to have multiple turbines in succession. Inertia dictates that more turbines in succession means more energy is subtracted from the water with each. This experiment also tested whether water flowing (the traditional) horizontally is as efficient as falling (the tested) vertically. Both new features (turbine count and source angle) were expected to significantly increase efficiency. When water passed through more turbines, they spun at an exponentially lesser rate of RPM (Rotations per Minute) with each. As the water source became vertically angled, gravity caused RPM to increase, but the pipe’s influence slowed down even the vertical fall. The results of this experiment showed multiple successive turbines generate energy, but much less effectively than predicted. The results continued to surprise, demonstrating vertical and horizontal flow is of the same efficiency. This did not support either portion of the hypothesis, as efficiency did not increase as astoundingly as expected, and vertical positioning was neither more efficient, nor less efficient. This can be applied, however in systems where multiple turbines and corresponding generators can handle the deficit, or vertical positioning is required, but neither is significantly more effective than commonly existing hydroelectric plants.

***Isabella Daquita, Gina Ferrara***

**Shell Preference of the Marine Hermit Crab Pagurus Longicarpus Based on Competitive Environmental Factors**

The purpose of this investigation was to study the shell choice of the hermit crab *Pagurus longicarpus* and how it is affected by the presence of different numbers of competitive crabs. That is the different number of crabs that are competing for one shell. *P. longicarpus* are small (ranging from 2.5 cm and less) marine hermit crabs that can be found along the east coast of the U.S. These crabs are detritivore and they eat a variety of foods such as detritus and other organic matter. One unique characteristic of *P. longicarpus* is that it needs to move into shells found in their environment because its soft body needs protection. Predation and dead snails create sources of empty shell, and often result in shell exchanges between hermit crabs. Competitions for these shells are quite rigorous as shells are rare to find. The objective of this study is to better understand the behavior of hermit crabs and to study their reactions to an artificial environment with a high competition for shells. We hypothesized that if the density of crabs in an artificial environment increases, then it will be more difficult for a hermit crab to find the ideal shell due to increased competition. To carry out this study, we altered the number of crabs in each environment with empty shells and video documented hermit-crab shell interactions for 40 minutes. The video was analyzed to obtain quantitative data. Results showed that our data is inconsistent and many other factors play an important role.

***Brianna Delgado, Vraj Shah, Peter Yu***

**Folding Thirds: a Device Designed to Help People with Disabilities in the Workplace**

People with disabilities face more challenges to find employment or vocational opportunities. Thirteen percent of workers with disabilities were unemployed in 2013, nearly doubling the unemployment rate for the general American public. Most employers have preconceptions about the workers’ capabilities for doing specific and meticulous jobs. In order to aid employees, workers use assistive technology to make certain actions faster and easier. Assistive technology has helped people for work and personal use since the 19th century with inventions such as the wheelchair, hearing aids and robotic prosthetics. Many assistive technology devices can be used in jobs and at home. For example, the workers at the Nassau Suffolk Services for Autism center (NSSA) frequently uses assistive technology to aid with common jobs. After meeting with the employees at the facility, we realized one of the more difficult tasks was to fold papers into thirds to fit inside an envelope. Without a device to help, several employees lacked the hand-eye coordination to correctly and easily fold the documents. The precision of each fold proved difficult for most of these workers and most papers they manually folded were too crooked to fit properly inside an envelope. In response, we designed and built a device called Folding Thirds to position the papers correctly for the workers. Utilizing a wooden stamp, workers would push the paper into a hole cut out of a base, dividing the paper into thirds. Folding Thirds, after initial instruction and practice, increased the speed of folding the papers as well as the accuracy of the folds. In addition, Folding Thirds can be used by all types of people, benefitting anyone was needs to fold a paper into thirds to fit inside an envelope.

***Jaclyn Dentrone,******Hyunjoo Kim,******Hyun Seo Lee***

**Sugar Sources’ Value in Ethanol Production by Region**

Ethanol as a fuel additive is known to be more beneficial to use than gasoline alone due to its low carbon monoxide and carbon dioxide emissions, as well as its ability to improve efficiency of gas utilization. Local ethanol production as a source of biofuel can decrease U.S. dependency on foreign oil. In addition, ethanol production supports farmers and creates domestic jobs since ethanol is produced from domestically grown crops. The production of ethanol is achieved through yeast fermentation of simple and complex carbohydrates. Past studies have supported that *Saccharomyces cerevisiae* is the most efficient and resourceful yeast for production of the greatest amount of ethanol. Studies have also shown that different types of sugar provided to *S. cerevisia* produce different amounts of ethanol. This experiment tested four different types of sugars: cane sugar, corn sugar, brown rice sugar, and coconut sugar, to see which type of sugar produces the greatest amount of ethanol. Each sugar is copious in different countries throughout the world. Sugar cane is abundant in South America, corn sugar is harvested in the U.S., coconut sugar is commonly grown in tropical regions such as South Asia and the Middle East, and rice sugar is produced in Southwest Asian countries. The purpose of the study was to determine the value of ethanol production using sugar sources endemic to a particular region. Each type of sugar was put in an airtight container as a 30% sugar solution. 3.5g of *S. cerevisiae* was added to the sugar solution. Yeast was initially in an aerobic condition, but sealing the container started the fermentation process. Data was collected by using a hydrometer to measure alcohol concentration in the solution. As shown in the results, cane sugar yielded the greatest amount of ethanol with a final ethanol percentage of 16.5%. Corn sugar produced slightly less, with a final ethanol percentage of 14.0%. From this result, it can be inferred that cane sugar would be the most economically beneficial to regions where cane sugar is endemic, closely followed by corn sugar. By comparison, coconut sugar produced less alcohol with a final ethanol percentage of 9.1%, and brown sugar resulted in the lowest percentage of ethanol production at 7.5%.

***Kyle Dituro – See Gabriel Cutrone***

***James Dolan – See Nicholas Bunnell***

***Joshua Drelich, Marcelo Eisenberg***

**A Study of Measuring the Chlorophyll Content of Plants Using a Spectrophotometer and Digital Imaging**

The purpose of this study was to determine the relationship between the color of the leaves and chlorophyll content of Wisconsin Fast Plant (*Brassica rapa*). This investigation focused on the examining of pictures taken of plant leaves and the chlorophyll content of these leaves, determined using a spectrophotometer. Wisconsin Fast Plants were grown for 7 days under varying amounts light exposure. The differing amounts of light exposure acted as the environmental change to produce plant leaves of varying chlorophyll contents. For each trial, three groups of six plants were grown, and were exposed to light for: 24h, 12h, and 0h, respectively. After the week of growing concluded, the leaves were cut from the stem and photos, using a Casio Exilm digital camera, were taken of each leave. The leaves were then placed into an 80% acetone and 20% ethanol solution for two days. During this time the chlorophyll dissolved out of the leaves and into the solution. The absorbance of the leaf samples were then determined using a spectrophotometer, set to wavelengths of 645 nm and 663 nm. The results from the 2 readings were used to calculate the chlorophyll a and b contents of the leaves. The plants with the highest chlorophyll contents from each trial were designated as the control plants. The digital photos taken of the leaves were then examined on Photoshop for their RGB values. These numbers were then scaled down and compared against the control plants. It was determined that there was a strong negative correlation between the Chl-a content and distance in color from the control.

***Claire Drotman***

**An Innovative Method of Reducing Food Contamination in Restaurants**

Restaurants often leave out condiments such as lemons, cherries, olives, etc. to compliment a consumer’s drink. What customers may not take into consideration when picking up a condiment for their drink is the method it was transferred to the container it lies in, and the duration it has been left out for. In addition, the individual is unaware of who has touched, sneezed on or contaminated the condiment they are about to consume. The microbial contaminants can come from raw meat, airborne spores landing on kitchen utensils, cross-contamination, and poor employee sanitation. The purpose of this investigation was to design and construct a device that will aid in the sterilization of bacteria- contaminated condiments commonly found in restaurants. The device was constructed using Formica glued on Plywood as a sturdy base, and Ultraviolet Germicidal Irradiation electromagnetic radiation bulbs. The optimum wavelength to kill microorganisms with the most germicidal effect is 254 nm, which is the output of the chosen bulbs inside the device. The double strands of DNA are ruptured when the energy omitted from the bulbs is absorbed, provoking the formation of abnormal single strand bonds, which prevent DNA replication. Protein production and cell metabolism are then blocked and the microorganism dies. The device has a built in switch to ensure there is no skin/eye contact with the energy omitted from the bulbs, which may cause irritation. To test effectiveness, cultivated *E.coli* K-12 in Nutrient Agar Petri dishes was placed in the device for various times of exposure. After proven effective using Petri dishes, contaminated lemons, oranges and apples were tested inside the device. Results thus far reflect the device’s effectiveness in sterilizing contaminated condiments found in restaurants.

***Olivia Dubi, Amy Uthup, Tara McCaffrey, Cassandra Onal***

**Layers: A Device to Create Multi-Layered Cupcakes**

The purpose of this project was to design and construct a product that produces a hollow desert that can be filled with either more batter, or another type of filling. In 2010, the baking industry employed roughly 1.76 million people in America. The employees earn many benefits, as well as relatively high incomes. This industry is known to account for about $311.0 billion in over-all financial production per year. Analyst Matt Lally says “Cupcakes are a convenient grab-and-go dessert option, and shoppers can buy a variety of flavors in one purchase. Cupcakes, and especially mini cupcakes, provide built-in portion control that many consumers are seeking today.” Based on polls from the 2013 Dessert Consumer Trend Report from Technomic, Inc., “Dessert is also no longer limited to the final course of the evening meal. It has become an all-day, any-day phenomenon. Cupcakes are considered “the ongoing affordable luxury.” The criteria for this invention were being able to make: multi-layered deserts; different sized cupcakes; double and triple layered big or mini treats: an outer shell of your choice and filling it with up to two fillings; and being able to bake with any batter. The device consists of two layers that have many opportunities. The first inner layer fits into the first outer layer, and the second inner layer fits into the second outer layer. The second outer layer also fits into the first outer layer. This allows endless opportunities when baking with Layers. To construct this Layers device we built a prototype allowing us to decide the most sensible measurements, first using materials that can be easily cut and formed into shapes. After making this prototype, we looked into the materials of normal cupcake pans, and once we got all the necessary equipment we built the actual pan. We then ran experiments and tweaked the design until it became perfect.

***Marcelo Eisenberg – See Joshua Dreilich***

***Jessica Fecht, Alexa Karadenes***

**The Detection of Micro-expressions as a Factor of Age**

A micro-expression is an involuntary movement of facial muscles which are affected by a person’s emotions. Because these movements are involuntary, they can help us identify the true emotion of a subject even when they are covering it up with a fake expression. Trained investigators are able to diagnose these micro-expressions which can help us identify a person’s deception. The purpose of this experiment is to see if age of effects how emotions are interpreted. With our experiment, volunteers viewed three power points, each containing a different age group that expressed the seven universal expressions. When viewing these power points they completed a survey that had questions which corresponded with the power point slides. Each question asked them to circle the emotion they believed was portrayed in the picture. These results helped us determine which age group’s emotions are the easiest for people to identify and if the age of the participant affected his or her result choice. Thus far the results showed that sadness was the hardest expression to identify for the participant, while happiness was the easiest expression. In general, the participants were most accurate when determining expressions performed by seniors and less accurate when identifying expressions performed by adults. The total numbers of correct answers for all the volunteers was similar, therefore, the data doesn’t support our hypothesis, which stated that the older the participant the more correctly they can identify the micro-expression. The results also showed that the age of the participant did not have a significant effect on the interpretation of the expressions

***Victoria Ferlauto, Vignesh Gunasekaran***

**The Response of Planarian to Light during the Regeneration Process**

The purpose of this investigation was to test the response of planaria to light during their regeneration process using a photoaxis assay. Planarians are one of the simplest organisms to have distinct organs and bilateral symmetry. They also have key anatomical features, such as a central nervous system and an excretory system that may be considered as a model organism for studying the starting point for the evolution of the more complex tissues that are found in higher level organisms. Planarians have the ability to replace parts of their body that have been lost (regeneration), including their heads. It is even possible to grow two new planarians using one planarian that has been cut into half. The undifferentiated cells in the blastema (cells that can replace the missing parts of the planaria) are called neoblasts. Neoblasts are specialized stem cells found throughout the planarian's body that are held in reserve just for this purpose. Neoblasts are capable of differentiating into any type of cell. When a planarian is exposed to light, its normal response is to move away from the source of the light and move to a darker area. This type of behavior is known as negative photoaxis, and it is suppressed during the regeneration process. It is hypothesized that this response will be restored to the planarians 5 days after the regeneration process has begun. To carry out this study, we shinned light onto a planaria and observed how long the planaria took to move into the darker region of the petri dish. If the planaria did not move into the darker region, this indicated that the negative photoaxis has not been restored. And the opposite is true if the planaria does move into the darker region.

***Gina Ferrera – See Isabella Daquita***

***Jake Finnell – See Anthony Ciccarelli***

***Colleen Flynn – See Jason Bak***

***Vincent Giannilivigni, Kyle Mitra, Joshua Mann***

**The Design and Construction of an Adjustable Footrest**

The goal of this project was to design and construct a foot rest that is capable to adjusting to different heights on a stool to ensure maximum comfort. Most stools do not provide foot support for the person seated. The lack of foot support can lead to health problems and discomfort. This footrest will provide a platform for the seated person to rest upon and improve relaxation and remove any discomfort that the user might have. The ideal substance to assemble this stool out of was wood. Plastic would break too easily and metal would be hard for us to work with. The prototype was made of wood since it was the easiest material to work with. Future models however, could be made of either plastic or metal. Moving the footrest was made possible by metal poles connected by clamps to adjust the footrest to the preferred height. The included features contribute to the overall success of our design and help the structure function as advertised. Our design was the optimal solution to build a functional product at a reasonable cost. The significance of our design is that we created a footrest that ensures maximum comfort for the user and improved the use of an everyday stool.

***Maya Glaser-Ksensky – See Katelyn Carone***

***Samantha Gray, Helen Koukoulas, Olivia Messina***

**The Design and Construction of the Pack-Buddy**

The purpose of this project was to design and build a new type of product for ice packs. This product will be used to enclose an ice pack to prevent leaks and prolong the use of the ice pack. Today, ice packs are commonly used to treat and provide relief from injuries. According to physical therapists, trainers, and nurses that we have interviewed, there are several problems with the ice packs being used today. These problems include the ice packs being too cold to apply directly to the skin, leakage and dampness, and short usage time. Also, we found that the nurses did not even have ice packs available, but instead ice wrapped in paper towels. Taking these problems into account, we created a prototype of the product that was a rectangular shape with a zipper enclosure. To test the effectiveness of the product, we placed one ice pack in the prototype of the Pack-Buddy and the other was not placed in a bag. Both ice packs were tested for a decrease in temperature over a period of 40 minutes. We found that the Pack-Buddy made with neoprene performed better and lasted longer opposed to the polyester material. This invention will be used to make the lives of athletes, nurses, doctors, physical therapists and those who are injured, easier.

***Vignesh Gunasekaran – See Victoria Ferlauto***

***Gabriel Green – See Eric Bass***

***Jonah Haber, Anthony Jao***

**Use of Assistive Technology to Help Workers with Autism**

Adults diagnosed with Autism are less productive in work and the mastery of simple tasks is difficult to complete efficiently. These adults also have difficulty finding jobs and are less likely to be permanently hired by an employer. Programs through organizations such as Nassau Suffolk Services for Autism (NSSA) provide job training and opportunities to those adults diagnosed with autism. The NSSA organization helps adults with the training they need to fulfill certain jobs at various locations. When visiting the workplace, the adults with disabilities were observed to have many problems completing various work-related tasks in a restaurant and office setting. One of the jobs that were observed the disabled workers doing was the folding of pizza boxes, which had many steps and was complicated. To counteract the difficulty faced by the disabled workers, an apparatus was designed and built to help improve the ability of the workers to fold the pizza box by reducing the number of steps required in the folding process of the pizza box. This was done by creating the apparatus out of wood and placing dowels in various locations. The box would then be pressed on the top of the apparatus, folding a majority of the needed folds. The purpose of this was to make the folding of boxes a simpler task and to decrease the time it takes to do this.

***Kayla Halper – See Gabriel Cutrone***

***Jessica Hastings, Nicolette McKeon, Samuel Silverman***

**What is the Effect of Non-opioid Chemicals on California Black Worms (*Lumbriculus Variegatus*)?**

Many people use non- opioid chemicals like Ibuprofen and Aspirin for common things such as fever, pain, inflammation etc. The purpose of this investigation was to discover the effect of non-opioid chemicals on the regeneration rate of California Black Worms (*Lumbriculus* *Variegatus*). Regeneration is the replacement of lost tissues, lost limbs, and organs. California Black worms are fresh water invertebrates that grow to a length and then continue to grow through fragmenting. California Black Worms are also made up of about 150 to 250 body segments; their bodies are supported by their fluid. In this experiment we have exposed the non-opioid chemicals Ibuprofen, Acetaminophen, Aspirin, and Advil to regenerating California Black Worms. We hypothesize that the rate of regeneration will be decreased. Aspirin is an anti-coagulant. This can cause prolong bleeding stopping them from healing and regenerating their parts. Ibuprofen and Advil are anti-inflammatory drugs; this may stop the worm from regeneration. Acetaminophen is toxic to liver and could possibly damage the worm. To carry out this investigation we first determined the dosage of each chemical that would not kill the California Black Worms. We then placed one worm in each culture dish using the same concentration of each chemical dosage for every worm being used for that chemical. We cut all the worms in half and measured segment growth overtime. We did the same to a worm not exposed to any chemicals. After conducting three trials we concluded our hypothesis was correct for all chemicals, but Ibuprofen. This is because Ibuprofen had a higher rate of growth and R² Value than the control. Overall, non-opioid chemicals have a negative effect on the regeneration rate of California Black worms.

***Christopher Huaman***

**Modifying the Wii Technology to aid those with Physical Disabilities**

The Wii is a group oriented gaming console for entertainment, and for people who have been diagnosed with CP (Cerebral Palsy) it can be difficult to operate. CP is a disability that paralyzes and warps bodily functions and muscle and sometimes skeletal development, and is one of the most common congenital disorders in America. There are many centers that take care of people with CP like the UCP of Suffolk (United Cerebral Palsy), and within these centers a common place event held for their client’s enjoyment is usually Wii game play. It allows for the clientele at the UCP to enjoy interacting with their peers and for caretakers to ensure their safety while their clients can play games normally unavailable to them, like bowling or baseball. For those who are wholly unable to play the Wii, even with assistance, they are often left out from enjoying the group fun and even ostracized. I modified the Wii so that those in the UCP of Suffolk who could not use the Wii without assistance, or at all, would be able to enjoy playing amongst their peers and friends with minimal assistance from the UCP caretakers. Through the re-wiring of the Wii’s remote controller it was possible to attach larger buttons as well as a joystick to improve the availability of the Wii game play and reducing the amount of required assistance for many of those with CP from caretakers at the UCP-Suffolk. I had changed the Wii remote into a two piece design that was comprised of a singular box which held the joystick and 2 buttons that replaced the A and B buttons as well as the directional movement from pressing the D-pad on the Wii controller, and the modified Wii controller that still supplied some of the extra buttons as well as the motion movement required in some games for the Wii. This increased the number of people among those with CP or any disability that affects motor functions and movement who can readily socialize and entertain themselves with the Wii. Other variations of Wii modifications have been shown to be beneficial for physical therapy and body posture among those with CP and other Quadriplegic disabilities it has been helpful to their mental health and well being. It has also been shown that those with CP tend to have difficulty socially interaction and being able to communicate with others, so the group Wii game play has been used for therapeutic reasons and helping the UCP clients develop social skills.

***Daniel Hosseinian – See Jason Bak***

***Brian Huang***

**Prognosticative Biomarkers in Polycystic Kidney Disease**

Polycystic kidney disease (PKD), the most common hereditary kidney disease, is characterized by progressive cyst formation in the kidneys. Currently, there are no accurate clinical methods for the evaluation of PKD. The most accurate method to measure PKD progression is cystic index and kidney/body ratio, none of which are feasible. The biomarkers neutrophil gelatinase-associated lipocalin (NGAL), cystatin C, kidney injury molecule-1(KIM-1) and interleukin-18 (IL-18) have been shown to detect acute kidney injury but have not been tested extensively for ADPKD. In this study, the effectiveness of the biomarkers NGAL, cystatin C, KIM-1, IL-18, blood urea nitrogen (BUN) and serum creatinine in detecting ADPKD was studied. In this study all samples, slides, serum and urine samples were prepared and provided to the student. The slides, serum and urine samples were all used in experiments at the lab. The concentrations of the biomarkers in urine and serum samples were detected using enzyme-linked immunosorbent assay (ELISA) and Bradford assay. Serum creatinine was sent to a hospital for measurement. Kidney mass and body mass was provided to the student by the lab. Kidney/body ratio was calculated from the kidney mass and body mass. Cystic index was calculated using the computer program Nikon Elements Viewer. The biomarkers were then correlated to kidney/body ratio and cystic index. Urinary IL-18, serum creatinine, and BUN had the strongest correlation. The urinary IL-18, serum creatinine and BUN were the most predictive biomarkers. These biomarkers can be potentially used to accurately predict the severity of PKD.

***Devin Irwin, John Simone***

**Chemotaxis in the Slime Mold *Physarum polycephalum***

Chemotaxis in *Physarum polycephalum* is affected by many variables and works to a certain degree (King, 2009). It has been proven that the mold can locate a food source through a maze. This has caused biologists to question which organisms are more intelligent than others (Bozzone, 2009). A test done with 4 food sources, all equidistant from the mold, shows signs that the mold may be confused by the vast amount of attractants in the area, and moved in inconsistent directions. In another test done with two food sources, again both equidistant from the mold, the mold migrated to the source with a higher concentration of chemotactic attractants. This data shows that our hypothesis was accurate when determining if the slime mold could determine higher concentrations of chemotactic attractants in food sources of equal mass. This data gives us more understanding of chemotaxis, which can help scientist figure out a way to cure types of metastatic cancer, because this type of cancer uses chemotaxis.

***Austin Izen, Adam Portnoy, Erick Vaysman***

**A Comparison of Typing Biomechanics With and Without the use of Computer Aids and its Effects on Carpal Tunnel Syndrome**

Carpal Tunnel Syndrome occurs when the median nerve which runs through the forearm into the palm is squeezed at the wrist. Symptoms of Carpal tunnel syndrome are weakness and numbness in the hands, a weakened grip of the hands, and a tingling sensation in the hands. Permanent nerve damage can occur if it is left untreated. There are various ways to treat and reduce the risk of developing Carpal Tunnel Syndrome. The purpose of this experiment was to analyze what changes in biomechanics of the hand/wrist area while typing with and without the use of computer aids to prevent Carpal Tunnel. We tested computer aids that claim to reduce the risk of developing Carpal Tunnel Syndrome and observed how these aides changed the biomechanics of the wrist area while typing. We also observed if the changes caused by the computer aides, if any, can in fact reduce the risk of developing Carpal Tunnel syndrome. In this investigation we video recorded participants typing a short paragraph on a normal keyboard without the use of computer aides and then had them type the same paragraph on the same keyboard, but using computer aides. The participants varied in terms of their typing abilities and age. After recording the participants typing we analyzed the angles of their fingers and wrist in relation to the keyboard and compared the angles measurements with and without the use of computer aides. We hypothesized that if one is to use keyboard accessories such as hand rests, wrist pads, etc., then it will change the biomechanics of their typing, and therefore reduce the risk of developing carpal tunnel syndrome.

***Anthony Jao – See Jonah Haber***

***Alexa Karadenes – See Jessica Fecht***

***Mikayla Katz, Emily Shin***

**The Effects of Car Air Fresheners on the Growth of Wisconsin Fast Plants (*Brassica rapa*)**

The purpose of this experiment is to find out if the volatiles in car fresheners have an effect on Wisconsin Fast plants (WFP). It has been proven that air fresheners’ volatiles can affect human health. Studies have shown that due to volatiles released by car fresheners, there are many effects, such as eye and throat irritation, and more dangerous effects, such as respiratory problems and cancer. It is also proven that plants respond to volatiles. For example, in a study the scientists stated that because of the released volatiles, the plant’s response can increase seed reproduction and build up its fitness. We used WFP as a model organism to test the effects of car freshener on living tissue. By evaluating the effects of car freshener on plants, it will show if this could be linked to effects on humans. We hypothesized that the volatiles in car freshener will have a negative effect on the Wisconsin Fast plants’ growth, reproduction, and development rate. Plants have been known to respond to volatiles released by other plants by releasing defensive volatiles. We were motivated to find out if car air fresheners may be a big health risk on people, and protect our environment. Our objective is to see how the volatiles in car air fresheners can affect living plants and humans. To carry out this study, several WFPs will be grown in sealed chambers with car air freshener made of plastic bottles with pieces of car freshener. The plants’ growth were recorded and compared to the growth of the control plant that was not exposed to air freshener. The results show that there is a negative effect of freshener on plant health and the greater the size of the freshener, the greater the negative effects on the plants.

***Ibrahim Khan***

**The Relationship Between WiFi Antennae Distance and Signal Strength**

The purpose of this study was to investigate the interference between a pair of omnidirectional WiFi antennas in relation to the distance between the antennae. WiFi was originally developed when the FCC opened the 900 MHz, 2.4 GHz, and 5.8 GHz bands for unlicensed use. Afterwards, the Institute of Electrical and Electronic Engineers (IEEE) created the 802.11 committee which regulated and standardized WiFi. This resulted in a boom of implementation in electronics, creating a wireless medium of communication, supplementing devices such as laptops, and smartphones. The majority of WiFi routers use an array of two antennae, to counter interference and to increase signal strength. I tested whether two WiFi antennae will interfere with each other rather than improving the connection. The double slit experiment is often used in the physics of waves, demonstrating interference between waves. In this investigation, two sources of WiFi substituted the two slits. The distance between the antennas was varied to change the location of wave interference. A portable computer was used to detect the waves, using XIRRUS WiFi Inspector, a program that analyzed signal strength of the waves. The data was then compared to the distance between the antennae, as well as the location of the computer to look for interference patterns.

***Andrew Kim***

**Highly Efficient Sponge for the Absorption of Contaminated Oil**

Aquatic oil spills are disasters that occur as a result of damaged oil tankers or containers, which release oil into water systems. The result of these disasters causes enormous environmental and economic problems. The fact that oil spills and their negative impact are a reality in the modern world make it imperative that technologies that can aid in cleanup be continually updated and improved. Many current techniques for cleaning up oil spills are ineffective or nullified by the natural environment. For instance, oil containment booms are rendered useless when water speeds exceed 1 knot (appr. 1.9 km/h) and cannot effectively get rid of all of the oil on the water’s surface (Pavía-Sanders et al., 2013). The purpose of this study was to develop an absorptive material made of polyurethane sponge coated with different kinds of polyhedral oligomeric silsesquioxane (POSS) material, which are complex silicon-based organic compounds that tend to have superhydrophobic properties. These sponges, when coated with POSS, had both superhydrophobic and superoleophilic properties and became selective in what they absorbed. A simple two-step dip coating method for coating these sponges was applied by letting the sponge soak in a solution containing the POSS material and its respective solvent, and then heating the soaked sponge to evaporate the solvent. The sponges proved to be reusable and efficient when absorbing oil out of a water-oil mixture, and absorbed the oil out of water in less than half of the time than that of unmodified sponges.

***Christine Kim, Jamey Meotti***

**An Exploration of Fat Globules and the Melting Process of Ice Cream**

The purpose of this investigation was to find out more about the melting process in ice cream. Melting properties of ice cream are greatly affected by the fat content. This study allowed us to explore the different amounts and sizes of fat globule clusters in different types of ice cream. The motivation for this study was the importance that the ice cream industry has on society. The ice cream industry is a billion dollar industry worldwide. Many people are concerned about their health; the fat content in the foods that they eat affect health. This study focused on how fat affects the melting process of ice cream. To carry out this study we sampled ice cream brands with different fat contents. A set size of ice cream was placed on a mesh screen with a bowl underneath, and allowed to melt at room temperature. While melting, a temperature probe was used to track the air temperature and the temperature of the ice cream overtime. The measure of the ice cream was taken as well as the melted part every 30 minutes. After choosing the ice cream we were going to melt, we looked at the fat content of the ice cream, found in the nutrition facts. Then we observed how they melted and how fast they melted by conducting an experiment.

***Joo Young Kim, Laxshika Raveendran***

**Meta-analysis of the Relationship between Cancer and Diabetes**

Studies conducted on the development of cancer in diabetic patients have produced contradicting results. Some research results state there is an increased risk for cancer in diabetic patients, while other research states there is a decreased risk for developing cancer. These contradicting results have led researchers to shift their focus to the medications that are prescribed to the patients. Through this meta-analysis, the cause of the increased or decreased risk in diabetic patients will become clearer. Recent research has suggested that the use of metformin has an effect on the development of cancer. Multiple epidemiological studies have been conducted to test for a correlation between metformin and incidence rates for cancer, and majority of the studies conducted on metformin, have shown a reduced risk for cancer. A search on Medline, and Science Direct was conducted with the following restrictions applied: age 19+, publication dates between January 1, 2000 and December 31, 2013. No language or geographical restrictions were applied to the search. The search terms used were: metformin and cancer, prostate, pancreatic, colorectal, and breast. The articles that were collected were reviewed individually and 13 select articles of the total 59 articles were used in the analysis. The results of the meta-analysis show that metformin users have a relatively lower risk for developing breast (HR 1.34, 95%CI 0.97-1.14), colorectal (HR 0.73, 95%CI 0.51-1.12) and pancreatic (HR 0.76, 95%CI 0.57-2.57) cancers. Meanwhile, metformin users were found to be at a higher risk of developing prostate cancer (HR 1.19, 95%CI 0.92-1.59).

***Hyunjoo Kim – See Jaclyn Dentrone***

***Helen Koukoulas – See Samantha Gray***

***Joshua Kravatz – See Jordan Cooper***

***Angela Kubik, Briana Kubik***

**A Study of Antifungal Agents in the *Nepenthes ventricosa*x*sibuyanensis* Pitcher Plant**

The purpose of this project was to determine whether any antifungal agents can be found within the pitcher plant species of the *Nepenthes ventricosa*x*sibuyanensis*. The pitcher plant is an insectivorous plant that gains most of its nitrogenous nutrients from the insects in the surrounding environment. Many pitcher plants live in acidic soils that do not have, due to low pH, the nitrifying bacteria that are needed to convert N2 into usable nitrogen in the soil. This lack of soil nitrogen is the reason why pitcher plants require the ability to utilize nitrogen from insects. In order for a pitcher plant to receive a substantial amount of nitrogen and nutrients, the plant must endogenously secrete secondary metabolites that assist in fending off other organisms that could interfere with the intake of nutrients in the plant. Scientists suggest that these metabolites could potentially be used as more efficient antifungal agents. Four variables were tested, including two different chitin induced liquids (open and closed pitchers), prey induced liquid, and non-induced liquid. To carry out the study, two open pitchers were exposed to chitin and prey respectively while an unopened pitcher was left alone as a control (without chitin or prey). Samples were taken from each pitcher and preserved. Then the preserved samples of pitcher fluid were analyzed for any presence of antifungal metabolites using UV Analysis. It was hypothesized that the chitin induced liquids would show significantly higher amounts of secondary metabolites when compared to the non induced liquid. Results show that more secondary metabolites were secreted in the pitchers that were induced by chitin when compared to the control and the pitchers induced by prey.

***Briana Kubik – See Angela Kubik***

***Sara Kurten – See Allyson Britt***

***Anthony LaSala, Douglas Verity***

**The Effect of Gravity on the Growth and Development of Halobacterium**

The purpose of this investigation was to study the effect of gravity on the growth and survival of halobacterium. Halobacterium is a micro-organism and is considered an archaea, not a bacteria contrary to its name. Halobacterium is found in conditions containing water and salt. Halobacterium is adept at surviving and striving in extreme conditions. They are found in areas that many other organisms can’t survive; which is why it makes them a prime suspect to survive in space. Halobacterium are able to survive aerobically and anaerobically. There are various types of halobacterium and are categorized as genera. They are sorted based on physical differences and similarities. There are currently 39 known genera. The objective of this experiment was to test the effect of a micro-gravity environment on the growth of halobacterium. This is important because it is thought that halobacterium could be a potential food source for micro-organisms and invertebrates. It is also believed that these organisms are able to exist on meteors in space. We hypothesized that the halobacterium will be able to survive in the micro-gravity simulated state, but will change the way it grows compared to the control group of halobacterium in normal conditions. To carry out this experiment, the halobacterium will be placed in a rotator that we built out of Legos. The rotator simulates the effect of micro-gravity. After the micro-gravity simulation the halobacterium was tested for the optical cell density using a spectrometer, to observe the cell growth. Our early results show that the halobacterium actually strived in the simulated micro-gravity environment. We observed that the experimental group under the effects of micro-gravity grew better than the control group under normal effects.

***Hyun Seo Lee – See Jaclyn Dentrone***

***Ryan Lee – See Daniel Choi***

***David Li, Mehtaab Sawhney***

**Impact of the Location of a Solar Cell in Relationship to the Focal Length of a**

**Fresnel Lens on Power Production**

The purpose of this study was to optimize the energy output of solar cells using a Fresnel lens. A Fresnel lens is a flat approximation of the standard convergent thin lens that is able to converge rays of light perpendicular to its surface onto a single point, its focal point, thus concentrating the light energy on a small spot size. To test how Fresnel lenses would impact the energy outputs of solar cells, eight lenses were placed above eight monocrystalline solar cells at heights equal to 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, and 1.8 times the lenses’ focal lengths, with an additional solar cell with no lens serving as the control. These setups were tested outdoors for seven days, with the power outputs across 120Ω resistors measured by an Arduino-based data logging circuit. It was found that all experiment groups outperformed the control group in average energy production except for the 1.0F group with the solar cell at the focal length (F), which decreased the energy production by an average of 9.76%. The net increases ranged on average from 1.25% to 14.93% with the 0.8F group performing the best, generating 14.93% more energy than the control. The 1.0F group failed to improve the performance of the solar cell. Findings of the current study indicate that uses of Fresnel lenses with solar cells at optimized lens-solar cell distances could enhance cell output and therefore the practicality of the use of solar energy.

***Joshua Mann – See Vincent Giannilivigni***

***Noah Marinaro, Lucas Marmorale***

**The Effect of Vibration and Movement on the Speed of Hydra Regeneration**

The purpose of this study was to determine the effect of different external vibration and movement speeds on hydra regeneration. Hydra are small freshwater Cnidaria that have the ability to regenerate when cut. When hydra regenerate, they tend to rapidly shake, or vibrate, which is why vibration and movement will be the main independent variable. Since hydra shake rapidly when they regenerate, external movement can either aid their regeneration speed, or slow it down. The objective of this experiment was to determine if different speeds of external vibrational movements affect the regeneration process of hydra when a section of the hydra is severed off. To carry out this study, parts of hydra were sliced off and placed into a depression in agar in a petri dish with water to ensure proper regeneration. Then the regeneration time were recorded while the hydra were subjected to movement of 10 rotations per minute (RPM), 70 RPM, no movement, and vibrational movement. We hypothesized that hydra will regenerate faster when they are subjected to quicker vibrations when compared to slower external movement. This is because hydra vibrate when they regenerate, and faster external vibrations will aid the hydra’s initial vibration. The results did not support the hypothesis, instead, hydra regenerated the fastest when subjected to slower, 70 RPMs of external movement.

***Lucas Marmorale – See Noah Marinaro***

***Scott Massa***

**Alzheimer’s Disease: The Effect of Neuregulin1/ErbB4**

**Back Signaling on γ-secretase Production**

Alzheimer’s disease (AD) is a neurodegenerative disorder resulting from the buildup of neuritic plaques and neurofibrillary tangles. Those with AD exhibit worsening memory and language function, and AD is the most common cause of dementia in the US. There is currently no treatment, prevention, or cure for AD, primarily because there are no factors proven to increase or decrease accumulation of amyloid-beta (Aβ) plaques associated with AD. Neuregulin1, Nrg1, is a protein substrate of γ-secretase, a protease responsible for production of Aβ plaques. Previous studies attempted to reduce Aβ buildup through inhibition of γ-secretase activity but were unsuccessful. This study tested whether presence of Nrg1 and ErbB4 could induce changes in transcription of γ-secretase subunit encoding genes through the back signaling pathway. After RNA extraction from N2a cells, RT-PCR, GSP PCR, and gel electrophoresis, relative expressions of *Psen1*, *Ncstn*, and *Aph1b* were quantified through ImageJ analysis of band intensity. Nrg1/ErbB4 back signaling led to a statistically significant increase in expression of the genes studied, yet Nrg1 or ErbB4 alone did not have this effect. This study is the first to test the effect of back signaling on transcript levels of γ-secretase subunits and demonstrate that Nrg1/ErbB4 back signaling is linked to AD pathogenesis via its upregulation of γ-secretase. The research provides a molecular interaction which can potentially be regulated to lessen γ-secretase production levels as a novel approach to reduce Aβ plaque accumulation. The investigation highlights promising directions for development of treatments, preventions, or cures for AD.

***Ryan McCaffrey***

**Construction of a 3-Dimensionally Segmented Dataset of Indoor Scenes Using the Microsoft Kinect**

Image segmentation has become a focus for computer vision research to enable computers to obtain information from their surroundings. Many algorithms have been produced to segment features of an image; these algorithms are constantly being altered to increase the efficiency and accuracy of the segmentation process. The algorithm constructed during this project utilizes a combination of recognized methods, including the watershed algorithm applied to Pb boundaries and an iterative segmentation framework, along with novel methods of inferring support relations between features of the image and classifying features into structural classes. To segment an image, an initial set of regions was first created by using the watershed algorithm applied to Pb boundaries to produce an oversegmentation of the image. Regions with minimum boundary strength were merged over an iterative process by the decision of a classifier that implemented similar RGB and position features to Hoiem et al. and novel geometric features. The geometric features included support relations, which were inferred based on depth information and geometric interpretation, and the classification of objects into structural classes. The segmented images of indoor scenes were uploaded into a public dataset intended for access by researchers of the computer vision field. The dataset created will be used as a comparison to similar studies to further the progress of image segmentation, which is currently essential in areas such as medical imaging segmentation and baggage security.

***Tara McCaffrey – See Olivia Dubi***

***Nicolette McKeon – See Jessica Hastings***

***Jamey Meotti – See Christine Kim***

***Olivia Messina – See Samantha Gray***

***Kyle Mitra – See Vincent Giannilivigni***

***Andrea O’Brisky***

**The Effect Harmonic Frequencies Have on Temperatures within a Hotspot**

**During Sonoluminescence**

The purpose of this study is to determine the effect of harmonic enhancement on different aspects of single bubble sonoluminescence, specifically concentrating on the effect upon hot spots. Sonoluminescence is the conversion of sound energy to light energy during when high frequencies cause bubbles to periodically grow before depleting. An internal ‘shock wave’ makes high temperatures causing molecules to obtain higher densities. The bubble cannot withstand these conditions and the shock wave collapses. The spot where the shock wave converges is a hot spot. Estimations predict that hot spots may reach up to 300,000,000K under ideal conditions. At such high temperatures, a process called nuclear fusion can take place. Nuclear fusion combines two nuclei to create a new nucleus, releasing energy. Different factors affect the success rate of sonoluminescence, and in turn, hot spot temperatures. A sonoluminescence device is in the process of being created. Currently, ambient noise is being reduced, resonance is being tested, and a new audio amplifier needs to be obtained due to low power amplification of precious device. Harmonic frequency enhancement data from prior studies was analyzed and compared to non-harmonic enhancement data due to unique properties that harmonics possess. The formula was used in order to determine temperatures. Harmonic enhanced groups were more successful with an average temperature of 1835.54 Kelvin and an average percent increase of 580.35%. Non-harmonic enhanced groups less successful with the average temperature at 675.17 Kelvin and an average percent increase of 130.32%. T-tests showed evidence of statistical difference between groups.

***Matthew O’Connell***

**Development of Computer-Based Multi-Sensory System to Better Relay Pharmacotherapy Information**

This project consisted of the design and creation of a system for prescribers to provide medication instructions to patients via translation, visual representation, and audio in order to replace current methods of simply providing textual instructions (often in a language that patients cannot read). Studies have found that misinterpretation of medication instruction is a prevalent worldwide issue. Dosing errors due to poor health literacy and language barriers place patients in danger of bodily harm and even death. These two factors are particularly pronounced when emergency aid personnel respond to distressed populations in disaster situations (warzones, natural disaster recovery, mass casualty incidents, etc.). Studies demonstrate that providing information through pictograms and multiple modalities improves outcomes. To address these problems, an interactive computer-based system, The Prescription Architect (TPA), was created for medication prescribers to convey pharmaceutical instructions via multiple modalities. TPA generates handouts with culturally sensitive pictograms. Textual and spoken instructions are also generated in the patient’s native language. A major advantage of TPA is that, after its initial download, it requires no internet access. New translations, pictograms, and orations can be easily appended to the program’s dynamic database. TPA is being hosted on the official website of an international pharmaceutical organization as well as being evaluated for integration into pharmaceutical practice. To date, the program has been downloaded over 700 times in more than 80 countries. Worldwide users are continually providing the author with more translations and orations so that the program can be used to aid more people.

***Cassandra Onal – See Olivia Dubi***

***Kristin Orrach – See Gabrielle Cooper***

***Megan Padgett, Kelly Page***

**A Bioinformatic Analysis of the Human Caspase-9 Protein**

The purpose of this experiment was to characterize and advance our understanding of the Caspase-9 protein. This protein is a Caspase protein that has a vital role in the process of apoptosis, cell death. This is important because failure of this process can result in uncontrolled cell mitosis, tumor growth, and autoimmune diseases. Also, the occurrence of unwanted apoptosis can lead to cases of Ischemia (restriction of blood supply to tissues) and Alzheimer’s disease (form of dementia). Therefore Caspase proteins are critical for normal cell function. Caspase-9 is an initiator Caspase; it breaks and initiates the enzyme Caspase-3. The objective was to study different properties of the protein and see how they affected its structure and function. We looked into characteristics of the protein such as, hydrophilic and hydrophobic amino acid sequences and the interactions they cause within the protein. We specifically studied chain “L” of this Human Caspase-9 Protein, by utilizing various computer programs such as PDB (protein data bank) and PyMOL (will construct the protein in a 3d image). We hoped to improve our understanding of the structure and functions of the Human Caspase-9 Protein.

***Kelly Page – See Megan Padgett***

***Jin Ho Park***

**Functions of the fimA and mfa1 Fimbriae of *Porphyromonas gingivalis***

*Porphyromonas gingivalis*, a gram-negative anaerobe, is a major etiological agent in the initiation and progression of chronic periodontal disease such as gingivitis and has also been implicated in the development of systemic diseases such as atherosclerosis. The causative agent of gingivitis or gum disease, *P. gingivalis,* is known to affect 75% of American adults. The virulence of *P. gingivalis* has been attributed to a variety of potential factors associated with its cell surface, the dominant factor being fimbriae (hair-like structures around the bacteria) of the bacteria. To cause infection, the bacterial fimbriae of *P. gingivalis* serve as a dynamic interface between the bacterium and the external environment. The fimbriae facilitate growth, nutrient acquisition, colonization, biofilm formation and evasion of host defense. Therefore, understanding the structure and functions of these fimbriae is essential for elucidating the microbial virulence that causes infection and the development of periodontal disease. This study includes three experiments to increase understanding of the major (fimA) and minor (mfa1) fimbriae of *P. gingivalis.* First, the minor and major gene clusters will be cloned into an *E. coli* vector so the bacteria express pili (current step). Then, a hemmaglutination assay will be performed to determine adhesiveness of the pili. Protein expression will be studied with the gel electrophoresis and the structures of the pili will be studied under the electron microscope. There have been multiple cases of the bacteria not ligating to the vector or the vector having only parts of the gene cluster. *FimA,* the dominant region of the FimA gene cluster as well as *mfa1,* the dominant region of Mfa1 have been cloned.

***Caitlin Passaro – See Allyson Britt***

***Vincent Pennetti***

**An Investigation into Clover (*Trifolium repens*) Mutations**

The objective of this study is to identify and isolate different mutations in White clover, *Trifolium repens*, which can later be combined to create a new variety of White Clover. White Clover is a natural nitrogen fixer, appealing form of ground cover/cover crop, it is commonly used in cattle feed, and it is a common source of nectar for honey bees and their production of honey. The importance of the addition of nitrogen to soil is that it is the nutrient most in demand to many plants. Since White Clover may be partially, or mostly, substituted for nitrogen based fertilizer in some areas, it decreases the demand for fertilizer and cuts down the risk of polluting and contaminating water sources with the fertilizer. After many hours of examining different patches of clover in many different areas results thus far show that variation amongst clover plants is quite common. The variations observed include larger or smaller leaves, increased or decreased number of leaflets, different leaf shapes such as heart or oval shaped, and variation in the length of individual clover stems. To further investigate the mutations in White Clover plants, intentionally cross-bred clover plants were grown in a controlled environment, White Clover plants were exposed to increments of UV light, a known mutagen, and clover plants were treated with a cutting-root method in attempt to reproduce an observed trait. The end goal of this study ultimately is to create a new ornamental variety of White clover.

***Michael Pont, Ryan von Hof***

**An Investigation In Oil Spill Remediation**

The purpose of this study was to find an effective method based on the total amount of oil removed and the total cost of the method, to clean an artificial oil spill. This would be in simulating how much oil can be absorbed by a specific material and the cost to clean a spill using that material. We simulated a moderate oil spill. The importance of this study is that in the past it has been unclear what the optimal solution is to the problem of cleaning an oil spill. We are testing a variety of materials and their effectiveness to clean a model oil spill and then to estimate the cost of the method on a larger scale. The materials we used include a low-grade cotton and sponges which are used to skim the surface of the water and pick up the oil, and hydrophobic sand made of sand made of recycled bottles. We hypothesized that the hydrophobic sand will be the optimal solution to clean the mock oil spill. To carry out this study, we used cotton, sponges, and hydrophobic sand to absorb oil out of the fish tank. We then recorded which was the most effective method by taking the pH of the water. The sand method did not appear to work very well with our method of measurement based on pH but we know that in a real situation there are microbes deeper in the water that will dispose of the oil. The more important part of the test was to see if the oil would be held at the bottom by the sand, which it was.

***Adam Portnoy – See Austin Izen***

***Alinur Rahim***

**Effect of Sediment Size in the Presence of Biofilms on the Change in the Flow Rate of a Substance**

Biofilms are communities resulting from bacterial extractions, and formed when bacteria adhere to solid surfaces where there is abundant water. Besides acting as a protective layer for the bacteria, the slimy polysaccharide secreted by these biofilms can serve as a barrier to slow the rate of flow of a substance. Previous uses of biofilms include the preventing of flow of a chemical from its source into a container. These studies have suggested that biofilms are more effective when there are objects present in its environment to which the biofilm can “latch” on to, including sediments, rocks, dirt and microorganisms. Changing the sediment sizes were used to determine its effect on the flow rate of medium. The change in the rate of flow of the medium was determined by finding the difference in velocity at which the medium drained through the sediment, from the tube before and after the biofilm was allowed to grow in the medium. The presence of a biofilm had the greatest effect on flow rate when the medium was made to flow through sediments of size 2 – 8 mm. Also, there was a strong exponential correlation between the maximum sediment size present in the tube and the flow rate. The purpose of this experiment was to determine which sediment size, when combined with the biofilm of bacteria, would result in the greatest negative change in the rate of flow of a substance. When chemical spills occur where this optimal sediment size range is present, biofilms can be used to more greatly control and reduce the chemical’s environmental impact on wildlife.

***Laxshika Raveendran – See Joo Young Kim***

***Eric Rizzo, John Voiklis***

**An Analysis of the Movement Patterns of Juvenile and** **Mature Brook Trout (*Salvelinus fontinalis)***

The purpose of this study was to analyze the movement patterns of both juvenile and mature Brook Trout (*Salvelinus fontinalis*), and to determine the characteristics of their preferred habitat. The data was obtained from the Adopt-a-Trout Program website on Long Island (www.adoptatrout.com). Radio and PIT tags were inserted by scientists into each fish’s body cavity. The data recorded for each fish spanned roughly 20-100 days for each trout. The coordinate location, water temperature, bottom color, bottom type and canopy type were noted roughly twice per week for the radio tagged trout. Several common behavioral patte rns of the juvenile and mature trout were observed. Most of the fish formed clusters in small areas where they stayed for several days, and some of the mature trout remained in one cluster for upwards of one month. There were other trout that moved among multiple clusters. The sizes of the clusters varied, but the mature trout generally formed larger clusters where they remained for extended periods of time when compared to the juvenile trout that formed smaller clusters that they stayed in for shorter periods of time. Many of the mature trout preferred to stay upstream in/near the lake, while the juvenile trout could be found upstream or downstream in areas of the brook where they could stay underneath an undercut bank. Data is still being collected in this study and the information from it can be used to improve brook trout habitat for increased survival in other areas of the region.

***Charity Russell, Maeve Smart***

**How Do Fruit Flies (*Drosophila melanogaster*) of Different Ages Respond to Sleep Deprivation**

Sleep deprivation has been shown to negatively impact the behavior of all organisms. In humans, sleep deprivation decreases the quality of life by causing depression, anxiety, and the inability to maintain equilibrium. The purpose of this investigation was to determine the effects of sleep deprivation on the behavior of fruit flies (*Drosophila melanogaster*) relative to age. A sleep shaker, which continuously rotated for a 48 hour period, was constructed to disrupt the flies’ natural circadian sleep cycle. The age dependent behavior of sleep deprived and non-sleep deprived fruit flies was compared with the use of three tests: Upward Movement Assay, Phototaxic Assay, and Line Crossing Assay. Results from the Upward Movement Assay demonstrated statistical differences in the vertical mobility of the sleep deprived fruit flies and the non-sleep deprived fruit flies. The Phototaxic Assay revealed differences in the behavior of non-sleep deprived flies and sleep deprived flies. Results from the Line Crossing Assay revealed a statistical difference in the horizontal mobility of the sleep deprived fruit flies and the non- sleep deprived fruit flies. The results indicated a strong behavioral difference between sleep deprived and non-sleep deprived flies. Additionally, the flies’ ability to perform in behavioral assays decreased with age. Sleep deprivation is known to cause over 70 million sleep disorders that affect over 40 million Americans. Thus, research regarding sleep deprivation is a crucial topic for study.

***Mehtaab Sawhney – See Xiaoxuan Chen, David Li***

***Vraj Shah - See Brianna Delgado***

***Emily Shin – See Mikayla Katz***

***Christopher Siegler, Matthew Wu***

**The Effect of Light Color on the Mud Snail *Ilyanassa obsoleta***

The purpose of this investigation was to investigate the response of the mud snail *Ilyanassa obsoleta* to light. Most mud snails*, Ilyanassa obsoleta* included, have their eyes located on special optic tentacles. These allow the animal to see. When a light is shone upon a mud snail, a reaction may be observed where the snail will move towards the light source. The objective of this study was to find out if *Ilyanassa obsoleta* reacts differently depending the color of light. We hypothesised that the color of the light will affect the movement of the animal, and that they will show a preference for blue light. This may be due to blue light naturally penetrating water easily compared to other colors, and thus the snails are more adapted to this color. To carry out this study, the mud snail was placed in salt water into a plastic tank 5 cm wide by 5 cm high by 60 cm long with a marked grid on the bottom. A light (either unfiltered, green, red, blue) was placed and turned on at one end of the tank, and starting in the center, the mud snail was left alone in the dark while a video camera recorded its movement for 15 minutes. It was observed that *Ilyanassa obsoleta* initially moved directly towards the light (recorded as positive phototaxis) source, but afterwards the snails eventually moved towards the unlit end of the tank (negative phototaxis). This pattern was observed for all colors. The snails were most attracted to the blue light and least attracted to the red light. The data supported our hypotheses; *Ilyanassa obsoleta* reacts to different colors of light in different ways.

***Juliana Sikorski – See Jungsoo Ahn***

***Samuel Silverman – See Jessica Hastings***

***John Simone – See Devin Irwin***

***Sydney Sirota – See Gabrielle Cooper***

***Maeve Smart – See Charity Russell***

***Maxwell Sugarman, Jeremy Vlacanich***

**A Study on the Effect of Bioacoustics on Marine Hermit Crabs (*Pagurus longicarpus*)**

This project was designed to determine the effects of bioacoustics on marine hermit crabs in a controlled environment. Bioacoustics is a science dealing with the sounds produced by or affecting living organisms. Marine hermit crabs cannot hear, but have microscopic hairs on their shell and on their antennae that sense vibrations which the crabs can respond to. This investigation allowed us to determine which frequencies marine hermit crabs can sense, and their reactions to these frequencies. A tank was filled with 7500 ml of salt water, and lined with Styrofoam on each side of the tank to stop the vibrations from reflecting off the glass and out of the tank. A crab was placed in a tank where the frequency was adjusted. Trials included 420 Hertz (Hz), 1000Hz, 10000Hz. In addition, during each trial the crab was also observed in three different locations throughout the tank, closest to the source, in middle of the tank, and farthest from the source. Thus far, results indicate that marine hermit crabs can detect higher frequencies of sound better than lower frequencies based on the crab’s movement. Certain body motions were also observed when the crabs were exposed to the lower frequencies of sound, like movements of the antennas or retreating into its shell. This experiment can help determine which sound frequencies may disturb the marine hermit crabs, and possibly provide protection from perceived threats of the *Pagurus longicarpus* in their natural environment.

***Hassam Syed***

**Beatboxing Authenticity Based on Quantitative and Qualitative Data**

“Beatboxing” is the imitation of the sound effects of drums, first developed in the hip-hop era, and is very similar to other culture’s vocal percussion. Used as a substitute for drums by DJ’s and more recently Acapella groups, beatboxing has become more realistic by developing the techniques used to make sound effects. However, it is unknown how realistic the beatboxing sound effects are. It is hypothesized that the beatboxing sound effects will be very similar to the drum sound effects, both in measurements and to the ears of certain groups of people. The 3 second samples of different sounds will be recorded on a computer program, LoggerPro, using a Vernier microphone, and the sounds’ measurements (sound pressure, change in y-value from the beginning of the recording, mean/average change in pressure) will be compared. As well as being recorded onto the computer program, these samples will be recorded onto a Samsung Galaxy S III and they will be played to different groups of human participants, varying in musical background and age. The participants will be given a questionnaire in which they will classify the sample to be of beatboxing or of real drums, based on their own judgment. It is hypothesized that the participants with increased musical experience will be able to distinguish the samples to be beatboxing greater than those with less experience, and similarly with those with an older age. A real-life application can be a form of musical therapy for children and even adults with anxiety or other mental illnesses, as a way to distract themselves and relax during times of personal crisis.

***Nakul Thampy***

**Analysis of Proteins Similar to MHC Class II Using Computational Biochemistry**

The purpose of this experiment is to compare the chemistry and structure of proteins that are synthesized by lymphocytes and proteins that are overexpressed on the surface of tumor cells using computational biology and informatics, and comparing them to the Major Histocompatibility Complex Class II. Tumor cells overexpress certain proteins due to genetic abnormalities that lead to the case in which the cells reproduce uncontrollably. This mutation also leads the synthesis of proteins that make the tumor cells more non-self, so that the immune system is capable of recognizing it, but does not until further stimulated. Computational biology involves the development and application of data-analytical and theoretical methods, mathematical modeling and computational simulation techniques to the study of biological, behavioral, and social systems. Programs such as pyMol allow the user to study the structure of proteins using protein data bank (.pdb) files. Using this program along with STRING, a database for protein interactions, I compared proteins that are overexpressed on cancer cells, found on the RCSB protein data bank, and compared them to MHC Class II. The knowledge of these protein interactions is important because this narrows the search for proteins that we can use to immunologically fight off tumor cells. My results show that there as score, provided by the RCSB protein data bank, decreases, the statistical and comparative similarity between the protein to MHC Class II decreases. This is verified through tests for p-values, percent identity per amino acid chain, length of domains, length of certain chains, root mean square deviation, and percent coverage per residue in the proteins. Certain proteins synthesized by lymphocytes induce a process known as antibody-dependent cell-mediated cytotoxicity, in which an antibody (lymphatic secretion) binds to an antigen on the tumor cell surface, and induces apoptosis through a type IV cytotoxic reaction. In the future, I would like to test this protein *in vivo* with live animals that have been treated to develop cancers, and inducing the production of the found protein by inducing hypoxia in the animal or providing the protein manually. This would eventually lead to the development of a drug that could eventually be sent to the FDA for testing as a immunotherapeutic treatment for cancer.

***Justin Tollin – See Nicholas Biancaniello***

***Victoria Turner***

**The Effect of Reduced Carbon Dioxide Concentrations on the Stomata of Wisconsin Fast Plants (Brassica rapa)**

Stomates are tiny structures on plants, found on the bottom of the leaf, through which gases are exchanged. This process is vital for photosynthesis, cellular respiration, and transpiration. The purpose of this experiment is to investigate the effect of reduced carbon dioxide concentrations on the stomatal densities and openings’ of the Wisconsin Fast Plant. The motivation of this experiment is to better understand how stomates react under certain environments. Because of limitations, increasing the carbon dioxide concentrations for the experimental group could not be done. However, by better understanding how stomates react under certain environments, we can take care of the environment and the plants will then germinate properly. In this experiment, one set of six pots of Wisconsin Fast Plants was grown in a clear, plastic, sealed chamber and another set in normal conditions (not in a chamber). After germination, clear nail polish was used to make leaf surface impressions and to see the stomates under the microscope. Then, the stomates were counted and the stomatal openings’ were observed to conclude if there were any contrasts between the control and experimental group. Also the field of view was measured to calculate how many stomates are in a certain amount of space compared to the other pots. It was hypothesized that the reduced levels of carbon dioxide would have an increased effect on stomatal characteristics.

***Amy Uthup – See Olivia Dubi***

***Elizabeth VanLoon – See Abbigayle Cuomo***

***Erick Vaysman – See Austin Izen***

***Douglas Verity – See Anthony LaSala***

***Thomas Vetere***

**An Analysis of OCD Perceptions and the Stigma that Surround Mental Illness**

The purpose of this investigation is to study and raise awareness related to the stigma and misconceptions of mental illness with a focus on Obsessive Compulsive Disorder (OCD). The motivation for this study came from the author’s observed experience connected to the stigma and hardships that others can impose on sufferers. According to the National Institute of Mental Health, 26.2% of adults in the United States suffer from mental illness. Many of them have felt the discrimination and stigma associated with their mental illness. There have been studies examining the response that people have towards those with mental illness; however, there have been few studies that looked directly at OCD. Obsessive Compulsive Disorder is a mental illness in which the sufferer experiences involuntary, intrusive thoughts that cause severe anxiety or apprehension. To reduce this anxiety, the sufferer engages in ritualistic compulsions. The compulsions can be, but are not limited to, checking, hoarding, or excessive questioning. To carry out this study a confidential survey originally written by Otto Wahl et al. was utilized along with additional questions created by the researcher to specifically address attitudes towards OCD. The confidential survey was administered to both teenagers and adults to assess their attitudes towards mental illness in a general perspective and to gauge their knowledge about OCD. The results show that there is no significant difference between genders for each section of the survey. In addition, level of stigmatization, OCD knowledge, and composite score had a significant difference between age groups. There was no significant difference between age groups for willingness to interact with a mentally ill individual. Overall stigmatization levels were medium falling at about the middle of the score range. Willingness levels were positive as they were low and close to the best possible score. OCD knowledge was poor with most scores close to the worst possible score. Overall, adolescents are more likely to stigmatize the mentally ill than adults.

***Jeremy Vlacanich – See Maxwell Sugarman***

***John Voiklis – See Eric Rizzo***

***Ryan vonHof – See Michael Pont***

***Matthew Wu – See Christopher Siegler***

***Chantel Yang***

**The Influence of Hydrogel Substrate on Herpesvirus Infections**

Hydrogels are matrices of three-dimensional, hydrophilic polymeric molecules immersed in water that display properties of both solid and liquid materials. They’re insoluble due to cross-linking, a process in which one polymer is bonded to another polymer. In terms of structure, hydrogels are very similar to the extracellular matrix of the tissue of many organs; thus, they are ideal scaffolds for studies pertaining to the dermis and penetration of the dermal layers. In this investigation, hydrogels with varying stiffness and glucose levels were created as scaffolds to test viral infectivity on epithelial-like cells. Combined, hydrogel stiffness and glucose level can be used to mimic the conditions of the human body and skin at different stages of life because as humans age, the skin softens gradually. Conditions that cause blood sugar levels to be irregular, such as type 2 diabetes, also are more common as age increases. The goal of this project was to determine if conditions associated with aging can make an individual more prone to viral reproduction and infection. Results indicate that stiffness of hydrogels can be manipulated with degree of cross-linking and glucose concentration. The hydrogels with lower stiffness and elasticity had higher infectivity rates.

***Peter Yu – See Brianna Delgado***

***Johann Yang – See Ryo Ashida***

**Alumni Updates**

***Rebecca Alford, Class of 2012***

***Carnegie Mellon University, Class of 2016***

Research Assistant at the Gray Lab, Johns Hopkins

Developer of Rosetta protein structure software and teaching workshops utilizing the software

Presenting at Rosetta Conference in Seattle, WA

***Farooq Ansari, Class of 2011***

***Stony Brook University, Class of 2015***

Interning at “The Academic Associate Program”, involving research Stony Brook Hospital Emergency Room

Completed research paper, *The Changing Climate and its Effect on the Family Ranidae*

Research pending publication, Brookhaven National Lab- *Radiolabeling the Chemical Compound Sucrose Octoacetate using F18*

***Jesse Badash, Class of 2011***

***Vanderbilt University, Class of 2015***

Currently engaged in information security research, ETH, Zurich, Switzerland

Summer 2014, software development for Microsoft

***Harrison Ferlauto, Class of 2013***

***Duke University, Class of 2017***

Summer math work at Duke University

Summer volunteer at Duke University Hospital Eye Center

***Alexander Ferreira, Class of 2013***

***Rochester Institute of Technology, Class of 2018***

Two planned internships within RIT

***Jason Gross, Class of 2009***

***Massachusetts Institute of Technology, Class of 2013***

***PhD Program, Computer Science, MIT***

Formalizing x86 Assembly at Microsoft Research in Cambridge, UK

Lead researcher on seven publications

Presentation of research paper *Experience Implementing a Performant Category-Theory Library in Coq*,

Summer 2014, Vienna

***Rachel Gross, Class of 2013***

***Northeastern University, Class of 2018***

Summer Internship in a hospital in Jerusalem, Israel

Research Assistant, psycho-Linguistic Lab, Northeastern Unversity

***Michael Iadevaia, Class of 2012***

***Cornell University, Class of 2016***

Summer Internship with National Labor Relations Board

Curriculum Development for Educators on disability awareness. Work to be presented at

Developmental Disabilities Awareness Day in Niagra Falls, NY

***Laura Jao, Class of 2013***

***Columbia University, Class of 2017***

Columbia Summer Undergraduate research Fellowship, Neurobiology Lab

***Matthew Katz, Class of 2011***

***Washington University, Class of 2015***

Intern at Honeywell, Integrated Supply Chain Intern Program

***Matthew Kim, Class of 2011***

***Columbia University, Class of 2015***

Intern for Google Maps in New York City

***Savina Kim, Class of 2012***

***Yale Unversity, Class of 2016***

Science Research Assistant, Therapeutic Radiology Lab, Yale School of Medicine

National Institute of Health Intern in Autism Policy work

Summer 2014, Richard D. Light Fellow, Korea, Public Health Research and Language Study

***Rachel Lordahl, Class of 2010***

***Stony Brook University, Class of 2015***

Summer 2014 in Madagascar participating in lemur research

Published research paper, *Diversication of Lineages and Traits Supports Multiple Adaptive Radiation in Babblers*

*(Aves:Timaliidae)*

***Philip Mauser, Class of 2012***

***Stony Brook University, Class of 2016***

Professor’s assistant in Arduino data collection

Electrical Lead of Solar Boat Team

***Rajkumar Pammal, Class of 2013***

***Harvard University, Class of 2017***

Harvard Global Health Internship, St. John’s Research Institute, Bangalore, India

***Erica Portnoy, Class of 2011***

***Princeton University, Class of 2015***

Computer Science research, Using the Web as a linguistic corpus for evidence of change, specifically the

Prepositional Because

Summer 2014, Technology policy startup in Washington, D.C.

***Savitha Racha, Class of 2011***

***Boston University, Class of 2015***

Boston University 7-year Medical program, entering Boston University School of Medicine August 2014

***Arpon Raksit, Class of 2011***

***Harvard University, Class of 2015***

Summer 2014, Math research at Harvard University

***Alexis Tchaconas, Class of 2010***

***Columbia University, Class of 2014***

Researcher, Wigler Lab, Cold Spring Harbor

Work at Developmental-Behavioral Pediatrics Unit at North Shore Long Island Jewish Health System

***Marni Wasserman, Class of 2011***

***Johns Hopkins University, Class of 2015***

Actuarial Intern at ISO

Research in Applied Math to optimize scheduling for Minor League Baseball

***Aaron Wilson, Class of 2011***

***Bucknell University, Class of 2015***

Summer Research Fellowship, Chemistry, studying *Heliobacterium modesticaldum*

***Michelle Zhou, Class of 2013***

***Boston University, Class of 2019***

6-year accelerated Physical Therapy program, Boston University

Summer 2014, Physical Therapy Internship, Birchwood Nursing Home

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