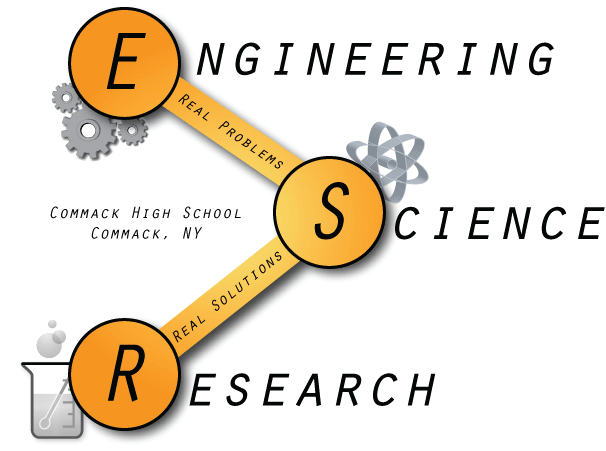
*The Research Dragon*





**Commack High School’s**

**Research Yearbook**

**2015 - 2016**

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

**Thursday May 19th, 2016**

**7:00 pm**

**Evening Events**

Poster Presentation of student projects

Slide Show Presentation… Emily Chen, Monica Cramer

Introduction…………..….Amy Uthup

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

Director of Science, K-12

Student Reflections…..….Jared Habermehl, Alexa Varlamos

Alumni Comments……….Scott Massa, Class of 2015

Guest Speaker………….. Mr. Howard Frauenberger

Retired Engineer

Grumman, Northrop Grumman

Special Recognition Presentation…....Caitlin Passaro

Joshua Zweig, Class of 2014

Rebecca Alford, Class of 2012

Alexis Tchaconas, Class of 2010

Honoring Our Seniors…...Kyle Mitra, Charity Russell

Senior Picture Compilation….Vincent Pennetti

Closing Remarks…..…….Amy Uthup

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

Dr. Daniel Kramer………………Science Teacher

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

Ms. Stephanie O’Brien………….Science Teacher

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

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

Ms. Alison Offerman-Celentano………….. 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 Abbott, Eric Biagi, Toni Boble, Laura Cavalluzzo, Joe Costa,

Lisa DiCicco, Chris DiGangi, Susan Fanwick, Carolyn Gallogly,

Paul Giordano, Dolores Godzieba, Steven Hartman, Camille Horak,

Dr. John Kelly, Dr. Barbara Kruger, Dr. Fred Kruger, Dr. Susan Lee,

Brenda Lentsch, Daniel Meeker, Lee Orth, Eileen Rogers, Genny Sebesta,

Gary Shaw, Jane Sherman, Amy Shushan, Victoria Stack, Dr. Grace Tan,

Lois Webster, and Frann Weinstein.

Ed Storck, Marc Caruso, 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**

David Li - National Semifinalist

Mehtaab Sawhney – National Semifinalist

**Siemens Competition in Math, Science, and Technology**

Abbigayle Cuomo – National Semifinalist

Elizabeth Van Loon – National Semifinalist

**Intel International Science and Engineering Fair**

**Kyle Mitra, Ray Janis**

**Mehtaab Sawhney**

***Awards to be Announced***

**Junior Science and Humanities Symposium**

*Students must apply to the symposium and be selected to present their projects*.

David Li – 2nd Place, Math, Computer Science, and Engineering

Noah Marinaro – 3rd Place, Environmental Science

Lucas Marmorale – 2nd Place, Biology

Mehtaab Sawhney

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

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

David Li, 1st Place, Math, Computer Science, and Engineering

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

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

David Li

**Long Island High School Psychology Fair**

Jordan Cooper

Christine Kim

Juliana Sikorski

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

**Toshiba/NSTA ExploraVision Program**

Karen Abruzzo – National Honorable Mention

Gabrielle D’Agostino – National Honorable Mention

Ryan Dery – National Honorable Mention

Olivia Dubi – National Honorable Mention

Aria Eghbali

Diana Gottleib – National Honorable Mention

Dmitri Gouvoussis – National Honorable Mention

Tara McCaffrey - National Honorable Mention

Tyler Meotti

Jake Novello

Victoria Pensiero – National Honorable Mention

Deniz Sinar – National Honorable Mention

Simon Snowden – National Honorable Mention

Teja Sundar – National Honorable Mention

Amy Uthup – National Honorable Mention

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

**ASE AstroSat Challenge**

Anthony Capua

Jared Habermehl

Spencer Lubell

**Camp Psych Summer Psychology Program**

Juliana Sikorski

**The Math Association of America Joint Mathematics Meeting**

Mehtaab Sawnhey – Student Presenter

**Society for American Gastrointestinal and Endoscopic Surgeons**

Monica Cramer – Student Presenter

*This marks the first time in Conference history that a High School student has been invited to present*

**Cubes In Space**

Kazuo Nakamura – National Honorable Mention

Kyle Spinelli – National Honorable Mention

**Exploration of the Moon by Secondary Science Students**

Michael Delmonaco – Part of Top 4 Scoring Groups

Nicole LaReddola - Part of Top 4 Scoring Groups

Trevor Rosenlicht - Part of Top 4 Scoring Groups

**NYIT Connect-to-Tech Engineering & Technology Competition**

Abbigayle Cuomo – 1st Place

Kyle Mitra – 1st Place

Raymond Janis – 1st Place

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

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

Abbigayle Cuomo

Emily Chen

Jordan Cooper

Raymond Janis

David Li

Kyle Mitra

Vincent Pennetti

Charity Russell

Mehtaab Sawhney

Elizabeth Van Loon

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

Abbigayle Cuomo – 3rd Place, Earth and Environmental Science

ASU Walton Sustainability Award

NASA Earth System Science Award

Raymond Janis – Yale Science and Engineering Award

David Li – 3rd Place, Embedded Systems

INTEL Award

Kyle Mitra – Yale Science and Engineering Award

Vincent Pennetti – 3rd Place, Plant Science

Mehtaab Sawhney – 1st Place, Mathematics

Mu Alpha Theta Award

Elizabeth Van Loon - 3rd Place, Earth and Environmental Science

ASU Walton Sustainability Award

NASA Earth System Science Award

*All First Place winners advance to International Science and Engineering Fair,*

*Phoenix, Arizona*

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

Paulina Buchta

Michael Delmonico – 1st Place, Earth Science

Nicole LaReddola - 1st Place, Earth Science

Daniel Lee

Amanda Loo

Samuel Petruzzi – Honorable Mention, Environmental Science

Nicole Pignataro

Trevor Rosenlicht - 1st Place, Earth Science

Meghan Russo

Yasmin Sahin

Anoop Singh

Maxwell Sugarman

Muzzafar Tasoglu

Jeremy Vlacancich

Matthew Wu

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

Abbigayle Cuomo - Honorable Mention, Earth and Environmental Science

Emily Chen – 1st Place, Robotics and Systems Engineering

Jordan Cooper – 1st Place, Translational Medicine

Raymond Janis – Best in Fair

–RICOH Sustainability Award

- American Meteorological Society Award

- Advancing to ISEF

David Li – 3rd Place, Embedded Systems

Kyle Mitra – Best in Fair

-RICOH Sustainability Award

- American Meteorological Society Award

- Advancing to ISEF

Vincent Pennetti – 1st Place, Plant Science

Charity Russell – 2nd Place, Animal Scinece

Mehtaab Sawhney – Honorable Mention, Math

Elizabeth Van Loon – Honorable Mention, Earth and Environmental Science

**WAC Lighting Foundation Invitational Science Fair**

Zack Abrams

Abinya Anand

Brandon Axelrod – Honorable Mention, Chemistry

Mia Bornfriend - 3rd Place, General Biology

Ruslan Burns - 3rd Place, General Biology

Sean Camiolo

Anthony Capua

Rahal Chakravorty – Merit Award, Prototype Engineering

Gabriel Chan - 3rd Place, General Biology

Julia Cicalo

Christopher Collado - Merit Award, Prototype Engineering

Jonathan Collado - Merit Award, Prototype Engineering

Gabrielle Cooper

Jordan Cooper – Honorable Mention, Biochemistry and Molecular Biology

Abbigayle Cuomo

Gabrielle D’Agostino

Matthew Damiata – 3rd Place, Prototype Engineering

Isabella Daquita - 2nd Place, General Biology

Emily Della Pietra

Michael Delmonico

Ryan Dery - Honorable Mention, Prototype Engineering

Olivia Dubi- Honorable Mention, Prototype Engineering

Dmitri Gouvoussis - Honorable Mention, Prototype Engineering

Eliana Gruvman - 3rd Place, General Biology

Samantha Gray - 2nd Place, General Biology

Vignesh Gunasekaran

Jared Habermehl

Jessica Hastings – Honorable Mention, Chemistry

Alex Horowitz

Rafael Iskra - 3rd Place, Prototype Engineering

Aryana Javaheri - Merit Award, Prototype Engineering

Maheen Khan

Christine Kim – Honorable Mention, Behavioral Science

Helen Kouokoulas – 2nd Place, General Biology

Nicole LaReddola

Anthony LaSala

Daniel Lee -3rd Place, Earth and Environmental Science

Delina Levine - 3rd Place, General Biology

William Liu

Spencer Lubell

Joshua Mann

Lucas Marmorale

Emma Matz – 3rd Place, General Biology

Brendan McCaffrey

Tara McCaffrey - Honorable Mention, Prototype Engineering

Paul McDonough - Merit Award, Prototype Engineering

Nicolette McKeon – Honorable Mention, Chemistry

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

Paul Mokotoff

Paul Moon - 3rd Place, General Biology

Nicholas Nasis

Jake Nieto - 3rd Place, Prototype Engineering

Eric Nigro

Kristin Orrach

Megan Padgett

Kelly Page

Caitlin Passaro

Victoria Pensiero

Trevor Rosenlicht

Charity Russell - 3rd Place, General Biology

Juliana Sikorski - Honorable Mention, Behavioral Science

Deniz Sinar

Anoop Singh - 3rd Place, Earth and Environmental Science

Simon Snowden - Honorable Mention, Prototype Engineering

Max Sugarman – Honorable Mention, Earth and Environmental Science

Carly Tamer

Cunyed Tasoglu – 3rd Place, Earth and Environmental Science

DeVaughna Tulloch

Amy Uthup – Honorable Mention, Prototype Engineering

Elizabeth Van Loon

Alexa Varlamos

Jeremy Vlacancich – Honorable Mention, Earth and Environmental Science

Ryan von Hof

Matthew Wu – Honorable Mention, Earth and Environmental Science

Peter Yu

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

Abinya Anand

Christopher Collado

Jonathan Collado

Gabrielle D’Agostino

Matthew Damiata – 3rd Place, 10th Grade Projects

Ryan Dery

Dmitri Gouvoussis

Raphael Iskra - 3rd Place, 10th Grade Projects

Mikayla Katz

Hamsa Khan

Anthony LaSala

Daniel Liu

Frank Mastroianni

Paul McDonough

Jake Nieto - 3rd Place, 10th Grade Projects

Caitlin Passaro

Victoria Pensiero

Charity Russell

Deniz Sinar

Simon Snowden

Peter Yu

**Molloy College Science Fair**

Gianna Anderson

Aaron Angeles

Emma Baker

Paulina Buchta

Daniel Cho

Daniel Czop

Alexis Davitashivili

Cathleen Deutsch

Eli Gonzalez

Austin Heller

Mikayla Kelly

Amanda Loo

Kazuo Nakamura

Zachary Peare

Samuel Petruzzi

Sarah Samad

Chase Schare

Maya Snowden

Kyle Spinelli

Lauren Tuffy

Benjamin Wolgang

Kevin Zhou

**Long Island Science Congress**

Adam Abdabhai

Jung Soo Ahn

Miles Bi

Alyssa Byrnes

Daniel Cho

James Cutrone

Michael D’Elia

Kyle Dituro

Jeremy Faust

Bridget Flynn

Julia Greco

Jason Haber

Joshua Hardoon

Joshua Kaplan

Yeil Kim

Joshua Lee

Jamey Meotti

Pragati Muthkumar

Sean Pak

Jack Romondet

Jack Schoenfeld

Sidney Sirota

Maeve Smart

Justin Tollin

Nicholas Tringali

Kevin Zhou

*Results to be Announced*

**Medical Marvels Challenge**

Alexis Davitashivili

Emily Della Pietra

Raphael Iskra

Nicole LaReddola

Yasmin Sahin

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

Karen Abruzzo

Julio Alves

Nicholas Bitoni

Sean Boylan

Kathy Cao

Andrew Ciccarelli

Monica Cramer

Aria Eghbali

Jessica Fecht

Jake Gefland

Diana Gottleib

Austin Izen

Alexa Karadenes

Mikayla Katz

Hamsa Khan

Ibrahim Khan

Catherine Kim

Jared Kirschner

Taylor Lipton

Noah Marinaro

Frank Mastroianni

Tyler Meotti

Sam Morris

Jake Novello

Vincent Santangelo

Manvi Sharma

Teja Sundar

Erick Vaysman

Douglas Verity

Johann Yang

**SAAWA Fair**

Ruslan Burns

Alyssa Byrnes

Gabriel Chan

Daniel Choi

Julia Cicalo – 3rd Place, Biology

Jordan Cooper

Daniel Czop

Cathleen Deutsch

Jessica Fecht

Bridget Flynn

Jake Gelfand

Austin Heller

Rayond Janis

Alexa Karadenes

Ibrahim Khan – 3rd Place, Physics

Christine Kim

Taylor Lipton

Lucas Marmorale

Kyle Mitra

Paul Moon

Sam Morris

Pragati Muthkumar

Megan Padgett - 3rd Place, Biology

Kelly Page - 3rd Place, Biology

Caitlin Passaro

Vincent Pennetti

Charity Russell – 1st Place, Biology

Chase Schare

Juliana Sikorski

Lauren Tuffy

Ryan von Hof

Johann Yang

**Secondary Science Research Journal**

Noah Marinaro, Author

**ABSTRACTS**

**SENIORS**

*Rahul Chakravorty, Aryana Javaheri*

**The Incorporation of Mobius Characteristics in Bridges**

Human-made structures are susceptible to natural destructive elements such as hurricanes and tornadoes that produce forces that may weaken them, possibly leading to structural failure. These natural phenomena can induce forces such as compression, tension, torsion and shear. Although the effect of these forces can be reduced by using advanced materials such as carbon based composites, the methods used to produce said materials are costly and/or volatile, and therefore have not been useful in advancing the standard designs of modern bridges. Because of this, most recent advancements in this field have been small changes in the alloy composition of the steel used for bridge-building. While this has resulted in improved resistance to forces, results have been relatively minute and more can be done to create better bridges. To potentially quicken the speed of advancement being made in force resistance, another approach to strengthening bridge design can be manipulating the standard designs of modern bridges. The purpose of this project was to observe the possible advantages to incorporating Möbius characteristics in bridge deign. Not only could the Möbius structures possibly provide more structural integrity and durability against natural phenomena, it can do so while using less material in comparison to current standard bridge design. Our results indicated that the incorporation of Möbius characteristics evenly distributes the forces on the bridges and reduces the overall stress on the bridge itself thus making potentially higher resistant bridges.

*Emily Chen*

**Smart Windows for Modulating Space Heating**

Glass windows are a major source of energy loss from buildings. Through new technologies and designs, windows have become more and more efficient. Currently there is emphasis on the development of smart windows, which can absorb infrared light (IR) or heat, instead of passing it through the window. Smart windows use electrochromism, which is applying electricity to induce a color change in the glass. This color change causes IR to be absorbed which decreases the amount of heat being transmitted through. In this study, tungsten trioxide (WO₃), having electrochromic properties, was used as the material to coat the window glass. It changes color when ions seep into spaces between the WO₃ layers when a current is applied. The objective of this study was to test the efficiency of various ions, Ni2+, Na+, and Mg2+ in which they intercalate with WO₃ to absorb infrared light. NaCl and MgSO₄ solutions were used because they are safe and readily available common salts. NiCl2·6H2O was used to test a hydrated salt. UV-Vis-NIR spectrophotometer data revealed that Ni2+ showed activity in intercalating and deintercalating with WO₃ glass. MoO₂ was used in place of WO₃, achieving similar results compared to WO₃ to show that other transition metal oxides can also be used. A prototype window was designed that consisted of double paned semiconductor glass, WO₃ in between, and a hole to inject ion solution and showed that ions Ni2+ and Mg2+ have the potential to be used in electrochromic windows to conserve energy.

*Daniel Choi, Johann Yang*

**The Effect of Ginger (Zingiber Officinale) on the Neuroinflammation Precipitated by Environmental Copper.**

Environmental factors can  have significant deleterious effects on the onset of neurodegenerative disease.  The introduction of environmental copper particles that can come from the inhalation of airborne copper or the ingestion of contaminated water from degrading copper pipes has been suggested as a primary agent in producing such effects. Research shows that copper particles can precipitate neuroinflammation both by upregulating certain pro-inflammatory cytokines including the IL-1B gene, and by downregulating anti-flammatory cytokines such as the IL-10 gene. To combat the onset of neurological disease, flavonoids have been used as a substitute for more conventional pharmaceutical medications especially in Asian countries through the use of herbal and natural medicines. Flavonoids are secondary plant metabolites that are especially beneficial in their anti-inflammatory effects, and are found in many common fruits and vegetables including ginger, a root that has historically been used to treat a variety of diseases. In this research, we treated HTB-11 neuroblastoma cells with copper particles in conjunction with a ginger extract. Then, DNA analysis on cytokines IL-10 and IL-1 Beta, general anti- and pro-inflammatory genes respectively, was completed to look for the up or down regulation of these genes associated with each treatment. We hypothesized that the presence of ginger would alleviate the neuroinflammation that we expected the copper particles to produce. We found that for the IL-10 anti-inflammatory gene, ginger would generally upregulate the expression of this gene even when in conjunction with copper particles, supporting the claim that flavonoids have potential in combating neuroinflammation.

*Monica Cramer*

**Analysis of Multi-center Robotic Inguinal Hernia Outcomes Across New York State**

Background: Utilization of robotics for inguinal hernia repair is steadily increasing. A major criticism surrounding this technology centers on its adoption outpacing supportive data. Additionally, a uniform benchmark of proficiency is not established with volume serving as a questionable surrogate marker. This study represents one of the first to date assessing outcomes following robotic surgery as well as the impact of hospital and surgeon volume on outcomes.

Methods: Following institutional review board and New York State approval, 19,677 patients who underwent laparoscopic and robotic inguinal hernia (RIH) repair from 2010-2013 were identified. Patients were identified using the New York Statewide Planning and Research Cooperative System (SPARCS) longitudinal administrative database. Chi-squared tests compared unadjusted marginal differences for categorical variables and Welch’s ANOVA and non-parametric tests compared unadjusted marginal differences for continuous variables. Propensity score (PS) analysis was used to estimate the adjusted marginal differences.  P-value<0.05 were considered significant.

Results: In total, 284 patients underwent RIH at 37 institutions (range 1–51 operations). Univariate analysis demonstrated RIH repair had significantly higher rates of complication (12.7% vs. 0.9%, p<0.0001), 30-day readmission (6.3% vs. 1.3%, p<0.0001), 30-day emergency department (ED) utilization (11.3% and 5.3%, p<0.0001) and longer length of stay (LOS) (2.3 vs. 0.2 days, p<0.0001) in relation to laparoscopy. The majority (90%) of robotic complications were minor and related to digestive issues. A significant discrepancy in population characteristics and comorbidity profile was demonstrated prompting PS analysis. PS analysis demonstrated no significant difference in any clinical outcome metric between procedures: complication (p=1), readmission (p=0.7), ED utilization (p=0.13), and LOS (p=0.31).

Patient outcomes were also compared among cumulative RIH hospital volume classifications: (≤10, 11-20 and ≥21) and surgeon volume classifications (≤5, 6-10 and ≥11). No significant difference in any outcome metric was demonstrated by volume. Hospital volume: complication (9.5% vs. 12.7% vs. 14.9%, p=0.47), readmission (6.3% vs. 5.5% vs. 6.7%, p=0.58), and ED utilization (11.6% vs. 10.9% vs. 11.2%, p=1.0), and complication (9.5% vs. 12.7% vs. 14.9%, p=0.47), respectively. Surgeon volume: complication (7.6% vs. 11.4% vs. 17.0%, p=0.08), readmission (8.6% vs. 4.6% vs. 5.2%, p=0.58), and ED utilization (13.3% vs. 11.4% vs. 9.6%, p=0.67).

Conclusion: In relation to laparoscopy, robotic surgery did not result in significant outcome differences in terms of complications and perioperative health resource utilization. Hospital and surgeon volume also did not impact patient outcome in this study.

*Brianna Delgado*

**Simulating Microbial Communities to Model Network Evolution**

The purpose of this investigation was to create a model to simulate biological communities after exposed to infection or disease. The harshness of environmental networks often range, some with rampant node loss (e.g. a computer network after exposed to a virus); while other networks operate under milder environments (e.g. a phone network with customers being occasionally lured away by competitors). The MassExodus code is a computer program that analyzed the evolution of a network through a loss of a burst of nodes by an infection, but the program majorly focused on non-biological networks and systems. The MassExodus code was analyzed to observe its current functionality and capabilities. Changes were made to code’s customization by adding new variables to the code such as the level of harshness, the number of nodes, the number of iterations, and more. Both variants of the code had their eigenvalues tested to analyze if the new program was consistent with the MassExodus code. The topology of the networks generated from the new program as well as the similar clustering of the eigenvalue were preserve so the accuracy of the new program is consistent with MassExodus. The new program created has more variability and can test more than within MassExodus, allowing more changes with the networks inputted into the code.

*Victoria Ferlauto*

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

The purpose of this investigation was to test the response of planarian to light during their regeneration process using a phototaxis 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 phototaxis, and it is suppressed during the regeneration process. It is hypothesized that this response will be restored to the planarians five days after the regeneration process has begun. To carry out this study, I 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 phototaxis had not been restored, and the opposite is true if the planaria does move into the darker region. Most of the planarian regained their negative phototaxis five days after being cut. This data supported the hypothesis because 88.83% of the planarian tested regained their response to light after five days.

*Jake Finnell*

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

This project was conducted to determine if the memory of a planaria could be 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 has 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. I would repeat this process ten times and then just shine a light and see for reaction. I discovered that the planaria associated the light with the shock. Then the planaria were split, separating the brain and the rest of the body with the use of a razor blade. After, testing was conducted on the part of the planaria that was severed from the original brain, and I discovered that the memory of the planaria was transferred to the regenerated offspring. This project can increase the understanding of segmentation related to the nervous system and can be applied to human body-part regeneration.

*Vignesh Gunasekaran*

**Does St. John’s Wort Cause Addiction in Planaria?**

This investigation was designed to assess whether or not St. John’s Wort (*Hypericum perforatum*) causes addiction in planaria. Addiction is defined as the development of physical dependence to a substance, and can be observed by the presence of withdrawal symptoms when an organism is withdrawn from the substance. St. John’s Wort is an herb with antidepressant properties, and in a previous investigation, I found that it was effective in reducing nicotine withdrawal symptoms in planaria. Planaria, which are free living flatworms commonly found in freshwater environments such as lakes and streams, were used for this investigation because they are one of the simplest organisms to have a brain and central nervous system. In this investigation, the planaria were split into 2 groups based on what they were pretreated with: Water (control) and St. John’s Wort. After pretreatment, the planaria were placed in a gridded petri dish that contained water, and their movement was measured by counting the number of gridlines they crossed in one minute. If St. John’s Wort causes addiction in planaria, then withdrawal from it will induce withdrawal symptoms (which will be quantified by a decrease in the number of gridlines crossed when compared to the control). I hypothesized that St. John’s Wort would not cause addiciton in planaria because there has been no scholarly literature saying it is an addictive substance. My results so far have supported this hypothesis because the planaria that were removed from the St. John’s Wort solution have not shown quantifiable addictive withdrawal symptoms.

*Austin Izen, Erick Vaysman*

**The Development of Sports Equipment for the Mentally and Physically Disabled**

The participation of children with disabilities in sports and recreational activities promotes inclusion, increases the amount of conditioning, optimizes physical functioning, and enhances overall well-being. By allowing children with disabilities to more easily participate in the same sports and athletic events as other children, their self-esteem was boosted, as well as their physical fitness, health, and overall well-being. Children who have autism struggle to stay focused on one event at a time. This project was designed to develop a baseball glove to make it easier for children with special needs to catch a ball. The glove is made so that the kids were able to learn the motion of catching a ball. A second ‘sheet’ was used to serve as a netting surrounding the glove. It formed a cone-like shape, which made it easier to catch the ball. The ball can easily land into the glove without the athlete closing their hand, but they can still have the feeling of catching the ball. Since their reactions are delayed, they were able to ‘catch’ the ball after it is already in the glove. The ‘sheet’ netting was also used to catch faster hit baseballs. The extra force of the baseball was able to increase tension in the second netting. The increased tension pulled the ends of the glove together to squeeze the ball. Although it required more skill to get the glove in the correct position to shield the children from the incoming ball,, it provided a defense mechanism for the children to help them catch the faster, more dangerous balls. After some practice, the kids were able to use a normal glove.

*Aryana Javaheri – See Rahul Chakravorty*

*Daniel Jung*

**The Correlations Between Systemic Problems, Age and Gender to the Severity of Periodontal Disease**

Periodontal disease is a serious inflammation of the gums that can cause pockets of infection around the roots and crowns of teeth, loss of bone, damage to gum tissue which will lead to tooth loss, if not treated. It has been previously shown that there are correlations between certain attributes, such as age and gender, to the presence of periodontal disease (Greene, 1963). But more importantly, there have been a growing number of recent studies associating rising numbers of people who suffer from periodontal disease to prevalent systemic problems such as cancer, cardiovascular disease, and preterm birth (Meyer et al., 2008). In addition, there is research made on correlations between systemic problems, such as type 2 diabetes, and periodontal disease, but such studies focus only on the prevalence of periodontal disease (Sandberg et al., 2000). This study attempted to come upon correlations between the severity of periodontal disease to age, gender, and systemic problems by comparing the probing pocket depths and bleeding on probing between patients. Due to the many variables affected by periodontal disease, a patient scoring system was developed in order to be able to compare patients with a single variable. Then, the scores were analyzed to find significant data by means of ANOVA and t-tests. Thus far, the research has shown minimal significant data. It is assumed that this is due to a small sample size. If correlations are found, doctors and dentists will be able to have a more probable cause for one’s periodontal disease or systemic problems.

*Mikayla Katz*

**Differences in Comorbid Disorders Between Males and Females with Tourette’s Syndrome And Persistent Tic Disorders**

Tourette’s Disorder (TD) is a childhood onset neurodevelopmental disorder which consists of unwanted motor and phonic (vocal) tics. In recent studies it has become evident that males have a three to four times greater prevalence of Tourette’s Disorder compared to females. In some studies this has been attributed to differing pre-natal brain and muscle development in boys vs. girls. There has been little research to investigate why Tourette’s Disorder, and many other neurodevelopmental disorders, including autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD), are more prevalent in males. The aim of this study was to investigate the differences between young males and females with TD and tic disorders and comorbid disorders in a small sample from a specialized clinical program for tics and Tourette’s Disorder. The data from this study came from conducting behavioral tests and then comparing males and females using statistical tests. Some of these tests measure OCD, ADHD, depression, anxiety, internal problems and external problems. I hypothesized that my results will indicate that females have more internalizing problems such as OCD, while males will have more externalizing problems like ODD. My results show that there is little to no statistical difference between males and females with tics and Tourette’s Disorder. My research will add knowledge to not only how males and females differ with respect to Tourette’s Disorder but also help gain knowledge about which neurodevelopmental disorders are more prevalent in males than females.

*Ibrahim Khan*

**Explore the Effect of Resonance Frequencies and the Resulting Vibrational Patterns Produced on Flat Planes**

The purpose of this investigation was to explore the resonance vibrations of flat planes similar to those in Chladni plates, which are vibrating membranes. Ernst Chladni examined the vibration in circular plates with reference to the vibration of musical instruments. Vibrations decrease the structural integrity, making a structure (in this case a plate/board) more prone to failure. This is applicable in bridges where a hanging plane, the bridge surface, is subject to the vibration of the traffic on the bridge. For example in 2000, the London Millennium Footbridge (a steel pedestrian suspension bridge) experienced structural instability. The resonance from the foot traffic caused the bridge to sway; this reduced the structural integrity of the bridge (Dallard P 2001). In this study, a bridge was modeled using a plywood board as the bridge bed; with the vibration in the board due to sound (mimicking the foot traffic), Dampers, objects which inhibit vibrations, were be implemented with the intention of increasing structural stability. The vibrations were detected/measured by the movement of fine sand on the plane’s surface. With the original method of applying the sound, the vibration was found to be minimal; however when the sound was more directly applied, the vibration patterns were more prominent. The optimal placement of the dampeners to more efficiently curb the vibrations is of further study.

*Ryan Lee*

**A Comparison of the Visual Reaction Time Between Student Athletes and Non-Athletes**

The purpose of this study was to determine if playing sports has an effect on a person’s visual reaction time. Mental chronometry is the empirical study of reaction time. The first reaction time procedure tested beyond simple reaction time was testing using multiple reaction stimuli by Dutch physiologist Donders in 1969. Generally, reaction time increased when there are a greater number of choices due to the trade-off between the person’s accuracy of testing and speed of response to the stimuli. Reaction time based on number of choices can be estimated using the function RT = a + b log**2** (n + 1), where RT is the reaction time, a and b are constants affecting slope and intercept, and n is the number of alternative choices. The speed of information processing and response can be increased significantly through practice. An app Reaction Speed Trainer was used to conduct the tests. Male and female high school students were given questionnaires regarding their history of playing sports and a consent form for their testing from their parents. Each participant took three different reaction time tests ten times each. Each test had a different number of variables. (one choice, two choices, and three choices) Data was collected and each participant was analyzed and compared to each other with factors such as the sports that they played, number of hours/week spent playing the sport, gender, and videogame experience because this may also have a deep impact on test results, etc. The data showed that generally athletes have better reaction times than non-athletes.

*David Li*

**A Multi-Dimensional Implementation of Named Data Networking for Embedded Systems**

In applications of wireless sensor networks, it is important to aggregate information within the network based on metadata associated with the data, such as time and location. Thus, the purpose of this study was to develop a networking protocol that enables an application to flexibly gather data in a network by specifying time range, geographic range, and data type. The solution was developed based on the Named Data Networking (NDN) protocol, which was adapted to the Raspberry Pi single board computer. Named Data networking is a computer networking paradigm that abstracts information in a network to the content of the data rather than the location of the device that holds the information. Then, a modified protocol was developed to specify and route information based on metadata. To test the efficiency and scalability of the new protocol, sample temperature data was generated, in addition to its metadata. Then, data was sourced from the network using both protocols, with routing times measured for different network sizes. It was concluded that the new protocol’s complexity grew much slower for the same problem than the existing NDN protocol. This network technology has implications in GIS, medical settings and home security monitoring.

*Noah Marinaro*

**An Investigation of Past and Current Weather Data from Mohonk Preserve, 1890 to 2012**

Climate change has been an important and controversial issue in science and politics. In order to get a long range view of this issue, it is imperative that historical weather data be used. The goal of this investigation was to analyze historical and modern weather data from Mohonk Preserve in New Paltz, New York to determine climate from 1890-2005. Data from historical log books at the Mohonk Preserve from 1890 to the present day were obtained. The maximum and minimum temperatures were recorded in the logbooks and transferred from logbooks into Excel spreadsheets. It was hypothesized that a warming trend would be observed that is similar to global climate trends. The data supported this hypothesis that the temperature has increased over the past 120 years. The minimum temperature of colder months has risen 4.7°F in 120 years and the maximum temperature of the warmer months has risen 2.7 °F in 110 years. The number of days above 90 °F for the warmer months increased by a factor of 20 between the periods 1896-1905, and 1996-2005. The temperature increase was about the same with respect to the global climate trends in the summer, but a higher extreme in the winter.

*Lucas Marmorale*

**The Structure of the Nuclear Pore Complex in Primary and Metastatic Prostate Cancer Cells**

Prostate cancer is the most common cancer among American males, and one of the most lethal diseases in its late stages. While there are treatments that tend to be successful in the early stages of prostate cancer, there is no current cure or effective treatment for the disease once it metastasizes. In recent studies, the nuclear pore complex (NPC) including the nucleoporin POM121 have been shown to be related to the aggressiveness of prostate cancer. The purpose of this study was to analyze the differences in the structure of the NPC between primary and metastatic tumor cell nuclei. It was hypothesized that the metastatic nuclei would have a higher concentration of nuclear pores, and each metastatic NPC would have a greater presence of POM121 than the primary tumors. The results supported the hypotheses, and it was also found that primary tumors are larger on average compared to metastatic tumors, and there is no significant difference in the width of the NPC in both cell types. Since metastatic tumor nuclei have a greater concentration of nuclear pores and more POM121 in each NPC, these traits can correlate to a more aggressive cancer. Further studies in to the direct relation of the presence of POM121’s effect on the structure of cells, and possible testing of treatments that affect cell structure or presence of POM121 in the cell can be used to further develop a possible new treatment for metastatic prostate cancer.

*Caitlin Passaro*

**Stress, Compassion Satisfaction/Fatigue, and Burnout in Mental Health Professionals**

The purpose of this investigation was to determine the level of stress that different mental health professionals experience related to their work and the level of satisfaction or fatigue experienced. A growing problem with stress and reduced job satisfaction of mental health professionals has led to a renewed interest in studies of the correlation between stress and job performance. Many different scales of measurement have been created such as the measurement of the Index of Clinical Stress and the Compassion Satisfaction/Fatigue Scale. It has been found that between 20% and 30% of general practitioners have abnormally high stress levels. This information is important because mental health professionals are looking for new ways to cope with their high stress levels to be more effective in their individual practices.

In this study, an online questionnaire/survey was made available on “Survey Monkey” to approximately 200 mental health professionals through the Suffolk County, New York Psychological Association and the Kenneth Peter Center. The objective was to determine the levels of stress that different mental health professionals experience related to their work, to determine the levels of satisfaction or fatigue experienced, and other factors (e.g. gender, age range, type of mental health professional, type of practice) that may impact stress level or satisfaction/fatigue. It was hypothesized that there will be a direct relationship between compassion fatigue and stress levels higher than the normal levels determined by the measurement of the ICS. It was also hypothesized that there would be a higher percentage of male mental health professionals who experience higher levels of stress when compared to female mental health professionals. Results show that every one of the forty mental health professionals who participated in the survey obtained surveys scores that indicated significant stress, moderate to extremely high risk compassion fatigue risk, and moderate-extremely high risk burnout risks. There were not enough male participants to draw comparison between female and male mental health professionals. Setting of practice did not show have any significant difference in scores between the mental health professionals.

*Vincent Penneti*

**A Genetic Analysis and Organogenesis of Unique Clover Phenotypes**

The objectives of this study were to perform organogenesis on clover leaf tissue and to establish an association between distinct variations phenotypic expression of clover through PCR. The phenotypic expression of plants often dictates their success as an ornamental plant and forage quality. By performing organogenesis on clover leaf tissue expressing the unique multifoliate phenotype, it may be possible that the plant resulting from the culture of multifoliate tissue expresses the multifoliate phenotype at a higher frequency than the explant it was cultured from. The growth regulators used for organogenesis of clover tissue are Benzylaminopurine (BAP) and Naphthaleneacetic acid (NAA). These growth regulators were in a bilayer medium and successfully induced significant growth and replication of a flower head. Additionally, certain phenotypes of clover regulate the forage quality of the plant. The activity of a family of R2R3-MYB genes in clover is responsible for the accumulation of anthocyanin pigments in leaf tissue which in turn increase the forage quality of the plant. It is not known if the phenotypic expression of red leaf, green leaf, red V, and white V are caused as a result of different genes or if a lack of expression of the gene and so a comparison between plants expressing the individual phenotypes could determine whether or not it is an expression issue. The application of methodologies used in this study is unique and the results may have application to the isolation and expression of specific clover phenotypes.

*Adam Portnoy*

**Identifying Weather Trends Over a 100 Year Time Period on the North Shore of Long Island, NY**

Climate change is a change in the statistical distribution of weather patterns, that change over an extended period of time (i.e., decades to millions of years). There is increasing controversy about whether the current trends in global warming are due to human sources or whether they reflect a natural trend due to factors that are not caused by humans. Historical climate analysis is important in determining trends for the future. The goal of this investigation was to analyze weather trends over a 130 year period (1885-2015) collected from the North shore of Long Island by the Strong Family of East Setauket. The weather station from which the temperature has been recorded has been located at the same place for the entire 130 year time span. It was hypothesized that over the time period of 130 years the number of warmer days as well as the mean temperature, will increase significantly. The data supported the hypothesis and found that the change was significantly different over the time period.

*Mehtaab Sawhney*

**A Study of Bar and Arc-K Visibility Graphs**

Bar Visibility Graphs were introduced by Duchet et al. and Schlag et al. to model Very Large Scale Integration (VSLI), the process where thousands of transistors are wired together on a chip. In particular, Bar Visibility Graphs record the direct vertical visibilities between a given set of horizontal bars. Dean et al., Babbitt et al. and Hutchison generalized Bar Visibility Graphs to Bar and Arc k-Visibility Graphs. In this project the maximal number of edges in an Arc k-Visibility Graph with n vertices is improved to at most (k+1)(3n-(3k+6)/2) edges for n>4k+4 and (n)(n-1)/2 for n<4k+5. Then the maximal edge bound given in Babbitt et al. for SemiArc k-Visibility Graph is shown to be optimal, disproving a conjecture given by Babbitt et al. Additionally this project makes progress towards classifying Bar k-Visibility Graphs by proving that a family of Bar i-Visibility Graphs is never contained in a family of Bar j-Visibility Graphs for i not equal to j. Finally the concept of random Visibility Graphs are introduced and the expected number of edges in a SemiBar k-Visibility Graph is calculated.

*Hassam Syed*

**Social Behavior of Students in a High School Cafeteria and the Importance of Food**

Human interaction is a very important aspect of life. In recent years, it has been shown that more children and teenagers have been using cellular devices, decreasing their sociability as they are avoiding direct interaction with others. In this study, students will be observed in a school cafeteria, which is a common place of interacting with peers. As they take part in their regular lunch-time routines, their behavior and interactions will be monitored. Behaviors include different types of smiling, speaking while eating as opposed to not speaking while eating, using their cell phones as opposed to conversing with their peers, etc. The frequencies of the actions will be recorded to determine a trend in their behavior. This will occur in three stages: in the beginning of the lunch period before the students are eating food; while they are eating food; and at the end of the lunch period when the students are done eating. By observing during these specific times, the significance of food’s impact on the students’ behavior will also be found. This study is significant because it relates to the social skills of students in our schools today.

*Erick Vaysman – See Austin Izen*

**UNDERCLASSMEN**

*Adam Abdabhai, James Cutrone, Joshua Lee*

**The Effect of Caffeine on the Regeneration Rate of Planaria**

Planaria are model organisms for behavioral toxicology research. They have a “primitive brain” with many features common to vertebrate nervous systems. Nearly all the neurotransmitters found in mammals are also present in planaria, making the useful to study nervous system development and regeneration. Caffeine is a known stimulant and increases alertness. The purpose of our experiment was to study the withdrawal behavior of caffeine on planaria by looking at the regeneration rate after exposure. Previously, locomotion activity was used to measure withdrawal symptoms. We exposed the planaria to Lipton caffeinated and decaffeinated tea for 5 minutes and used water as a control group. Afterwards, we cut the planaria in half and measured the regeneration rate over 2 days repeatedly.

*Zack Abrams*

**Can Morphological Damage to a Hippocampal Neural Cell Line by Cyclophosphamide Treatment be Ameliorated by Increasing Neurogenesis?**

An estimated 1.5 million people were diagnosed with cancer in 2015, and many of these people will turn to chemotherapy. However, evidence suggests that chemotherapeutic agents can negatively affect a patient’s brain in a phenomenon known as “chemobrain”. Prior research has shown that injecting stem cells into the mouse hippocampus after chemotherapy can restore cognitive function. Therefore, the purpose of this study was to determine if increasing the proliferation of hippocampal neuronal cells before exposing them to cyclophosphamide, a chemotherapeutic agent, would allow the cells to be more complex and confluent than unaltered cells. To study the effect of increasing proliferation, a mHippo E18 mouse hippocampal neuronal cell line was plated and cyclophosphamide was added to model a mouse hippocampus undergoing chemotherapy treatment. Photos were taken periodically to examine the cells at different stages. Results have not yet been found, but a difference between the cells with increased proliferation and the cells without it is expected to be seen in the cells’ morphology and count. More research can also be done on mice in *vivo* to artificially increase their neurogenesis and look at the effects on behavioral tests and *vitro* analyses after undergoing chemotherapeutic treatments. Understanding how cell proliferation, or “neurogenesis”, affects the health of cells could be a key factor in alleviating the effects of chemotherapy-induced cognitive deficit

*Karen Abruzzo, Diana Gottleib, Teja Sundar*

**The Design and Construction of a Modified Binder for Student Use**

Today, a majority of students use binders to carry papers and notes for class. Binders have been proven to make the lives of students easier and more organized. Although they are very useful, they are not as good quality as they should be. Binders fall apart much too easily, and the main problem are the rings that hold paper. Almost every student that has used a binder can tell you that the rings get unaligned too easily, thus preventing them from easily organizing papers. The purpose of our project was to improve binders, and make them more durable and compact for students, teachers, and businesses. After surveying students and teachers about their likes and dislikes about binders, we were able to create a new binder that incorporates improvements. Not only do the rings last longer, but our binder incorporates other features which are not available such as improved pockets, and even a hole puncher. Our product will help students, teachers, and businesses to be more organized and will also improve binders by making them much more durable and convenient.

*Jung Soo Ahn*

**Pitch Recognition and its Relationship to Language**

The purpose of this study was to test for a correlation between the ability to speak multiple languages and the ability to recognize the pitch difference of two separate interval notes. The motivation for this study was to gain knowledge of the effect of ethnicity in recognizing pitch difference. An interval is the difference between pitches and can be described as melodic if it is related to sounding tones, such as two adjacent pitches in a melody. Pitch is the degree of how high or how low a note is and it is the quality that makes it possible to judge if a note is higher or lower. Studies have shown that musicians from Asia, especially from East Asia, have a higher percentage on average than Caucasians towards recognizing pitch. This ethnicity effect stirred attention towards the possible factors of the ability to recognize pitch from geneticists and cognitive neuroscientists due to the potential genetic factors and environmental factors, such as tone language experience, and musical training style. To carry out this study, non-musicians who were able to speak different languages other than English, listened to several sets of intervals and were asked to differentiate and recognize pitch differences. The results show that the hypothesis that Korean and Chinese speakers are better able to recognize pitch differences compared to English speakers.

*Julio Alves, Jared Kirschner, Vincent Santangelo*

**The Effects of Microbeads on the Survival of Brine Shrimp**

Microbeads are used in many cleaning and cosmetic products. The small pieces of plastic have been found to be in stomachs in fish. They get into waterways because their small size allows them to pass through sewage filtration systems. These beads have been classified as the newest form of plastic pollution in oceans and lakes because of the effects they have on marine life. In this experiment we will be testing the effects the microbeads on brine shrimp to more closely see how they affect one of the lowest animals in the food chain have on marine life. The experiment will consist of four different tanks. Each tank will have fifteen brine shrimp and a different contraction of microbeads. Tank one will have .01 grams of small microbeads, tank two will have .01 grams of large microbeads, And the third tank will have .01 grams of both small and large microbeads, tank four will be the control tank and have no microbeads. Through the course of a week the brine shrimp be left in the dishes with no additives. Our hypothesis was supported, in that the brine shrimp exposed to microbeads had a higher mortality rate. The shrimp in the control group had a greater survival rate than shrimp with any amount of microbead exposure. The small microbead sample experienced a 100% mortality rate by day seven, while the large microbead sample experienced an 93% mortality and only had 1 shrimp alive by day seven. This data shows the harmful effects of microbeads on aquatic life and the importance on banning such products.

*Abinya Anand, William Liu*

**Cogni-Tooth: A Learning Tool Designed to Help Those with a Fine Motor Disability to Improve Oral Care**

Toothbrushes are used extensively throughout the world to maintain dental hygiene. Unfortunately, those who have limited fine motor skills through physical disability have difficulty moving their arms to guide the toothbrush into the crevices in their mouth, resulting in poor hygiene as well as a dependency on a caretaker. The purpose of this project was to design and construct a device for those suffering from Cerebral Palsy and other fine motor disabilities to function as a learning tool to aid in the commitment of limb movements associated with brushing teeth to muscle memory. The central structure of the device was constructed using a nylon tube attached perpendicular to a base of cedar wood. A squared off region on the outer tube was bounded by plastic so the toothbrush can only move in an up-and-down motion.

*Gianna Anderson, Mikayla Kelly*

**Comparative Proteomics of Various Superorders of Fish**

According to Darwin’s Theory of Evolution, every organism came from a common ancestor. Evolution can link every organism on the earth to a common ancestor. The purpose of this investigation was to determine if different suborders of fish have a similar evolutionary makeup.  Using the Comparative Proteomics Kit 1: Protein Profiler Module by Bio-Rad,  we completed protein electrophoresis.  Protein extraction procedure, a gel loading, running, and staining procedure, and a GelAir drying frame method was used to collect data.  The fish that were tested belong to the groups Clupeiformes, Acipenseriformes and Salmoniformes.  The objective was to determine if various types of fish from separate suborders had similar proteins in common. It was hypothesized that if the various fish species have similar evolutionary backgrounds, then they will have more proteins in common. This type of research is important because it helps to the find linkage between different organisms. The social impact of this research is that with the discovery of the proteins in the various organisms can help relate the different organisms.

*Aaron Angeles, Elias Gonzalez*

**Analyzing the Success Of Major League Pitchers Returning from Tommy John Surgery**

The purpose of this project was to investigate the success of Tommy John Surgery among Major League Baseball pitchers. In the 1970’s, Tommy John, a former pitcher for the Los Angeles Dodgers, one day felt a strange pop in his elbow. Over the next few weeks he experienced soreness and pain in and around his elbow. His doctor decided to operate on the elbow with a new revolutionary Ulnar Collateral Ligament (UCL) surgery, which would eventually be named after Tommy John. According to popular opinion in the baseball world, Tommy John surgery is a unwanted risk that pitchers tend to avoid. With rehab and recovery time ranging anywhere from one to three or more years, a successful return to pitching is not guaranteed. Through this project we are seeking to find the success of a pool of MLB pitchers upon return from UCL surgery as well as baseball activity after surgery. The goal of this study was to find repetitive successful comebacks throughout the pool of MLB pitchers according to their performance after returning. To determine success of the pool, we collected pre/post surgery WAR values of 50 Major League pitchers that have at least two years of prior pitching experience. The percent change of the WAR values from before and after their surgery as well as percent change of certain age groups were also calculated. Thus far, results show that average WAR values decrease after surgery, and that there is no correlation between age and percent change of WAR values. Results also show that percent improved is greater in younger pitchers.

*Brandon Axelrod, Jessica Hastings, Nicolette McKeon*

**To What Extent does a Surrounding Environment of Atmospheric Moisture and Ammonium Hydroxide**

**Have on the Bond Strengths of Adhesives in a Cyanoacrylate Solution?**

The purpose of this experiment was to determine the effect of a surrounding environment of atmospheric moisture and Ammonium Hydroxide on the bond strengths of adhesives in Cyanoacrylate glue. Anastomosis, the surgical union of open wounds, traditionally is achieved by the use of surgical suture (stitches). Cyanoacrylate adhesives serve as a popular alternative to stitches in the surgical industry. They make the reconnection of tissue an easy and affordable process, and results in minimal scarring. Ammonium Hydroxide is a common commercial form of ammonia, and it consists primarily of water (H₂O) and ammonia (NH₃). It is a colorless liquid with a strong characteristic odor. This study was beneficial in determining optimal conditions that would result in the strongest bond strength between the glue and the balsa wood structures. Cyanoacrylate adhesives bond very well to slightly moist surfaces, and it was hypothesized that the bond strength of the Balsa wood connected by Cyanoacrylate solution would be affected by different atmospheric humidity conditions, specifically the  different concentrations of Ammonium Hydroxide in the surrounding air. The molarity of NH4OH was varied inside a sealed chamber in which four identical wooden structures that were bonded together with 10 µl of commercial superglue in four locations and left to dry. The experimental structures were left to dry in the chamber with 100 mL of 1M, 2M, 3M, 4M, and 5M of Ammonium Hydroxide. 0M served as a control for the experiment in which more than four trials were conducted. Controlled results were obtained by adding 100 mL of water into the chamber. After about four hours, the structures were tested for bond strength by measuring the breaking point of the structure using the Vernier Structures and Materials Tester. As testing progressed, more force was needed over a longer period of time to break the cyanoacrylate bonds between the glue. It was concluded that there exists a significant difference between 0M of NH4OH and 5M of NH4OH on shear force needed to break the bonds between the structures. The results and conclusions from this experiment can be used not only to benefit doctors who use glue to close wounds but also in a commercial and or home environment.

*Emma Baker, Emily Lupo*

**The Effect of Symmetry on a Person's Perception of Attractiveness**

Your face as it is right now is not symmetrical. Your eyes aren't exactly at the same location on each side of your face, one side of your nose is different than the other and the same is with your lips. The purpose of this investigation, was to find out if symmetry has any effect on perception of attractiveness by utilizing the golden ratio. The Golden ratio appears in nature and art. The golden ratio is a measure of symmetry. It’s based on calculating ratios for a given object where it has perfect symmetry. Studies have shown that there is a mathematical code for beauty. The number it is assigned to is based around 1.6. We used 10 faces, and flipped them to the right and left in Microsoft word. Then they are calculated for the golden ratio of each picture. We randomly choose 10 of the 30 pictures and had participants rate them in terms of attractiveness based on an image scale, our objective was to see if their selection had any correlation to the pictures with a higher golden ratio. Five of the faces used for our project had a correlation to the golden ratio that was .1 or less, seventeen were .26 or less and the other eight that were left were considered to be too far from the golden ratio and aren't considered to be attractive. When these results were compared to the ones obtained from our study the majority of the faces were found to be average after putting them results into a chi test. The number on the Chi test was less than .05 so the null hypothesis was rejected and we accepted the alternative. Which shows that the golden ratio does affect the rate of attractiveness in humans.

*Miles Bi, Michael D’Elia*

**The Correlation Between of Color and Music**

The purpose of the investigation is to see what perceived correlations exist between color and music. Color can be considered a subjective topic due to variation in the human population, as color can be perceived differently by different individuals. Music is defined as vocal and/ or instrumental sounds combined in such a way as to produce beauty of form, harmony and expression of emotion. Both color and music can be considered multi-sensory in humans, using both sight and sound to experience them fully in relationship to each other. Previous studies researching these relationships have looked at color influencing music selection. Our study was intended to bring these two concepts together by testing how experiencing one sensation may influence selection of another. In this study, we collected data on the associations students formulated between our preset color schemes and piano music from the three main eras of highly developed music prior to the 1900’s. Participants assigned points to colors, which were then and analyzed. We hypothesize that for pieces in major key, it will create a preference for brighter and warmer colors, while pieces in a minor key will create a preference of cooler and darker colors. The data collected was based off of two different things, color choices for major and minor music and color choices for musicians and non-musicians. For major music color choice warmer and brighter colors were mostly chosen, where yellow was the most frequent choice. For the minor music color choice, the color choices differed drastically, but the cooler and darker colors were chosen more frequently. The top two colors were blue and grey. For the musician and non-musician color choices, results showed that musicians chose warmer and brighter colors more frequently, while non-musicians chose cooler and darker colors more frequently. Our hypothesis was correct that cooler and darker colors would most likely be correlated with minor songs and warmers and brighter colors would most likely be correlated with major music. This was further supported by statistical analysis. This project helps show how people correlate different colors with different types of music. This research can be used to enhance our understanding of human perception of the relationship between music and color preference.

*Nicholas Bitonti, Sean Boylan, Andrew Ciccarelli*

**Planarian Regeneration in Different Environments**

Planaria are freshwater flatworms that are only a few millimeters long. Recently, planaria have been the topic of study when it comes to regeneration, but the optimal conditions for regeneration are unknown. In order to test the optimal planarian regeneration environment, planaria were separated into five groups made to mimic certain types of environments; the control group, and groups testing light, dark, heat and cold. Each planarian was cut transversely and then left to regenerate in their respective environments. One important factor to note is that the group that tested light was under only LED light bulbs because they do not give off heat and this would not interfere with the test results. The time recorded by each planarian was based off the last piece to regenerate either the head or the tail. Twenty four hour light had a clear effect on the regeneration speed shorting the time from an average of 13.2 days to an average of 4.2 days. Ambient light lowered the 13.2 day average to 8.2 days. Heat also yielded similar results shortening the 13.2 day average to an average of 10 days. However lack of heat had no clear correlation to regeneration speed. At the end of this project it was revealed that a well-lit, hot environment caused the planarian to regenerate at a quicker speed.

*Mia Bornfriend, Eliana Gruvman, Delina Levine, Emma Matz*

**Roundup’s Effect on the Regeneration of Planaria (*Dugesia dorotocephala*)**

The purpose of our investigation was to study the effects of runoff pollution on aquatic life using Roundup. The primary function of Roundup is to limit the growth of unwanted weeds and plants. However, the use of Roundup on ground vegetation can cause runoff to seep into surface water and groundwater. Roundup has been presented as an herbicide that is harmless to humans, but studies have shown that exposure to Roundup may have a detrimental effect on animal cells such as aquatic invertebrates. In our experiment, Roundup was tested on the rate of regeneration of *Dugesia dorotocephala*. These are more commonly known as black planaria, a type of aquatic flatworm. The planaria were divided, and the “tail” portions were exposed to varying concentrations of Roundup and observed until eyes developed. Higher concentrations of 5%, 3%, 1%, 0.75%, 0.5%, 0.1%, and 0.08% caused planarian death before regeneration could occur. Roundup concentrations under 0.08% allowed for regeneration. Roundup concentrations of 0.06%, 0.04%, and 0.02% caused an average of 5.5 days for regeneration (when eyes became visible), while our control group regenerated on an average of 5.75 days. Therefore, we concluded that while lower concentrations of Roundup did not greatly affect regeneration, the higher concentrations caused planarian death. This could translate to similar detrimental effects on human exposure to Roundup due to the similarities between human and planarian cells.

*Sean Boylan – See Nicholas Bitonti*

*Paulina Buchta, Amanda Loo*

**Frozen Fruit Flies: The Hereditary Nature of Cold-Tolerance in *Drosophila melanogaster***

Progress in the areas of testing cold tolerance on mammals has led to the development of this study, which is to determine if cold tolerant fruit flies can pass on their cold-tolerant traits to their offspring. Cold tolerance is the ability to live and grow under cold conditions. Many insects have the ability to go into diapause, also known as a period of suspended development in an insect, especially during unfavorable environmental conditions. The functions of *Drosophila melanogaster* are often studiedbecauseof their genetic similarity to humans. In this study, wild-type fruit flies were placed into vials and placed into a -20℃   freezer. The fruit flies were then separated based on gender. After a10 minute incubation, recovery times were recorded. Thus far, results show there is no statistically significant difference between male and female fruit fly recovery times (p=0.464). Further testing on ages is being investigated. The offspring of the cold-tolerant fruit flies will be tested, along with the offspring of the non-cold tolerant fruit flies (by similar recovery time testing). This information can be used to better understand and lead to new advances in preserving cells and tissues for use in research and human health related to cryogenics.

*Ruslan Burns, Gabriel Chan, Paul Moon*

**How Philodina Rotifers Survive in Extreme Conditions by Transiting Between Animated and Tun states.**

Rotifers of the genus Philodina are able to withstand extreme conditions by employing a biological mechanism called anhydrobiosis. In anhydrobiosis, the organism places itself in a dormant state which is called a tun state. By utilizing the molecule called trehalose, most anhydrobiotic organisms are able to withstand rapid changes in their environment. However, rotifers lack the ability to synthesize this vital molecule. The purpose of this experiment was to observe the effects environmental stressors have on the reanimation of rotifers. First rotifers were desiccated to put them in the tun state by placing them in the freezer.. F The slides were then defrosted and the rotifers in the tun state were removed and subjected to the desired test conditions(i.e heat,UV rays,microwaves,drying,etc.). Results show that exposing rotifers to extreme heat (75℃) kills 100% of  the population but more moderate heat (25℃) provided a better reanimation percentage (50% percent success rate).Microwaves also proved detrimental to the health of the rotifers,killing the whole population.We hypothesized that cold temperatures and ultraviolet rays would cause a large percentage of the rotifers to die.However,our results showed that rotifers were able to reanimate despite these conditions. Further experimentation is on-going into how the duration and speed of the administration of environmental stress affect the percentages of reanimation success. Information gathered from observation of these experiments will be used to better understand the process of anhydrobiosis.

*Alyssa Byrnes, Bridget Flynn, Pragati Muthukumar*

**Substances and their Effects on Planaria Eye Regeneration**

The regenerative process of planaria is possibly the most fascinating feature of this species. Both ethanol and sucrose are substances known to affect humans. The purpose of this experiment was to test ethanol and sucrose and their effect on planaria eye regeneration, and to see the different effects ethanol and sucrose had on the planaria regeneration. There was a control group with just water, a group that was placed in 1%, .75%, .5%, .25% and ethanol solution and a group that was placed in 1%, .75%, .5%, .25% and sucrose solution. Four planaria were cut transversely and placed in each group and the experiment was conducted three times. The results were recorded by the time taken for the planaria tail piece to regenerate .The time it took for the tail pieces with ethanol to grow was 11.25 1.71 days for 1 % , 9.000.82 days for .75%, and 6.50 2.08 days for the .5% and 8.25 0.96 days for the .25%. The control took about 8.751.71 days to grow its eyes back. However, the sucrose enhanced the growth of planaria taking it only 5.75 0.96 days in 1%, 6.25 1.71 days for the .75%, 7.5 1.29 days for the .5% and 5.751.71 days for the .25% to grow back. So it can cautiously be said that sucrose is an agent that can be utilized to enhance regeneration.

*Anthony Capua, Jared Habermehl, Spencer Lubell*

**Geomagnetic Field’s Correlation with Weather**

The purpose of our project is to improve upon current predictions and our understanding of the causes of weather. Current weather evaluations are wrong an alarmingly high percentage of the time. We know that many external factors may affect certain aspects of weather, but there are still many factors currently unknown to meteorologists. If there is a correlation, our research will allow people to predict and prepare for dangerous natural disasters that could occur. For example, accurate weather predictions will help predict when flash floods can come from the weather so people can prepare and possibly evacuate if needed to preserve the life of the people in the area. Although the concept of the weather being affected by Earth’s magnetic field was introduced by King (1975), it is still not known whether the magnetic field can affect the amount of precipitation and barometric pressure. Through analyzing data retrieved from space above weather systems, we will be able to determine if there is an influence on the precipitation and barometric pressure based upon Earth’s magnetic field.

*Daniel Cho, Kevin Zhou*

**The Effects of Grouping on Learning in Planaria ( *Dugesia tigrina* )**

Planaria have been shown to have simple learning patterns, and planaria can be used as a  model organism to study simple learning behavior such as operant conditioning. Operant conditioning is a  change in behavior by using a reinforcement which is given after a desired response. In this study we wanted to find out if planaria react to operant conditioning differently when conditioned individually or in pairs. To carry out this study: we placed a planaria on one side edge of a petri dish and put a droplet of water six centimeters away and when the planaria reached the water it was rewarded with time in the water droplet. Then, repeated with two planaria together and during this process we timed the planaria in terms of how long it took to get to the next drop. We hypothesized that: the planaria will show faster progress towards a drop when the planaria are placed in pairs, which means stronger operant conditioning. The data shows that there is a greater in progress towards operant conditioning in the single planaria compared to when the planaria are in pairs.

*Andrew Ciccarelli – See Nicholas Bitonti*

*Gabriel Chan – See Ruslan Burns*

*Sean Camiolo, Emily Della Pietra, Maheen Khan*

**The Correlation Between Conformity to Peer Pressure** **and Development of Theory of Mind**

Theory of Mind (ToM) Conformity to peer pressure (CPP) are two aspects of early childhood development usually studied separately. Theory of Mind is defined as the ability to attribute mental states — beliefs, intents, desires, pretending, knowledge, etc. — to oneself and others and to understand that others have beliefs, desires, intentions, and perspectives that are different from one's own. Peer pressure is the influence of others in the peer group. Conformity to peer pressure is complying with these influences. Studies have shown that most preschoolers have not developed theory of mind and conform to peer pressure.The purpose of this study is to see if there is a correlation between conformity to peer pressure and theory of mind in preschoolers between the ages of 2 and 5 years old. To carry out this study, we performed two series of tests- the ToM and CPP series. The ToM series included several short stories intended to test if a child can understand that what one person knows, is not what another person knows. The ToM series tests each child for ToM , if they can differentiate their thoughts from others and for the absence or presence of theory of mind. The CPP series included a number of rounds where one person is prompted to relay a different answer than the others in the testing group. The CPP tests will test the participants to see if they conform to peer pressure. If the child changes their response to match the other children’s responses then that means that they are susceptible to peer pressure.  This study will provide further understanding of cognitive psychology, and improve the way we teach children about peer pressure.

*Kathy Cao, Catherine Kim, Manvi Sharma*

**Exploring the Correlation Between Music Genre and Memory Retention in Adolescents**

In modern day testing, there is often the need to memorize things, creating a demand for ways to study more efficiently. Although students have found multiple ways to help them study for exams, most students do not study while listening to music as they claim that it is distracting. However, there may be a positive correlation between music genre and memory retention in adolescents. In former studies, it has been shown that different music genres aid in certain tasks. So, the purpose of this investigation is to explore the correlation between music genre and memory retention in adolescents. This was determined by having students memorize a sequence of seven pictures while listening to different genres of music playing in the background. Then they were asked to recall as many pictures as they were capable of. Tests for each genre were scored out of 14, and it was found that classical music scored the highest with a mean score of 11.78. On the contrary, pop music was found to be the worst for memorization with a mean of 9.09. This study benefits high school adolescents as it determined that the classical genre of music is best for the recollection of information. So, by listening to classical music while studying, students may receive higher grades when assessed on information that they were required to memorize.

*Julia Cicalo, Megan Padgett, Kelly Page*

**Differences & Similarities Between Protein Models in Experimentation** **and Models in Computation**

Proteins perform a vast array of functions in many different biological processes within living organisms. Most proteins attain their biological functions through specific interactions with other proteins, Therefore determining all of the protein-protein interactions in the cell would help in understanding how cellular processes work. Because relationships between molecules tell us more about biological processes than the molecules themselves, network centered approaches in protein research and structural determination are vital. Computational protein docking provides a procedure that predicts the structure of protein-protein complexes from their unbound structures. The gap between identified interactions, and 3D modeled interactions is very large, and growing.This study compared computational methods and experimental methods, by evaluating the degree of success the computational methods had in predicting the structure of protein-protein-interfaces. This showed how different methods create potentially different structures, and how their accuracies vary. This will augment the understanding of structure determination, and helps determine the most efficient and precise ways to further study this field of science. The differences and similarities between various models were explored and Interactome3D will provided structural data on the interactions that were studied. The selected models were then downloaded from PDB and cleaned, to be submitted to the ROSIE Docking2 server. This investigation analyzed the differences and similarities between protein-protein interaction models developed from experiment and models from computation.

*Christopher Collado, Jonathan Collado, Paul McDonough*

**The Design and Construction of a Customized Prosthetic Arm**

The purpose of this engineering project was to design and create a cost effective prosthetic arm to allow an amputee to be able to perform normal activities of daily living that we often take for granted. There are many prosthetic devices available on the market but some of the more high end models with high functionality are not covered by most insurance plans and are quite expensive. The prosthetic devices covered by insurance still leave the amputee with a large out of pocket expense. In addition, most prosthetic arms are very heavy, and can put a lot of pressure and weight onto the opposite arm by the way the prosthetic is attached to the body. It can also tug on the user’s clothing, which can expose parts of the body, as well as cause the device to fall off if not attached correctly. This can be embarrassing and frustrating for the amputee. In this project, we worked with an amputee to create a new type of prosthetic arm that weighs less and is less expensive than a conventional prosthetic. With this creation, we aimed to improve the lives of those who have been affected by the loss of an arm.

*Jonathan Collado – See Christopher Collado*

*Gabrielle Cooper, Kristin Orrach*

**Developing a Novel Method for the Diagnosis of ADHD through Crowding Results**

Crowding is a phenomenon that describes how the recognition of objects is impaired by any surrounding objects that are not presented directly to the fovea. In most people, crowding is only significant and measurable in the peripherals (when viewed off from the side). Crowding impacts the reading speeds of all individuals at certain angles and eccentricities, but  studies have shown individuals with preexisting reading disabilities are more affected by crowding, slowing down their readings speeds substantially. Studies have also been done that show 25-40% of people with attention deficit hyperactivity disorder (ADHD) read at much slower speeds and displaying significantly lower processing speeds while reading. Due to the correlation of reading speeds with ADHD, it is hypothesized that crowding would be a way to measure ADHD and in people. By comparing the difference in crowding between individuals without ADHD, measuring crowding could be used as a more accurate way to diagnose these disorders. This study was done to see if crowding can be used as a benchmark test for ADHD. To test for crowding, each participant was given a vision test via computer. The vision test is a series of powerpoint slides that were shown for 200 milliseconds and the participant was asked if they can identify the object shown on the slide. This was repeated a number of times, at increasingly smaller eccentricities and critical spacing, until the participant could no longer identify the object.

*Jordan Cooper*

**Evaluation of the Activity of the NF-κB Pathway after BCL6-BTB Inhibition in Activated B-cell**

**Diffuse Large B-cell Lymphoma**

Non-Hodgkin's Lymphoma (NHL) is one of the most common malignancies in the United States. Diffuse Large B-Cell Lymphoma (DLBCL) is the most common and aggressive subtype of NHL, itself separated into Activated B-Cell (ABC) DLBCL and Germinal Center B-Cell (GCB) DLBCL. The most common oncogene in DLBCL proliferation is BCL6, with constitutive NF-κB and JAK/STAT3 signaling being critical to ABC DLBCL proliferation. BCL6 inhibition has proven fatal to DLBCL cells, primarily those of the GCB type, with its role in ABC DLBCL being less clearly understood. NF-κB and JAK/STAT3 inhibition is lethal to ABC DLBCL cells. As such, the relationships between BCL6, NF-κB and STAT3 have become prime targets of study for novel lymphoma therapies. In this study, I tested whether a novel small molecule inhibitor of BCL6 (here referred to as 1085) could downregulate NF-κB activity and upregulate STAT3 expression, so as to identify a rationale for combinatorial treatments of ABC DLBLC comprised of BCL6 and JAK/STAT3 inhibitors. 1085 treated cells showed significant decreases in viability as measured through Cell Titer Blue, Flow Cytometry and Cell Counting assays for LY1, HBL1, S4 and Toledo cell lines (P=.001, .008, .004 and .03 for Cell Titer Blue fluorescence). BCL6 inhibition led to statistically significant downregulation and reduced nuclear translocation of NF-κB but did not significantly affect STAT3 translocation. Taken together, the data suggest that the BCL6/NF-κB/STAT3 axis may be a viable target for combinatorial therapies in DLBCL via BCL6 and JAK/STAT3 inhibition.

*Abbigayle Cuomo, Elizabeth Van Loon*

**A Modified Forest Fire Index for the Northeast United States**

Forest fires are dangerous to human and animal life as well as community infrastructure situated near a fire. Currently, more than ten forest fire indices are used in the United States, but most were designed for the Western United States. The purpose of this study was to modify the Hot Dry Windy index (HDW), a fire index used in the Western United States, apply it to the Northeastern United States and verify its ability to predict fires. Weather data (1989-2014) was obtained from nineteen major airports in the Northeast United States as well as fire history data (1999-2008). The performance of the Standard HDW index was analyzed in the Northeast US; Its correlation to actual fire data was poor so Standard HDW formulas were manipulated to create a new modified HDW formula used in this study. Box and whisker graphs were examined to determine low, moderate and high fire danger ratings by season. Analysis of fire history data showed that fires which were categorized in the high and moderate classes, based on the modified HDW index, burned on average more acres of land than fires in the low class. The modified HDW index was compared to the Stony Brook University Fire Weather Index. Danger classes were redefined and fire probability was able to be predicted. In conclusion, our modified HDW index, dependent upon the danger class division, is able to predict both fire probability and intensity in the Northeast United States.

*James Cutrone – See Adam Abdabhai*

*Daniel Czop, Catherine Deutsch*

**Laundry Detergent & Blackworm Regeneration**

In many parts of the world, sewage flows untreated or undertreated into our waterways resulting in contamination. We investigated the effects of Tide laundry detergent on the regeneration rate of Lumbriculus variegatus, or California blackworms. The purpose of our experiment to help better understand the effects of pollution on aquatic life and ecosystems. Blackworms are a robust species capable of regeneration making them a model organism for this study. First, we found the LD 50 ratio for the Tide laundry detergent, which was a concentration of 1.0 x 10-11% Tide detergent to water. Concentrations above this would dissolve the blackworms outer membrane. We then cut the blackworms in half and placed them in the detergent mixture. Every two days we counted the new rings formed by the blackworms under a camera, using motor software. So far the data suggests that Tide detergent is extremely toxic to blackworms, and possibly many more creatures. For example, in a solution of 1.0 x 10-6% of Tide to water, our worms’ outer membrane simply dissolved due to toxicity. Our research could be used by many different environmentalists, as well as in research involving blackworm anatomy. In addition, this experiment could provide a general idea on the toxic concentrations for many chemicals found in Tide laundry detergent.

*Gabrielle D’Agostino, Victoria Pensiero, Deniz Sinar*

**S.T.A.A.N.: A Sensory Table Assisting Autistic Needs**

Autism, a prevalent disorder in many people of all ages, affects the learning capabilities of an individual. Children with autism have a difficult time adapting to learning standards in a classroom environment. Throughout the day, they must receive various sensory inputs to stimulate their senses, and therefore regulate their emotions. Currently, there is no conclusive cure, but rather multiple treatment options that help assist those facing difficulties with autism. One way that children in a classroom are able to receive the necessary sensory input, is by having the opportunity during the day to use materials of differing textures and properties to stimulate their senses. These include but are not limited to sand, ribbon and dry rice. We visited a primary school in our community and observed  the sensory environment in their classrooms. In addition to this, we discussed with teachers, the daily struggles of having to store each sensory material in a separate bin in a classroom environment. Our table consists of these features and materials, such as dry sand, clay, and water, along with electronically and manually operated games or musical devices for children with autism, provides a more efficient and easier way of giving the students a chance to regulate their emotions, and prepare for the standard classroom learning experience.

*Michael D’Elia – See Miles Bi*

*Matthew Damiata, Raphael Iskra, Jake Nieto*

**Developing an App to Aid Those with Memory Degenerative Disorders and Cognitive Impairment with Taking Prescription Medication**

The growing problem of memory degenerative diseases such as Alzheimer’s disease and dementia has led to renewed interest in studies of memory stimulating techniques, procedures, technology, and memory preservation. In the United States, 5.3 million people of all ages have Alzheimer’s; this disease affects 1 in 9 people age 65 and older, and 1 in 3 people age 85 and older. Often time’s individuals who suffer from Alzheimer’s disease forget to take their `prescribed medications at necessary times, or think that medication can all be taken at one time to make their schedule simpler. The purpose of our project was to create a mobile application, MediAlarm, for individuals who suffer from memory loss or comprehensive impairment, which would impede their ability to take their prescription medication correctly or at all. The mobile application facilitates the process of taking medicine by alarming the patient and overlaying a personalized instruction video over the medicine container. MediAlarm also notifies the caretaker and doctor of the user if the alarm is neglected. We utilized the MIT App Inventor platform to code and aesthetically design MediAlarm. MIT App inventor offers a user-friendly block coding system to allow any person to establish a fully functioning application. MediAlarm has the potential to prevent the accidental consumption of medication and help to break down the barrier of communication between the patient, doctor, and caretaker.

*Isabella Daquita, Samantha Gray, and Helen Koukoulas*

**The Physical Effects of Indirect Predator Exposure on the Species *Daphnia magna* and *Daphnia pulex***

The purpose of this investigation is to determine the influence of indirect predator exposure on the aquatic crustaceans *Daphnia magna* and *Daphnia pulex*, and how exposure affects the daphnid size, number of eggs formed, and other possible physical/behavioral features. *Daphnia,* otherwise known as the water flea, are small, approximately 2.0-5.0 mm long for *D. magna* and 0.2-3.0 mm long for *D. pulex*, transparent micro-crustaceans with a high sensitivity to environmental changes. Daphnids are widely used as an indicator species to assess the ecological impact of environmental changes because of their pivotal position in freshwater systems. Exposure to predator kairomones (chemicals released by predators), water toxicity, and even small scale turbulence can induce physical responses such as the formation of neck teeth, large crests, or helmet heads. For our experiments we cultured groups of *D. magna* and *D. pulex* in water that predators of daphnia were kept in. We then observed and took photo micrographs of the daphnids under a microscope to measure the length and area of the daphnia as well as count the number of eggs the organism carried. We hypothesized that with exposure to predator water, the length, area and number of eggs of daphnia would decrease. Results show that their was a significant effect on the length, area and number of eggs produced when the daphnia were exposed to the predator kairomones.

*Alexis Davitashvili, Benjamin Wolgang*

**Do Anesthetics Affect the Behavior and Reproduction Rate of Drosophila melanogaster?**

Drosophila melanogaster, also known as the common fruit fly, are used as important models to study human diseases, especially those related to genetics. When any work is done using fruit flies they are anesthetized using carbon dioxide, Fly Napp, or freezing. Few Studies have been done to see the effects of anesthesia on fruit flies. The purpose of this investigation was to determine the effect of anesthetics on the behavior and reproduction of fruit flies. The behavior of fruit flies was determined by measuring the moving speed of the fruit flies by using an Upward Movement assay and Phototaxic test. The reproduction of flies was determined by the number of larvae a female produced, after anesthetics were applied. Results thus far indicate that anesthetics significantly decrease the upward movement and phototaxic response to light. There is no statistically significant difference in the number of larvae produced related to anesthesia used.

*Emily Della Pietra – See Sean Camiolo*

*Michael Delmonaco, Nicole LaReddola, Trevor Rosenlicht*

**Resolving the Primary Mechanism Causing Floor-Fractured Craters**

**Using GRAIL and LOLA Data**

Floor fractures are found in relatively few craters on the moon and the cause of their formation is a mystery. There are two proposed ideas for the cause of these fractures. The mechanism causing floor fractured craters has been hypothesized to be either magmatic intrusions or viscous relaxation. Due to the lack of gravity data in earlier studies, a definite answer was not determined. Recently, gravity data from the Gravity Recovery and Interior Laboratory (GRAIL) has provided new insight into how floor fractured craters form. For example, Clement et al. (2015) used GRAIL data to suggest the magmatic intrusion hypothesis is more likely. In this research, we expand on the previous work to further ascertain which of these proposed hypotheses is best supported by the data. To carry out this study, data collected by the GRAIL satellites and the LOLA data set were used. This data provided precise measurements of the moon’s gravitational anomalies and a list of floor-fractured craters respectively. The data is available to the public through Arizona State University’s Java Mission-planning and Analysis for Remote Sensing (JMARS) program, which provides detailed maps of the moon that display the data collected by satellites such as GRAIL. The average gravity anomaly of each crater we observed was calculated. Floor fractured craters were compared to craters with similar properties using a unique crater class scheme to determine if a significant gravity difference exists among them. Because magmatic intrusions would lead to a difference in gravity anomalies between floor fractured craters and normal craters that viscous relaxation would not produce, the results of our comparisons has allowed us to conclude the probable cause of floor-fractured craters. Floor-fractured craters were measured to have a higher gravity anomaly difference between the crater and its surroundings compared to non-floor-fractured craters with similar properties. This leads to the conclusion that magmatic intrusion is the cause of floor-fractured craters. This experiment is important because it allows for a better understanding of lunar surface activity.

*Ryan Dery, Dmitri Gouvoussis, Simon Snowden*

**The Wheelovator:**

**An Inexpensive Wheelchair Lift**

The purpose of the project was to design and construct a device that can lift a wheelchair 10-12 inches off the ground to increase reach and independence of people who use wheelchairs that is less expensive and more efficient than other current wheelchair lifts. In the United States alone there are 2.2 million people who use wheelchairs. The goal of the wheelchair lift was to increase the vertical reach of people in wheelchairs, which will increase their independence. We met with a man who uses a wheelchair and spoke to him about what he desired in the lift. He wanted a lift so he could reach tools on the upper shelves when he worked in the garage; he wanted it to be safe, comfortable, inexpensive, and portable. Once we obtained this information we began to design the wheelchair lift. Our initial design was a platform that the wheelchair could roll onto, However, after considering safety and mobility we decided to mount the lift on the wheelchair. The current lift contains two wood panels, an electric scissor carjack, and a battery. The carjack was placed in between two wood panels, the top panel was secured on to the wheelchair, so that when the carjack extends it lifts the wheelchair off the ground. We added to metal bars to stabilize the wheelchair when it extends.

*Catherine Deutsch – See Daniel Czop*

*Kyle Dituro*

**Asymmetrical Clustering by Gender In Free Forming Groups**

A study by Daniella Kramer-Moore (2010) stated that when multi-gender groups of 3 or 4 people separate into smaller subgroups by spontaneous separation, they can be classified as either “H” (hetero-gender) if at least one subgroup was multi-gender (have both males and females) but none were mono-gender (Consist of only females or only females). If there was at least one mono gender subgroup and no multi-gender subgroups, it can be classified as “M” (mono-gender). Lastly, a group called “MH” is one consisting of one mono gender subgroup and one multi gender subgroup. Following from this is the gender dominance of the subgroups, which is dictated by the largest subgroups and the modal gender of the subgroups, for instance, a subgroup separation of *mm f f m* (m = male, f = female, subgroups are separated by spaces) would be male dominated, and one like *ff m m* would be female dominated. This project was designed to determine the effects of emotion on naturally occurring group separation. This study was conducted by going to a public place where group separation is likely to occur naturally, and waiting in a densely populated area for group separation to occur. Then, upon separation, the degree to which the eight base discrete emotions (joy, anguish, rage, fear, surprise, interest and shame) were expressed was recorded on a scale of 1 -10, 10 being the most extreme expression of the emotion and one being the weakest. The purpose of this study is to determine the most prevalent emotion expressed by an individual during separation from a larger group.

*Olivia Dubi, Tara McCaffrey, Amy Uthup*

**Snakety : A Snake Identification Mobile Application**

The purpose of this investigation was to create a Snake Identification Computer Application for New Mexico that can run on Android devices. This application was created using AppInventor2, a program run from MIT that allows one to invent basic working mobile applications. Our application is useful for anybody living in or visiting New Mexico. By using the application, people are able to identify the type of snake they encounter and reveal how dangerous it is by looking at a “biography,” or small description of it. There are about 75-100 rattlesnake bites annually in New Mexico alone (New Mexico Poison & Drug Information Center, n.d.). In the United States, 7,000-8,000 people suffer from snake bites yearly (Miller, "Snake Bite Death Statistics Worldwide"). We want to prevent fatal reactions from occurring by providing people with beneficial knowledge about snakes. Our goal is to not only decrease the number of injuries and fatalities caused by snakes, but to also educate people about these animals. In the event of a snake bite, our application provides essential information on how to react to get the best results. We called hospitals in the state of New Mexico and listed ones that are equipped with anti-venom serum, along with tips about how to act upon snake encounters. This information is given to help decrease the potentially fatal consequences of snake bites.

*Aria Eghbali, Tyler Meotti, Jake Novello*

**Damtector-Roof Damage Detecting Device**

The purpose of the project was to design and build a device that would be able to detect moisture underneath roof shingles. There is no current inexpensive device that can detect moisture underneath the roof. Low slope or flat roofs are favored by most businesses and homes because they can last for approximately 20 years except they are more likely to be affected by condensation damage leading to mold spores and rotting of the wooden supports and the roofing, if not maintained frequently 1. The cost for identifying the problem and repairing roofs currently cost $100-$350 for a 10x10 foot roof 2.By being able to the detect damage early, the cost for repairs will decrease since the damage will be checked before it progresses. To test our device we created two 2x3 feet simulated roofs, one being the control and the other roof being the variable. One of the roofs had a water logged plank of wood and the other had a dry plank of wood. On top of both the control and variable roofs we placed roofing paper and asphalt shingles, to have the same layers as a common roof.  We used a metal detector to produce an electromagnetic field that would pulse through water logged roof creating its own field, finding that the moist wood and dry wood produce different strengths of an electromagnetic field3. The metal detector made a high pitched when it was hovered over the dry plywood and a deep pitch when the metal detector was hovered over the wet plywood.  Since the electromagnetic field strengths for each surface was different the tone of the metal detector would be different, allowing for the identification of moisture under shingles which would result in roof damage.

*Jeremy Faust, Joshua Kaplan, Jack Schoenfeld*

**Investigating The Aggregation of California Blackworms**

*Lumbriculus variegatus* (California blackworm) typically live in muddy sediments and shallow water, interestingly if you put them in a water only environment they clump together. They use photoreceptors to respond to stimuli like shadows; movement, but what causes them to clump in a nonthreatening environment? The purpose of our investigation was to determine if certain environmental conditions would cause them to clump more readily. We exposed them to different temperatures, food variables, and an environment with a predator to see its influence on its rate of aggregation. After experimentation, it appeared that all factors affected aggregation to some degree. Further study may reveal which factors have the most affect, and if the effects are cumulative.

*Jessica Fecht, Alexa Karadenes*

**Phototropic Response of Germinating Radish Plants to Different Light Conditions**

This investigation was designed to analyze a radish plant’s phototropic response to different colors of visible light. Specific colors of light trigger a greater phototropic response in a plant than others (Briggs 1963). A plant’s reaction to external stimuli is called tropism.  Phototropism is a specific type of tropism in which a plant responds to the external stimuli of light.  During phototropism a plant curves and grows towards the direction of a light source. The goal of this study was to determine different wavelengths will cause different phototropic response in the radish plant by identifying the direction and angle in which the plant curves when near different colors of light. To carry out this study a radish seed was placed on wet filter paper in a petri dish. The dish was completely opaque except for a small slit to allow some light through to give exposure to the growing seed. As a control, some radish seeds were germinated in complete darkness. Photographs of the growing plants in the petri dishes were taken daily. The curvatures of the plants towards light were measured using the digital program, ImageJ. Thus far we have concluded that the plants have curved only slightly in the white light. It is possible that geotropism is preventing the plants from curving. Plants that did sprout in light were light green in color while the plants that grew in the dark were usually yellow.

*Bridget Flynn – See Alyssa Byrnes*

*Jake Gelfand, Taylor Lipton, Sam Morris*

**Using Waste Energy from Heating Systems to Redesign Domestic Heating**

The purpose of this project was to design a system that makes furnaces and boilers more energy efficient in heating water and air. The majority of homes in the United States use water boilers and furnaces to heat water and air, respectively, in their home. These can use a variety of different fuels and energy sources to heat both the air and water, but all have one thing in common: they produce exhaust and harmful waste byproducts, while wasting heat. Water boilers and furnaces use different types of vents with varying efficiency to get rid of exhaust and insulate itself. With the introduction of a device that takes the excess thermal energy from the waste and pollutants in boilers and furnaces to help heat a house, the cost of heating a house could be reduced. A slight alteration was made to the type B-vent to blow clean air between the hot exhaust and insulation tubes, and back into the house. The model that was built combined a B-vent with a miniature room in order to simulate the what the device would do inside a house. The effectiveness of the device was be determined by the temperature of a model home after 1 hour with the device running, compared with the surrounding air temperature. It was found that there was a significant difference between the ambient room temperature and the artificial room, which showed that our device could be used to augment heating systems in homes and increase efficiency and productivity of standard boilers and furnaces.

*Elias Gonzalez – See Aaron Angeles*

*Diana Gottleib – See Karen Abruzzo*

*Dmitri Gouvoussis – See Ryan Dery*

*Samantha Gray – See Isabella Daquita*

*Julia Greco*

**Phenotypic Effects of Limostatin Expression on**

**Insulin Output in** **Fruit Flies *(Drosophila melanogaster)***

Limostatin is the peptide hormone in endocrine cells in the gut of *Drosophila melanogaster* that suppresses the secretion of insulin during starvation. The purpose of this study was to observe some phenotypic effects of flies (wing size and development time) that are altered by the over expression of Limostatin. *Drosophila melanogaster* are excellent models to study various genetic and physiological disorders in humans. They are used to study diabetes due to the fact that they have similar functioning hormones to humans for controlling glucose levels. Limostatin, in the insulin producing cells of the fly, is an ortholog to the Neuromedin U hormone in the Beta cells in the pancreas in humans. In this study, three different strains of flies were crossed. The wild type control cross had flies where males were crossed with virgin females, and Limostatin was present in natural form. The positive control cross consisted of flies where neurons were in a “paralyzed” state because they remained hyperpolarized state therefore unable to meet the threshold.  These flies have a decreased secretion of insulin. In the experimental group, virgin females were crossed with flies that had an over expression of limostatin. These flies also have a decreased insulin secretion. It was hypothesized that the positive control and experimental flies would have noticeably smaller wings, which indicate a smaller body, produce fewer offspring, and have a longer time to eclosion (larvae and pupa emergence). Thus far results show that the Limostatin experimental and Kir2.1 positive control crosses have smaller wing areas then the wildtype control cross. The Limostatin and Kir2.1 crosses also have longer time to eclosion compared to the wild type control. These developmental delays are a cause of the decrease in insulin secretion. This data has important implications on diabetes and understanding the effect of insulin output in humans.

*Eliana Gruvman – See Mia Bornfriend*

*Jason Haber, Joshua Hardoon*

**Can Verbal Encouragement Improve Physical Performance**

**Using a Handheld Strength Device?**

Muscle fatigue is a temporary feeling that your muscles are tired. This is from overuse of muscles. It has been shown that an individual may be able to overcome obstacles, such as muscle fatigue, with the addition of verbal encouragement while using muscles. There are no proven ways to overcome the effects of muscle fatigue; however, verbal encouragement may be able to aid a person to temporarily overcome muscle fatigue. To investigate the relationship between verbal encouragement, and its effect of overcoming muscle fatigue on the human body, a group of students will squeeze a dynamometer to exert force on a handgrip. The purpose of this investigation was to see if there is any correlation between verbal encouragement and muscle fatigue, and to see if verbal encouragement can aid a person to temporarily overcome the effects of muscle fatigue. It was hypothesized that the amount of force exerted on a dynamometer handgrip is higher with the addition of verbal encouragement compared to when there is no verbal encouragement. To carry this study out, participants were tested twice, once with encouragement and once without encouragement. They squeezed the dynamometer as hard as they could for 15 seconds first with no encouragement and then with encouragement.  Then data was then compiled into Microsoft Excel and the minimum, maximum and averages were then found for each trial. The results did not support the hypothesis even though 42% of the participants had an improvement in hand strength with the addition of verbal encouragement; there was no statistical significant difference between the non-verbal encouragement trials and the verbal encouragement trials.

*Jared Habermehl – See Anthony Capua*

*Joshua Hardoon – See Jason Haber*

*Jessica Hastings – See Brandon Axelrod*

*Austin Heller, Chase Schare*

**Using Allometry to Describe the Phenotypic Adaptation of Bean Plants**

**(*Phaselous vulgaris*) to simulated wind.**

Allometry is the relationship between the size of an organism as a whole and the size of its body parts. Allometry can be used to study the function of a body part and its contribution in helping the whole body function properly. The purpose of this experiment was to apply allometry to the study of the comparative growth of roots and shoots in Red Kidney beans under two conditions. One condition was the shaking of plants daily for five minutes (wind simulation) and the other condition was no shaking (control). The force of wind was modelled by regular shaking. Studies found that the allometry in trees that were in a forest were proportional to the allometry of individual trees. “The allometries of forest- and individual plant -level… relationships share strikingly similar scaling exponents” (Niklas, 2007). The plants were collected and measured at different life stages to test for patterns between plants of the same group (shaken or not shaken). The plants were removed from the soil and dried. Each plant was dried and the roots, shoots, leaves and petioles were massed. The relationship of the root and shoot of a plant was compared to the relationship of the petiole to leaf of the same plant. This was done to test if the petiole has allometric relationships to the root system and the petiole acted as the shoot system. Also the root was compared to the shoot, and the petiole was compared to the leaf. This was done in order to see if a constant ratio existed among plants of all sizes. Thus far results show there is little correlation between the ratios of shaken and non-shaken plants. Although,the mass of the roots that have been shaken, was overall larger than the mass of the roots that have not been shaken.

*Alex Horowitz, Brendan McCaffrey, Nicholas Nasis, Eric Nigro*

**The Universal Backpack Frame**

Backpacks are becoming a growing concern amongst adolescents. The use of regular backpacks causes distortion of the curves in the middle and lower back, uneven balance, and rounding of the shoulders. The purpose of this project was to design and construct a backpack frame that reduces back pain in students who use backpacks. A study in 2002 found that 74.4% of students in grades 7-12 experienced back pain. A more recent study of 532 students from six primary schools in 2014, reveals that four hundred forty eight of the students reported having pain or discomfort in the neck, shoulders, upper back and the lower back. A survey was conducted in our school to determine concerns related to student's backpacks and back pains. It was found that a majority of the students had over 20% of their body weight in their backpack and a majority of the students experienced either back or shoulder pain. The average weight that usually causes back pain was 10% to 15% of the user’s body weight. This data shows that there was a need to reduce back and shoulder pain. To do this, we designed a custom, compact backpack frame that distributes the weight of a person’s backpack onto the strongest part of his or hers back which includes the shoulder and lumbar spine. This frame aids in eliminating back and shoulder pain, while still being compact, strong and durable, unlike the conventional backpack which does not distribute weight effectively.

*Raphael Iskra – See Matthew Damiata*

*Raymond Janis, Kyle Mitra*

**Combating Storm Surge Inundation in Underground Transit Systems**

During Hurricane Sandy, many areas throughout New York City experienced flooding due to storm surge. The Metropolitan Transit Authority’s failed efforts to preserve the subway infrastructure led to high levels of internal flooding due to extensive water flow through subway ventilation gratings. In this investigation, we have redesigned the standard ventilation grating, presently used in New York City, to reduce storm surge inundation. After brainstorming potential solutions, we used Computer-Aided Design drawings of various designs and analyzed them using Computational Fluid Dynamics software. Viable solutions were compared to conventional gratings through storm surge replication tests, ventilation simulations, and stress and deformation analyses. The best solutions were physically assembled as small-scale PLA plastic models using 3D printing to test functionality. The most effective design implements an inverted lateral system, which can be manually closed to seal subway gratings before an anticipated storm surge. Data analysis of this system indicated its ability to reduce nearly all storm surge inundation, maintain higher stress tolerance, undergo less deformation over time, and retain similar ventilation properties to the current grating. The newly redesigned grating is able to reduce nearly all damages and storm costs associated with storm surge inundation while retaining the ability to function as a proper ventilation grating. The redesigned grating requires a one-time installation in storm surge susceptible regions of New York City and will compensate for all initial costs after a single storm.

*Joshua Kaplan – See Jeremy Faust*

*Alexa Karadenes – See Jessica Fecht*

*Mikayla Kelly – See Gianna Anderson*

*Hamza Khan, Frank Mastroianni*

**Biomimicry in Action: A Study of the Feasibility of a Honeycomb- Inspired I- Beam**

Biomimicry is quickly emerging as one of the next architectural frontiers as scientists are looking towards nature for innovation to solve the world’s problems. The inspiration for our project is the honeycomb, a mass of hexagonal wax built by honeybees. This design uses the least amount of material to create a lattice of cells within a given area. The purpose of this project is to create a honeycomb inspired I-beam for use in the construction of skyscrapers or other structures. We used a 3D printer to create the foundation of our honeycomb I-beam design and a control beam. We will use a Vernier Structures and Materials Tester to simulate the strength of our design over the control. The key advantage of the honeycomb design is that it would be cost effective as it uses less material.

*Maheen Khan – See Sean Camiolo*

*Catherine Kim – See Kathy Cao*

*Christine Kim, Juliana Sikorski*

**A Comparison of the Effect of Mental Imagery Training on the Performances of Recreational and Competitive Figure Skaters**

The purpose of this investigation was to compare the effects of mental imagery training on recreational figure skaters and competitive figure skaters. Mental imagery is the visualization of an action before the action is performed. Mental imagery training allows for more efficient visualization and can lead to more self-confidence and a better overall final performance. In a past study by Stanković (2011), the more competitive athletes of a sport showed a larger improvement after the use of mental imagery training than the less competitive athletes. The level of competitiveness may affect athletes of all kinds in terms of their success in utilizing mental imagery, including skaters. This study allowed us to test and explore the effect of using mental imagery on young figure skaters within a specific skill level and how that effect differed when a skater had a different level of competitiveness. The motivation for this study was the many different competitive skaters that participate in competitive skating who want to advance their skills. The results of this study can be used to determine the limits of mental imagery training in an athlete’s training regimen. To carry out this study, we had figure skaters of different ages and different skill levels take survey to test their knowledge and understanding of mental imagery before and after the test. The participants then were scored on their own skating routine. The skaters were then given a mental imagery training program sheet to be done every night; a part with increased specificity was added to this program after the first week. After two weeks, the skaters performed the same skating routine and were judged in the same manner.

*Yeil Kim, Sean Pak, Jack Romondet*

**The Effect of Sucrose on the Lifespan of the Fruit Fly (*Drosophila melanogaster*)**

Sugar is a substance that most people consume with most of their meals. However, it also continues to be the leading cause of many health problems, such as heart diseases and diabetes. Many people still do not know the potentially negative effects that sugar can have on their health and continue to consume it in large amounts. The motivation behind the experiment was to determine the effects of the consumption of varying levels of sucrose on the lifespan of Drosophila *melanogaster*. The fruit flies were reared in containers containing artificial food, in which varying amounts of sucrose was added. Every day, at approximately the same time, the fruit fly containers were examined for mortality. The mortality rate was calculated for each day, and then averaged once ample data had been collected for each group. Additionally, to further investigate whether or not the added sucrose affects fruit flies, the flies underwent tests to assess their locomotive abilities. Fruit flies were placed at the bottom of an open tube. The time it took for each fruit fly to travel 20 cm upwards (towards a light source) was recorded. The results showed consistent patterns, which showed that as the concentration of sucrose fed to the flies increased there was a reduction in survival and decrease in locomotive speed.

*Jared Kirschner – See Julio Alves*

*Helen Koukoulas – See Isabella Daquita*

*Anthony LaSala*

**The Development of Tools to Aid those with Disabilities in the Workforce**

People with disabilities can have difficulty being employed as they lack the necessary skills required in the workplace. The Association for Habilitation and Residential Care facility, or AHRC, provides proper training to those with developmental and intellectual disabilities so they can obtain skills required for employment. Businesses partner with the AHRC to provide tasks similar to those in the actual workplace of the business. By completing these tasks, the people with disabilities gain experience that prepares them for employment. One of these tasks is tying and tightening zip ties around coiled cables. The workers can have difficulties with completing this task because of their disabilities. The purpose of this study was to design and construct a device to facilitate the tying and tightening of zip ties. Tools for the same purpose have previously been developed. However, these tools would not be of any help to the people with disabilities in completing the task because the tools are not specialized for people with disabilities. A new design was developed based on the existing tools but specialized for people with disabilities. Prototypes were made with foam and tested. The design was revised based on tests until a successful design was obtained. Using this design a final prototype was created using 3D printing. The prototype was tested by the workers. Sixteen workers participated. Twelve were able to successfully tie the zip tie around the cables using the prototype while four were unable to do so. Both the workers and supervisors provided positive feedback, saying they would prefer the prototype over tying by hand.

*Nicole La Reddola - See Michael Delmonaco*

*Daniel Lee, Anoop Singh, Cunyed Tasoglu*

**A Study of the Relationship of the Sea Ice Extant North of Iceland and the Activity of the**

**Atlantic Meridional Overturning Circulation**

The Atlantic Meridional Overturning Circulation (AMOC) is a major ocean current system in the North Atlantic Ocean which serves a key role in global temperature regulation. The AMOC being a thermohaline circulation system, is driven by density differences. Recent studies regarding the AMOC have indicated that the current is slowing down in certain regions . Scientists believe that this is a result of meltwater from ice sheets that is possibly interfering with density differences in the AMOC. The purpose of this study was to determine the relationship between the melting of the sea ice north of Iceland and discharge from the AMOC. Data was collected on salinity (g/kg) and discharge (sV), of the ocean current system from public datasets available through the National Oceanic and Atmospheric Administration (NOAA), NCAR and the National Snow and Ice Data Center (NSIDC) from 2005 to 2012. Correlations of the salinity with discharge of the AMOC and sea ice concentration with ocean salinity were conducted to determine possible factors for changes in the overall activity of the AMOC. The correlation data demonstrates significant relationship between sea ice concentration and salinity, however the results thus far indicate that the relationship between salinity and discharge is more complex than previously thought, as no significant correlation was found. Knowledge of the factors that drive the AMOC could help to determine the potential effects of ice melt, sea surface temperatures, and salinity upon temperature regulation, as well as contribute to understanding of thermohaline circulation systems.

*Joshua Lee – See Adam Abdabhai*

*Delina Levine – See Mia Bornfriend*

*Taylor Lipton – See Jake Gelfand*

*William Liu – See Abinya Anand*

*Amanda Loo – See Paulina Buchta*

*Spencer Lubell – See Anthony Capua*

*Emily Lupo – See Emma Baker*

*Joshua Mann, Paul Mokotoff*

**The Effects of L-Theanine on Behavioral Patterns of *Drosophila melanogaster***

The purpose of this investigation was to test the effect of L-Theanine, an amino acid found in green tea, on physiological and behavioral aspects of *Drosophila melanogaster*. Recent investigations have indicated that L-Theanine may induce relaxation and increase attentiveness. One experiment concluded that L-Theanine influenced heart rate and blood pressure in human test subjects. In this investigation, the effect of L-Theanine consumption in different concentrations was tested on locomotion in fruit flies. The same tests were performed on sleep deprived flies to determine if L-Theanine has a more significant effect under conditions of sleep deprivation compared to tests under normal conditions. During experimentation, three groups of flies were tested. One group was the control and received 0 mg/mL of L-Theanine. The other groups received amounts of 5 mg/mL and 15 mg/mL respectively. Five female flies (ranging from 2-6 days in age) in each group were tested for locomotive ability by being timed while moving towards a light. After, the flies were placed in a device to deprive them of sleep and were then put through the locomotion assay again. The results of the investigation indicated that there was no statistically significant difference in the locomotive ability of flies under normal conditions. However, there was a statistically significant difference in locomotive ability under conditions of sleep deprivation, with the flies that were administered L-Theanine showing increased ability.

*Frank Mastroianni – See Hamza Khan*

*Emma Matz – See Mia Bornfriend*

*Brendan McCaffrey – See Alex Horowitx*

*Tara McCaffrey – See Olivia Dubi*

*Paul McDonough – See Christopher Collado*

*Nicolette McKeon – See Brandon Axelrod*

*Jamey Meotti, Maeve Smart*

**The Effects of Various Levels of Co-60 Radiation on Wisconsin Fast Plants (*Brassica rapa*)**

The purpose of this study was to investigate the effects of various levels of Cobalt-60 radiation on the growth and development of Wisconsin Fast Plants *(Brassica rapa)*. Wisconsin Fast Plants, also known as *Brassica rapa* are rapid-cycling Brassicas. Plants in this family include cabbage, turnips, and broccoli. During our experiment, we used Wisconsin Fast Plant seeds that were exposed to varying levels of Co-60 radiation. Cobalt-60 is a synthetic radioactive isotope of the element cobalt. Data such as germination rate, height, and survival rate were recorded. We hypothesized that as the Wisconsin Fast plants seeds were exposed to an increasing amount of Cobalt-60 radiation, their growth and development would be increasingly affected. Results showed that the seeds exposed to 4,000,000 RADS of Co-60 radiation never germinated. Plants that were exposed to no radiation, our control group, germinated the fastest. The group of seeds that were exposed to 50,000 RADS grew to be the tallest and had the greatest rate of growth. As the amount of radiation increased from 150,000 RADS to 4,000,000 RADS, the height of the plants decreased and the germination time increased. Plants that were exposed to radiation experienced a mutation that caused their leaves to turn yellow and purple, compared to the control’s green color. Plants exposed to 0 and 50,000 RADS had a 100% survival rate. As radiation levels increased from 150,000 RADS, percent survival decreased. This investigation is important because it shows that radiation can be used to develop new varieties of Wisconsin Fast Plants with unique traits, which can then be applied to laboratory research.

*Tyler Meotti – See Aria Eghbali*

*Kyle Mitra – See Raymond Janis*

*Paul Mokotoff – See Joshua Mann*

*Paul Moon – See Ruslan Burns*

*Sam Morris – See Jake Gelfand*

*Pragati Muthukumar – See Alyssa Byrnes*

*Kazuo Nakamura, Kyle Spinelli*

**The Effect of Extreme Atmospheric Conditions on Extremophiles in a Cryptobiotic State**

The purpose of this project is to explore the survival of microorganisms in cryptobiosis exposed to the extreme conditions of space or the upper atmosphere. Our project is an astrobiology research experiment. Astrobiology is branch of science that is concerned with life in space. Cryptobiosis is a state in which organisms can go into in which their metabolic processes are slowed down to a minimum in order to preserve the life of the organism. Organisms in a state of cryptobiosis have been known to survive extreme radiation, heat, cold, a lack of water, and even survive within a vacuum. In the project several extremophiles in a cryptobiotic state will be exposed to the extreme conditions of outer space, such as high radiation, fluctuating temperatures and changing pressure. Two microorganisms will be tested including tardigrades, and brine shrimp.  As will organisms found in samples of lichens. These organisms will travel into the upper atmosphere or outer space, within a 44 mm cube, that we designed. We will utilize Cubes in Space, a program that allows students to examine the reactions of extremophiles when exposed to the extreme environmental conditions of space. Thus far, we have designed the containment cube for our specimens and have begun testing (control) for the emergence of brine shrimp from cysts and the emergence of organisms from lichens, we have identified six different organisms within the lichen, the brine shrimp have a 79% hatching rate. The launching date for the experiment will take place in June.

*Nicholas Nasis – See Alex Horowitz*

*Jake Nieto – See Matthew Damiata*

*Eric Nigro – See Alex Horowitz*

*Jake Novello – See Aria Eghbali*

*Kristin Orrach - See Gabrielle Cooper*

*Sean Pak – See Yeil Kim*

*Zachary Peare, Maya Snowden*

**The Bacterial Hunger Games:   
A Study In Intercolonial Competition Between   
Escherichia Coli and Serratia Marcescens Over Nutrients**.

Bacteria are extremely diverse, which makes them perfect subjects for experimentation. The majority of natural environments contain a high diversity of bacterial species. However with this diversity, comes an inevitable competition for both space and resources in order to thrive. Prolonged interaction between different bacterial colonies conceivably increases such opposition. The purpose of this study is to observe intercolonial competition between two different species of bacteria: Serratia marcescens and Escherichia coli. This competition was fostered by gradually depriving the nutrients. These two species were combined in culture tubes of nutrient concentrations ranging from 10% to 100% of the normal composition of Luria Broth. The data thus far has been sporadic and inconsistent. Because of these inconsistencies no conclusion can be drawn at this time. The anticipations of fluctuating numbers with differing nutrient concentrations proved to be correct based off of the number of colonies present when they are counted.

*Megan Padgett -See Julia Cicalo*

*Kelly Page – See Julia Cicalo*

*Victoria Pensiero – See Gabrielle D’Agostino*

*Samuel Petruzzi*

**The Effect of Nicotine and Cigarette Waste on Regeneration in Planaria**

Regeneration in planaria is an adaptation that can be used as a measure of the overall health of the organism and environment it is in. Through this, one can examine the health, or levels of pollution, of an aquatic ecosystem through measuring the rate of regeneration in planaria while living in water samples from a particular ecosystem. Cigarette waste is an extremely common pollutant and its effects on planaria are unknown. In this study an analysis of the changes in the rate of regeneration in planaria when exposed to nicotine and waste from cigarettes was conducted. The rate of regeneration was quantified based on the number of days until ocelli (primitive eyes) appeared following the removal of the planaria’s head and the growth of the remaining segment of the organism in a solution containing either nicotine or precipitated cigarette waste. This was compared to a control group of unexposed planaria. It was hypothesized that in planaria exposed to the pollutants, cigarette waste or nicotine, the rate of regeneration will decrease. Results showed an average time of 15 days for the ocelli to regenerate fully when exposed to cigarette waste, but only 9 days when unexposed. Therefore, a significant difference is present between the two and the hypothesis is correct.

*Nicole Pignataro, Meghan Russo, Yasemin Sahin*

**The Effect of Water that has been Exposed to Artificial Turf**

**on the Regeneration of California Blackworms (*Lumbriculus variegatus)***

Currently there is a controversy related to the health effects of artificial turf use for sports fields. It is known that artificial turf contain toxic chemicals that could come in contact with people playing on the turf as well as chemicals from the turf leaching into the soil.  Chemicals that have been found in artificial turf come from recycled tires that are used during the process of making turf and it contain many carcinogens and irritants such as polyaromatic, hydrocarbons, phthalates, and volatile organic compounds (VOCs). The crumb rubber in turf is also found to contain cancer causing chemicals such as arsenic, benzene, nickel, and cadmium. Turf is also composed of ethylene-propylene and styrene butadiene with vulcanizing agents, fillers, plasticizers, and antioxidants. Based the on controversial use of artificial turf especially for schools we wanted to study the effect of turf on a living organism.  The purpose of this study was to see the effect of turf-soaked water on the regeneration of California Blackworms (*Lumbriculus variegatus).* Regeneration was determined by the growth of the worms that were placed in water that was exposed to different kinds of artificial turf over different lengths of time.  Regeneration growth was measured from photomicrographs of the blackworms in six different types of turf compared to worms in water with  no turf residue (control). Results show that there is a clear negative effect of turf-soaked water on the growth of the blackworms as well as obvious deformities to the worm’s morphology.  However the results did not show a consistent pattern relative to the type of turf and time of exposures.

*Jack Romandet – See Yeil Kim*

*Trevor Rosenlicht – See Matthew Damiata*

*Charity Russell*

**Do Planaria Exhibit Addictive Withdrawal Responses After Exposure to Sucrose and**

**Condition Place Preference to Sucrose?**

Planaria (*Dugesia antillana*) are common laboratory organisms frequently used in neuropharmacology research. There are many advantages to the use of planarians in the field of neuroscience because planarians express mammalian-like neurotransmitter systems. Planarian neurons display vertebrate-like characteristics including multipolar shape, dendritic spines with synaptic boutons, a single axon, vertebrate-like neural proteins, and low spontaneously generated electrical activity. Furthermore, evidence indicates that planarians display addictive-like effects, such as anxiety, depression, drug seeking, and dependence, when exposed to drugs of abuse. I took advantage of these planarian characteristics to test the hypothesis that sucrose or the non-saccharide sugar sweetner, aspartame produces withdrawal-like symptoms and a conditioned place preference in planarians. Planarians were exposed to various concentrations of sucrose or aspartame (0%-artificial pond water (APW), 1%, 5% and 10%). The effects of the substances were quantified using a line crossing assay to test motility and a conditioned place preference (CPP) test to identify an environmental preference shift as a result of sucrose exposure. When testing motility, planarians exposed to sucrose or aspartame displayed slowed movement when compared to planarians exposed to the control APW. Planarians exposed to aspartame produced an intensified withdrawal behavior. During the CPP test 1% and 0.01% sucrose and aspartame solutions were used. Planaria displayed a stronger preference shift when exposed to 1% sucrose and learned to associate sucrose with their least-preferred environment. Planaria exposed to both 1% and .01% aspartame solutions experienced a preference shift and learned to associate aspartame with their least preferred environment. Planaria's addiction toward sucrose or aspartame was stronger than their natural inclination for a dark environment. These results suggest that table sugar and aspartame, similar to abused drugs such as cocaine, nicotine, and alcohol, can produce addictive-like effects in planarians.

*Meghan Russo – See Nicole Pignataro*

*Yasmin Sahin – See Nicole Pignataro*

*Vincent Santangelo – See Julio Alves*

*Sarah Samad*

**Do Planaria (*Dugesia tigrina*) Exhibit Addiction and Withdrawal Symptoms when Exposed to Over the Counter Herbal Products?**

Planarian pharmacology is strikingly similar to vertebrate pharmacology and therefore planaria is a suitable research model in this study. Planaria is an example of organisms showing cephalization, including a primitive “brain” such as multipolar neurons and dendritic spines, seen in vertebrates. Since, neurotransmitters found in mammals are also present in planarians this provides an explanation why planarian responses to stimulants at the cellular level will be similar to humans. The purpose of this experiment was to investigate the behavioral responses of planaria when treated with increasing concentrations of over-the-counter (OTC) stimulant herbal preparations, including caffeine. The OTC products tested are: Valerian (root extract), Guarana (seed extract), St. John’s Wort, and Caffeine. The study aimed to determine the levels of addiction when planaria are exposed to increasing concentrations of stimulants; to find out if planaria prefer light rather than dark when conditioned with a stimulant. Behavioral observations were made by comparing normal and treated specimens using increased dosing (10%, 20%, 30%, and 40%) solutions of OTC product. Treatments will be done in 3.5 cm diameter plastic petri dishes. The OTC product will be dissolved in artificial pond water and made in specified concentrations. Ten mL of test solution will be added to the petri dish, and planaria were observed in light and dark conditions over time (5 minutes). A line crossing assay were conducted to measure locomotion. Results indicate that planaria exhibit withdrawal after OTC exposure since locomotion increased and showing a preference shift towards light.

*Chase Schare – See Austin Heller*

*Jack Schoenfeld – See Jeremy Faust*

*Manvi Sharma – See Kathy Cao*

*Juliana Sikorski – See Christine Kim*

*Deniz Sinar – See Gabrielle D’Agostino*

*Anoop Singh – See Daniel Lee*

*Sydney Sirota*

**Judging the Accuracy of a Weather Reanalysis Model:**

**A Comparison with 19th Century Weather Observations**

Recently, climate modeling groups worldwide produced a number of simulations of climate change from the late 19th century through the end of the 21st century as part of the Fourth Assessment Report (AR4) by the Intergovernmental Panel on Climate Change (IPCC). Climate change has been a major concern, and understanding the history of weather patterns and their tendencies is crucial. Since the 1990s, major national and international efforts have led to the creation of climate data sets called retrospective analyses or ‘reanalyses’ using reanalysis systems, such as the National Oceanic and Atmospheric Association’s (NOAA) 20th Century Reanalysis. Reanalysis systems generate huge amounts of temperature, pressure, precipitation, and many other types of data that cannot be absorbed by the human mind without further refinement and interpretation. The different reanalysis models have different abilities, such as being able to recreate historical weather data. Using these long-term datasets and reanalysis systems, a more comprehensive understanding of our atmosphere can be determined. The purpose of this investigation was to determine how successfully the 20th Century Reanalysis System (20CR) can model weather patterns. The starting point for this analysis was the use of historical weather records from the Southern Ocean which was compared to recreated data from 20CR. The historical data used in this study came from the logbooks maintained by record keepers at the Cape Borda Station weather station, located off of the southern coast of Australia (1870-1899). The data in the logbooks was imaged by the Bureau of Meteorology of the Australian Government. The precipitation data was digitized from the logbooks using Excel. The generated precipitation data from the 20CR model was then compared to the historical precipitation data, and standard tests were done to compare the actual data to the data predicted by the 20CR model. After the analysis was completed, the results thus far show that there is no significant statistical difference between the actual historical recorded data and the data recreated by the 20th Century Reanalysis system. This indicates that for this example the 20CR model is a good predictor of past precipitation data.

*Maeve Smart – See Jamey Meotti*

*Maya Snowden – See Zachary Peare*

*Simon Snowden – See Ryan Dery*

*Kyle Spinelli – See Kazuo Nakamura*

*Max Sugarman, Jeremy Vlacancich, Matthew Wu*

**The Effect of the ENSO (El Niño Southern Oscillation) Cycle on Chinook Winds in Cut Bank, Montana**

This project was designed to determine if there is a correlation between ENSO events and Chinook winds in Cut Bank, Montana. El Niño Southern Oscillation is a weather phenomenon that has huge effects on the environment worldwide and is caused by a warming in pacific easterly trade winds. ENSO has been shown to cause droughts, floods, and monsoons. A Chinook wind is a very strong, usually gusty, and an occasionally violent foehn [wind](http://glossary.ametsoc.org/wiki/Wind) that blows down the lee slope of a mountain range, often reaching its peak strength near the foot of the mountains and weakening rapidly farther away from the mountains descending the eastern slopes of the Rocky Mountains, primarily in winter months. We collected data from the MesoWest Data (University of Utah) database. Using this data, we looked at specific environmental factors that characterize Chinook Wind events, such as wind gust speed, temperature, humidity, and change and wind speed and temperature over time. After we identified specific Chinook events, we compared the frequency of these events to ENSO years to see if there is a correlation between the two phenomenon. We also looked into the extent that the length of Chinook events were impacted during El Niño years and La Niña years defined by the Oceanic Niño Index (OÑI) (Null, 2016).We hypothesized that during ENSO years, Chinook wind patterns in our selected areas will be enhanced and will be more frequent than in non ENSO years. Investigating a correlation could help further our understanding of the phenomenon, but may also help local people affected by being able to adapt to and predict Chinook winds more accurately in relation to ENSO events.

*Teja Sundar – See Karen Abruzzo*

*Carly Tamer, DeVaughna Tulloch, Alexa Varlamos*

**The Effect of Organic and Inorganic Fertilizer on Regeneration of *Lumbriculus variegatus***

Due to growing desires to improve soil properties and facilitate plant growth, the use of fertilizers has increased around the globe. As humans utilize more fertilizers as a way to keep their lawns “healthy,” they risk damaging these organisms and their ability to carry out functions important to survival. Regeneration and asexual reproduction, for example, is a way for organisms to grow and repair damaged body parts. Without this ability to regenerate, many organisms would decrease in number which could lead to the extinction of various species. This could in turn, alter the food chain and the environment as a whole.  In this experiment, we tested the effect of both organic and inorganic fertilizers on the regeneration of *Lumbriculus variegatus* (California blackworm) to discover which fertilizer was more detrimental to blackworm regeneration; therefore, demonstrating which fertilizer could be more dangerous to an organism’s health. The blackworms were cut in half and exposed to Scotts® Starter Fertilizer (inorganic fertilizer) and Milorganite (organic fertilizer) dissolved in water and regeneration data was recorded over the course of five days. The control group tested the worms in water only. Thus far results show, worms exposed to organic and inorganic fertilizers regeneration approximately two times more segments than that of the control group. Therefore, our data could not support our original hypothesis that fertilizers are detrimental to organisms, and further testing must be done. This project will better our understanding on the effect of fertilizers, used by everyday consumers, on ecosystems.

*Cunyed Tasoglu – See Daniel Lee*

*Justin Tollin*

**An Analysis of Territoriality Exhibition in Asian Short Crabs**

The Asian shore crab, *Hemigrapsus Sanguineus,* is an invasive species that causes a decrease in biodiversity since they outcompete native species. The crab, also known as a Japanese shore crab or Pacific crab is believed to have arrived in the United States in 1988 in the ballast of a cargo ship or in the water discharge. Since they are invasive, they can affect the chemical makeup of the water, availability of resources, and even alter the food chain. The term invasive is defined as spreading prolifically and undesirably. The purpose of this study was to investigate whether Asian Shore Crabs, of different sizes exhibit different territorial behavior. Territoriality is defined as the behavior of an animal in defining and defending its territory. By obtaining a greater understanding of its territoriality, it may be possible to use that knowledge to control the crabs population so they don’t have such a negative effect on native species. To conduct this study, crabs that were collected from the local beach were relocated into control tanks based on gender and size. Tiles were placed inside of the experimental area to simulate rocks that the crabs would normally live under. I hypothesized that the crabs do exhibit territoriality. Crabs that exhibit territoriality will focus in on going to the same tile each time. All trials were done inside of an experimental tank that original had two tiles, but then had four. It will take longer for the male crab to shelter himself under a tile. Thus far results show that the crabs are showing territoriality.

*Nicholas Tringali*

**The Effect of Birth Control Medication on Hatching Rate of Brine Shrimp**

Waste products with pharmaceuticals are becoming a greater problem. This study started in Europe but findings have since attracted the attention of science. The purpose of this experiment was to determine if birth control medication has an effect on the hatching of brine shrimp eggs. It has been show that birth control drug has gotten into the water supply. Contaminated septic tanks with birth control could lead to negative effects on the environment. The hatching rates were determined by counting the eggs on the first day and the third day. Brine shrimp eggs usually hatch at about 10-50% in a day. The eggs were put in 20 grams/liter salt water and the hatching rate is counted using a microscope. I hypothesized that birth control will slow down the hatching rate of brine shrimp. I hypothesized this because; Birth Control medication stops human reproduction so I believe it should stop brine shrimp reproduction . Data thus far suggests that the control for the brine shrimp hatching rate is around 30%. Not all of my data is yet recorded.

*DeVaughna Tulloch – See Carly Tamer*

*Lauren Tuffy*

**Is There a Difference in the Density and Type of the Antibiotic Resistant Bacteria in the Rhizosphere Compared to the Non-Rhizosphere?**

The purpose of this study was to compare the density of antibiotic resistant and non- antibiotic resistant bacteria between the non-rhizosphere and to rhizosphere zones around the plants. Rhizosphere soil is in the direct vicinity of roots, while non-rhizosphere is about two centimeters or more away from root systems. Previous studies have identified that soil contains a large number of diverse bacteria types, including antibiotic resistant bacteria. To carry out this study soil samples were collected from the rhizosphere and the non-rhizosphere zones with a sterilized shovel. The soil was soaked in sterile water. This was done to dilute the sample. A sample of the water was plated on agar plates, with either antibiotics or no antibiotics. The numbers of colonies were counted and colony characteristics were identified and compared. Thus far results show that the rhizospheres have the most antibiotic resistance bacteria and the non- rhizosphere and the rhizosphere have similar bacterial colonies. This study is important because bacteria help plants obtain nutrients, and increase antibiotic resistance in the world is a serious medical issue.

*Amy Uthup – See Olivia Dubi*

*Elizabeth Van Loon – See Abbigayle Cuomo*

*Alexa Varlamos – See Carly Tamer*

*Douglas Verity*

**The Relationship Between Fat Content in Some Fruits and Vegetables and Their Mass**

Fruits and vegetables such as avocado, coconut and peanut contain fatty acids or lipids. Lipids are naturally occurring fat molecules that make up a major portion of each of the food sample’s total mass. The purpose of this investigation was to determine the amount of fat that is present in avocado, coconut and peanuts and to compare the total fat extracted from the sample to its original mass. Based off of the data I collected from prior research, the food samples that I tested had a correlation between the mass and fat concentration. The previous data I researched suggests that as the food sample began to ripen it contained more fat and had a higher mass than when it was not ripe. I hypothesized that there will be a positive correlation between the mass and the total fat extracted. Based on previous studies and data it was evident that the total fat extraction was correlated with the original mass of each of the food samples. The overall fat extracted will determine how much fat is generally contained in the food samples and the correlation of the fat percentage and it’s the sample’s total mass.

*Jeremy Vlacancich – See Max Sugarman*

*Ryan vonHof*

**An Investigation into the Economic Viability of Fischer-Tropsch Synthesized Green Diesel**

For the past several decades the use of fossil fuels, such as coal and oil, have had devastating effects on the environment. It has been widely accepted that the use of these fuels have led, in part, to global warming via the greenhouse effect. In order to prevent the worsening of the global climate alternative, carbon neutral, energy sources must become prevalent. A possible candidate for an alternative carbon neutral fuel is green diesel which is chemically the same as traditional diesel, but does not add greenhouse gases to the atmosphere when burned. The purpose of this experiment was to determine if green diesel can be synthesized through a Fischer–Tropsch reaction and be an economically sound replacement for modern fossil fuels. The Fisher-Tropsch reaction requires hydrogen, a source of triglycerides, and a catalyst, in the synthesis of green diesel, the source of triglycerides is typically microalgae, and in this investigation calculations will be made using *Parietochloris incisa*, a common source of triglycerides. Economic calculations were made assuming that microalgaes were grown under standard conditions and using Department of Energy Oil Data for comparing the cost of green diesel to the cost of modern fossil fuels and projecting the future of the oil market. It was found through my investigation that Fische-Tropsch synthesized green diesel will likely become a viable alternative for traditional diesel by the year 2025.

*Benjamin Wolgang – See Alexis Davitashivili*

*Matthew Wu – See Max Sugarman*

*Johann Yang, Daniel Choi*

**The Effect of Ginger (Zingiber Officinale) on the Neuroinflammation Precipitated by Environmental Copper.**

Environmental factors can  have significant deleterious effects on the onset of neurodegenerative disease.  The introduction of environmental copper particles that can come from the inhalation of airborne copper or the ingestion of contaminated water from degrading copper pipes has been suggested as a primary agent in producing such effects. Research shows that copper particles can precipitate neuroinflammation both by upregulating certain pro-inflammatory cytokines including the IL-1B gene, and by downregulating anti-flammatory cytokines such as the IL-10 gene. To combat the onset of neurological disease, flavonoids have been used as a substitute for more conventional pharmaceutical medications especially in Asian countries through the use of herbal and natural medicines. Flavonoids are secondary plant metabolites that are especially beneficial in their anti-inflammatory effects, and are found in many common fruits and vegetables including ginger, a root that has historically been used to treat a variety of diseases. In this research, we treated HTB-11 neuroblastoma cells with copper particles in conjunction with a ginger extract. Then, DNA analysis on cytokines IL-10 and IL-1 Beta, general anti- and pro-inflammatory genes respectively, was completed to look for the up or down regulation of these genes associated with each treatment. We hypothesized that the presence of ginger would alleviate the neuroinflammation that we expected the copper particles to produce. We found that for the IL-10 anti-inflammatory gene, ginger would generally upregulate the expression of this gene even when in conjunction with copper particles, supporting the claim that flavonoids have potential in combating neuroinflammation.

*Peter Yu*

**Effects of Urban Development on Precipitation**

The purpose of this study was to determine how the presence of urban development affects precipitation and temperature before and after the 1970’s. From the end of the 19th century until now, America has shifted from an agricultural nation to an urbanized, industrial one. As urbanization spreads, this investigation is imperative in deciphering how aspects of urbanization impact precipitation. Spread of Urban development is reported to greatly increase the rate of pollution in the air (Westphal and Lamberts, 2008). Urban areas generally hold higher temperatures due to pollution or absorption of sunlight by roads and buildings. For this study, since a warmer climate can hold more moisture in the air, it can be expected that there would be more precipitation and higher temperatures in urban areas. During the 1970’s, the previously four rural areas (Hawaii Kai HI, Coral Springs FL, King City OR, and Clear Lake City TX) underwent the construction to the modern metropolitan areas they are today. The precipitation and temperature of these four areas has been measured and compared based on past weather reports from the years 1961-1995. Data between years before (1961-1975) and after (1980-1995) was deemed to be statistically different with statistical analysis (T-Tests). This concludes that the years after the construction of cities has seen with a significant decrease in rainfall than years prior. It also indicates that the years after construction had a significant increase in temperature. While the data source area may seem small, the results of this investigation hold worldwide implications concerning future trends in the ever modernizing world.

*Kevin Zhou – See Daniel Cho*

**Alumni Updates**

**Class of 2015**

*Jason Bak,*

BS Candidate, Chemistry, Computer Science

*Ryan Chan, Hunter Macauly*

BS Candidate, Biology, PreMed track

Volunteer, Bellevue Hospital

*Matthew O’Connell, Stanford University*

BS Candidate, Computer Science and Management Science and Engineering

Software Developer, Zynga

**Class of 2014**

*Zan Asif, SUNY New Paltz*

BS Candidate, Biology

*Anthony Bisulco, Northeastern University*

BS Candidate, Electrical and Computer Engineering

Undergraduate Researcher, Department of Homeland Security Laboratory

Research Intern, MIT Lincoln Laboratories

Fall 2016, Design and Development work, CERN, Geneva, Switzerland.

*Christina Cabana, Carnegie Mellon University*

BS Candidate, Chemistry, Biochemistry

Science and Humanities Scholar

Undergraduate Researcher , Bruchez Lab

Summer 2015, Undergraduate Researcher, Rout Lab, Rockefeller University

Summer 2016, Amgen Scholar’s Program, Columbia University

Barry Goldwater Scholarship Nominee

*Justin Cheung, Stony Brook University*

Chemical and Molecular Engineering

8 year BE/MD Medical Program

Intramural Research Training Fellowship at Vaccine Research Center, National Institute for Allergy and Infectious Disease, Bethesda, MD

*Sarah Lamorte, University of St. Andrew’s*

5 year Master of Chemistry Degree Program

Organic Chemistry concentration

*Hugh Han, Johns Hopkins University*

Summer intern at the Johns Hopkins University Applied Physics Laboratory

Late summer Software Engineering Intern in China

*Tracey Rosenlicht, Stony Brook University*

Volunteer, Oncology department, Stony Brook Hospital

*Rakia Syed, Stony Brook University*

Biology and Linguistics student

*Noah Tollin, University of Georgia*

Biology Program, PreMed track

*James Whittaker, Lehigh University*

Pennsylvania Governor's School for Engineering and Technology

*Joshua Zweig, Columbia University*

BS Candidate, Computer Science, Environmental and Sustainability Engineering

Cyber Security Research with Dr. Steve Bellovin

Carbon Sequestration Research with Dr. Klaus Lackner

Summer 2015, Microsoft

Summer 2016, Security Engineer, Area 1 Security

**Class of 2013**

*Megan Kurten, Scared Heart University*

BS Candidate, Nursing, Honors Program

*Trinity Russell, Wesleyan University*

BS Candidate, Neuroscience, Behavior and Psychology

Summer 2015, Yale School of Medicine Summer Medical and Dental Education Program

Summer 2016, National Institute of Health, Institute on Drug Abuse

**Class of 2012**

*Rebecca Alford, Carnegie Mellon University*

NIH fellowship at Johns Hopkins, Chemical and Biomolecular Engineering in Jeff Gray's Lab.

Hertz Foundation Fellowship

PhD Program in Chemical and Biomolecular Engineering, Johns Hopkins University

*Rachel Gross, Northeastern University*

BS Candidate, Behavioral Science, PreMed

Clinical Research Coordinator, New England Baptist Hospital, Research Department

*Michael Iadevaia, Cornell University*

Bachelor’s Candidate, Industrial and Labor Relations, Highest Honors

Fall 2016, UCLA Law School

*Steve Jang, Carnegie Mellon University*

MS Candidate, Chemistry

*Abdullah Khan, Stony Brook University*

BS Candidate, Biology

*Savina Kim, Yale University*

BS Candidate, Cognitive Science and Economics

Healthcare Coverage Group, Barclays

*Zachary Kramer, Stony Brook University*

Education, History

*Philip Mauser, Stony Brook University*

BE Candidate, Electrical Engineering

RF Engineer, Zebra Technologies

*Anthony Musto, Hunter College*

Law Enforcement, Education

*Rajkumar Pammal, Harvard University*

Work with Qur, healthcare start-up in Boston

*Neela Qadir, Drexel Uniersity*

MS Candidate, Chemistry

*Cortney Tiberia, University of Buffalo*

Intern, Ernst and Young

**Class of 2011**

*Jesse Badash, Vanderbilt University*

BS, Computer Science and Math

Software Engineer, Google

*Amanda Cramer, Cornell University*

Fall 2016, Syracuse Law School

*Matthew Katz, Washington University*

BS, Chemical Engineering

Deloitte Consulting

*Matthew Kim, Columbia University*

Computer Science Engineer, Dropbox

*Ian Marquit, Farmingdale State College*

BS Candidate, Nursing

*Sonal Nanda, Carnegie Mellon University*

RPI's Nuclear Engineering PhD Program

*Erica Portnoy, Princeton University*

Berkley University for Graduate School in computer science

*Savitha Racha, Boston University*

BS, Philosophy and Medical Science

2nd Year Medical student, Boston University School of Medicine

*Arpon Raksit, Harvard University*

Master’s program in Math at Cambridge University

Fall PhD program in Math at Stanford University

*Karen Schaub, Cornell University*

BS, Biometry and Statistics, Applied Economics minor

Retirement Actuarial Analyst at Towers Watson in Stamford, CT

*Asli Sinar, NYU*

*Marni Wasserman, Johns Hopkins University*

Insurance Services Offices, Actuarist

*Aaron Wilson, Bucknell University*

BS, Pre Med

Medical Student, St. George’s University, Grenada

**Class of 2010**

*Alexis Tchaconas, Columbia University*

Hofstra-Northwell School of Medicine

*Robert Schuman, Duke University*

Materials and Process Engineer, Boeing

*Rachel Lordahl, Stony Brook University*

BS, Biology

Doctor of Veterinary Medicine 2019 Candidate, Atlantic Veterinary College

**Class of 2009**

*Jeremy Forman, Queens College*

BA, Film Studies

MS Candidate, Library Science

*Jason Gross, MIT*

MIT Graduate school

*Robert Schumann*

BS, Mechanical Engineering

MS, Aerospace Engineering

Materials and Process Engineer, Boeing

**Class of 2004**

*Elizabeth Bloomfield, Yale, Columbia, London School of Economics*

Investment banking at Morgan Stanley

*Sarah Fink, Williams College, Cambridge University*

BioDuro Senior Scientist

**Class of 2003**

*Brandon Imber, Harvard University*

Attending medical school

**Class of 2001**

*Christina (Chang) Hung, Harvard University, University of Pennsylvania*

Associate Director of Investments at Bucknell University

**Class of 2000**

*Jennifer Danielson, Johns Hopkins University, NYU School of Medicine*

Anesthesiologist

**Class of 1999**

*Grace Tan, MIT, New York School of Optometry*

Private Optometry Practice, Northport

*John Egan, SUNY Geneseo, Emory University*

Attorney at Seyfarth Shaw, New York

*Sandra Nudelman, Harvard University*

McKinsey & Company, Management Consulting Firm

**Class of 1996**

*Dominick Rosa, Yale University*

Anesthesiologist

**Class of 1992**

*Robin Niles, Cornell University, Boston University School of Medicine*

Senior Associate Scientist at Biogen Idec

**Class of 1989**

*Michael Maitland, Yale University, Albert Einstein College of Medicine*

Associate Professor of Medicine, University of Chicago

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