

On March 12, 2011 at Sleepy Hollow High School, 33 Yorktown HS Science Research students publicly presented their research at the Progenics/Regeneron/Acorda Westchester Science & Engineering Fair (WESEF).

There were 270 students (244 projects) from 29 schools involved. In all, 220 awards were given out including the Grand prize of an all expense paid trip to present their research at the Intel International Science & Engineering Fair in Los Angeles, California this May.

The Intel ISEF brings together 1,600 science fair winners from every state and 60 countries and is considered the “Olympics of Science Fairs”. This is the larger and more global of the two Intel sponsored events. The other being the Intel Science Talent Search

Participating Schools: Blind Brook, Briarcliff Manor, Carmel, Croton-Harmon, Dobbs Ferry, Eastchester, Edgemont, Fox Lane, Gorton, Hastings, Hendrick Hudson, Horace Greeley, Irvington, John Jay, Lakeland, Mahopac, Mamaroneck, New Rochelle, Ossining, Pelham Memorial, Scarsdale, Sleepy Hollow, Somers, Soundview Preparatory School, The Ursuline School, Tuckahoe, Walter Panas, White Plains, Yorktown

In unprecedented format: 33 of the 33 current Yorktown HS Science Research students that participated in WESEF, won awards.

Overview of the top award winning schools:

Yorktown– 62 Awards

Ossining– 47 Awards

Sleepy Hollow, Briarcliff, – 19 Awards each

Scarsdale, Edgemont – 18 Awards each

Mamaroneck – 17 Awards

Horace Greeley – 16 Awards

John Jay, Croton Harmon – 10 Awards each

American Meteorological Society Award

Environmental - Miwa Wenzel

Physics – Luke Nolan

Computer Science – Linus Hamann

ASM International Foundation Award

Joseph Verticchio – Engineering

Association of Women Geoscientists

Amanda Cesario – Environmental

Megha Bhambri – Environmental

Intel Excellence in Computer Science

Alex Trestyn – Computer Sci.

Linus Hamann – Computer Sci

National Society of Professional Engineers

David Stavans – Engineering

Nithin Santhananm – Engineering

National Oceanic & Atmospheric Administration Awards

Miwa Wenzel – Environmental

Society for In Vitro Biology Award

Andre Nakkab – Cell Biology

Stockholm Junior Water Prize

Amanda Cesario – Environmental

US Army Award

Kathryn Keane – Behavior/Social Sciences

Palak Bhambri – Biochemistry

Air Force Award

David Stavans – Engineering

US Navy/US Marine Corps

Joseph Verticchio – Engineering

John Wolff – Medicine & Health

Yale Science & Engineering Association Inc.

Nithin Santhanam – Engineering

Luke Nolan – Physics

Linus Hamann – Computer Science

Patriot Risk Management Group

For Behavioral research projects dedicated to making life better for people

Laura Anderson – Behavior/Social Sciences

Westchester Medical Academy of Medicine Award

For “Excellence In Research” Award

Meaghan Skelly – Medicine & Health

Julia Kelly – Biochemistry

Dave (Yide) Lu – Medicine & Health

Philips Awards for Exceptional Research -

Andre Nakkab – Cell Biology

“Visual Impact Award” for the projects with the best visual representation of research sponsored by the Clayton Family

Francesca Giordano - Plant Science

John Wolff - Medicine

Amanda Cesario - Environmental

Joseph Verticchio - Engineering

Nikita Patel - Biochemistry

Arya Viswanathan - Behavior

George D. Yancopoulos Young Scientist Award
sponsored by Regeneron Pharmaceuticals – (plaque and \$200
given out to two projects)

Kathleen Mavrommatis – Behavior/Social Sciences

Paul J. Maddon Innovations in Science Award
sponsored by Progenics Pharmaceuticals, Inc. – (plaque
and \$250 given out to two projects)

Alex Trestyn – Computer Science

**Phelps Memorial Hospital Medical Staff – High
Honors Award** – (\$100 given out to four projects)

Benjamin Strober - Biochemistry

New York State Science + Engineering Fair Award –
(\$150 to pay for a second chance to win a spot at the Intel ISEF at NYSSEF given to the #9 and #10 project
overall)

Nisha Rath – Medicine & Health

BEST IN CATEGORY AWARDS

**4th Place Awards Sponsored by Westchester Academy of
Medicine**

– (\$25 + Medallion)

Nithin Santhanam – Engineering

Arya Viswanathan – Behavior

Brian Pulling – Medicine & Health

Amanda Cesario – Environment

Tony Wang – Cell Biology

3rd Place Awards Sponsored by Psychogenics Pharmaceuticals **– (\$50 + Medallion)**

Linus Hamann – Computer Science

Stephen Anderson - Medicine

Juliana Vigorito – Biochemistry

Miwa Wenzel – Environment

2nd Place Awards Sponsored by Acorda Therapeutics **– (\$75 + Medallion)**

Alexei Naumann – Microbiology

Luke Nolan - Astronomy

Alex Trestyn - Computer Science

Michael Cerabona - Engineering

Kathleen Mavrommatis - Behavior

Yide (David) Lu – Medicine & Health

Priya Mohindra (& partner Gabriel Weissman – Horrace Greeley HS) – Biochemistry (team tied for 2nd)

Amna Chaudhry – Biochemistry (tied for 2nd)

1st Place Awards Sponsored by Regeneron Pharmaceuticals **– (\$100 + Medallion)**

Matthew McIntyre – Microbiology

Amanda Buonagurio (and partners: Morgan & Elyse Blueglass – Somers HS) - Behavior/Social Sciences

Nisha Rath – Medicine

Benjamin Strober – Biochemistry

Environment – Megha Bhambri

And the WESEF 2011 – FINALISTS

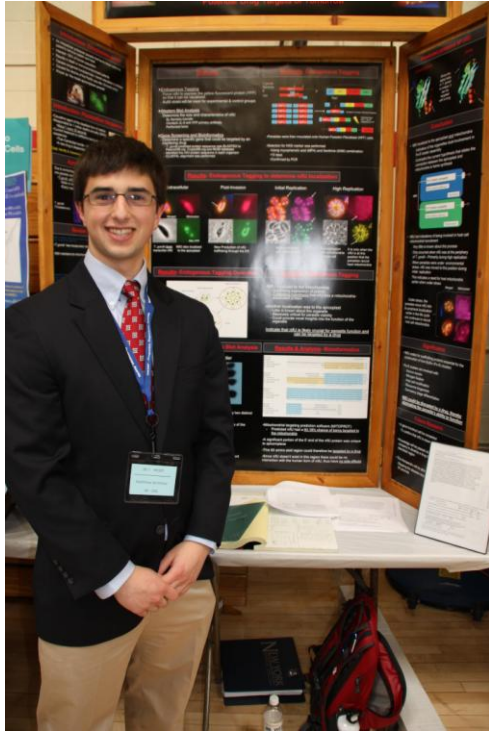
Sponsored by

Progenics Pharmaceuticals & Fuji Film

The top 12 overall projects win the following prizes: A plaque, A Camera, Case, and memory card (retail value of \$300) sponsored by FujiFilm USA which is the exclusive photo imaging company of WESEF, A Celebration Banquet in their honor at the Crabtree Kittle House in Chappaqua sponsored by Carl Zeiss MicroImaging and Acorda Therapeutics, An all expense paid trip (thanks to Progenics) to the Intel International Science & Engineering Fair in Los Angeles, California to compete against the best research students from all over the world. This trip is known as the “Olympics of Science Fairs” and is sponsored by the continuous support from Progenics Pharmaceuticals.



Matthew McIntyre – Microbiology



A Solution to the Worldwide Malaria Epidemic: *T.gondii* Mitochondria-Associated Proteins as Potential Drug Targets of Tomorrow

ABSTRACT

Plasmodium falciparum, the apicomplexan parasite responsible for the deadliest form of malaria, causes one million deaths annually. Recently, resistant strains of the parasite are leaving standard treatments ineffective. The goal of this study is to identify a new genetic target for the treatment of infections caused by apicomplexan parasites. This study focuses on the *nifU* gene which transcribes two forms of a scaffolding protein known to be crucial to the assembly of iron-sulfur (Fe-S) clusters. Fe-S clusters are known to be involved in host cell modification, ribosome biogenesis, and in sensing redox signals. Using another apicomplexan parasite, *Toxoplasma gondii*, as a model, this study utilized bioinformatics, endogenous tagging, and Western blot analysis to characterize the *nifU* gene in apicomplexan organisms. To our knowledge, this study is the first to confirm the expression of a *nifU* protein in apicomplexa. This study has shown that the *nifU* gene in apicomplexa has a unique region that could potentially serve as a therapeutic target. This study has also demonstrated that the *nifU* protein has multiple localizations to the parasite's mitochondria and apicoplast throughout the invasion-lyses cycle. A new hypothesis for the interactions between the parasite's apicoplast and mitochondria is proposed.

Michael Cerabona – Engineering



Increasing the Efficiency of Solar Tracking Systems

ABSTRACT

Previous research has shown that a solar tracking system can improve the output of a solar cell by 30%. However, tracking devices are not widely used in solar installations because they are inefficient because they use high speed/low torque motors. This creates a load mismatch with current tracking systems which require a low speed and high torque input. Expensive gearboxes are often used to solve this problem, nearly defeating the purpose of a tracking system. This research has focused on replacing these inefficient mismatched motors with a material called muscle wire, a shape memory alloy that contracts when electric current is applied. The muscle-wire tracking system consists of a muscle-wire gear assembly, a differential photodetector and electronic driver circuitry. Once designed and completed, the prototype was tested outdoors, and results showed that it was able to precisely track the sun, providing a 24% increase in energy output over the control stationary cell. Additionally, calculations demonstrated that over the course of a day of tracking the sun, the muscle wire used only .00147 KWH of electricity. When scaled up, it is projected to provide a 45% greater net-output than other motor-based systems. This research has served as a proof-of-concept that will allow solar tracking systems to be more efficient, cost effective, more widely used.

Amanda Buonagurio

(& partners: Morgan & Elyse Blueglass from Somers HS)

- Behavior/Social Sciences



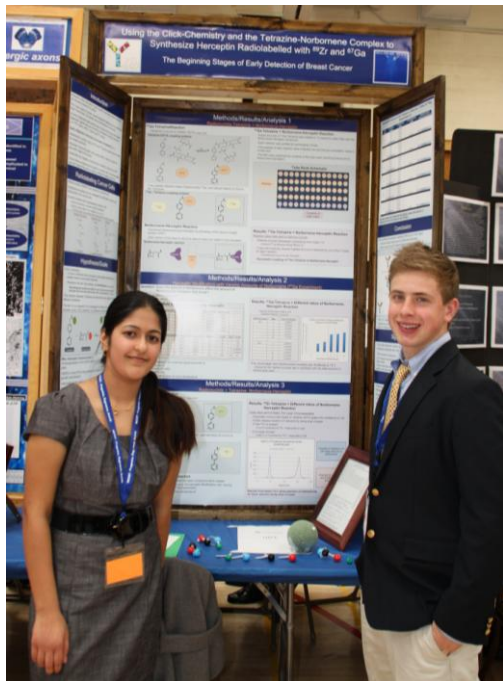
Discovering the Keys to a Positive, Lifelong Relationship Between People with Special Needs and their Nondisabled Siblings. A Worldwide Study to Help Guide Parents & Siblings with this Challenging Relationship

ABSTRACT

Countless efforts are dedicated to help adults with special needs; however, very few are dedicated to helping their nondisabled siblings. In order to analyze if there were any parenting trends that led to a positive, lifelong relationship between the nondisabled sibling and their sibling with special needs, an online survey was created measuring the behaviors, attitudes, and views of nondisabled siblings. The survey was distributed to sibling support groups and organizations focusing on people with special needs and their family members. Over 450 surveys were completed from 40 states in the USA and 16 additional countries. The way that parents present the challenge of having a sibling with special needs to their nondisabled child/children has the largest impact on the strength of the sibling relationship, at that point in time and in the future. If parents clarify to the nondisabled child about the disabilities of their sibling with special needs by creating an environment where they could discuss concerns they were having in regards to their sibling as well as being included in family decisions, then the relationship between the siblings were significantly more loving, caring, and overall positive, with lower levels of resentment and frustration. Just as nondisabled siblings can act as a support group for each other, if there is only one nondisabled child in the house, more emphasis needs to be placed on balancing the amount of attention given to each child. To continue this method of research, it is essential to closely analyze family dynamics in an effort to determine if the findings of this study holds true in different environments as well as involvement from other countries.

Priya Mohindra (& partner Gabriel Weissman from Horrace Greeley HS)

- Biochemistry



Using Click-Chemistry and the Tetrazine Norbornene Complex to Synthesize Herceptin Radiolabelled to Zr-89 and Ga-67

ABSTRACT

Antibodies labeled with radioactive nuclides have emerged as simple devices that are very suitable for use in imaging cancer cells. However, the method by which these devices are constructed is intricate and inefficient. The antibody trastuzumab (Herceptin) was successfully radiolabeled with ^{89}Zr and ^{67}Ga , using copper free click chemistry. Using the tetrazine-norbornene complex to attach our radionuclide to the antibody we demonstrated that a) tetrazine joined to the radioactive metal, b) norbornene attached to the Herceptin and c) the norbornene and tetrazine “clicked” in order to form the entire complex. We further discovered an alternative way for combining the radionuclides to the Herceptin. In this method, the tetrazine was not bound to the radionuclide but to the norbornene and Herceptin. Then, the radionuclide was successfully added to the tetrazine-norbornene-herceptin complex. This shows the efficiency and versatility of this synthesis process, which can enable scientists to use a variety of radionuclides coupled with different antibodies to target different types of

And believe it or not.....

Both **Michael Cerabona**

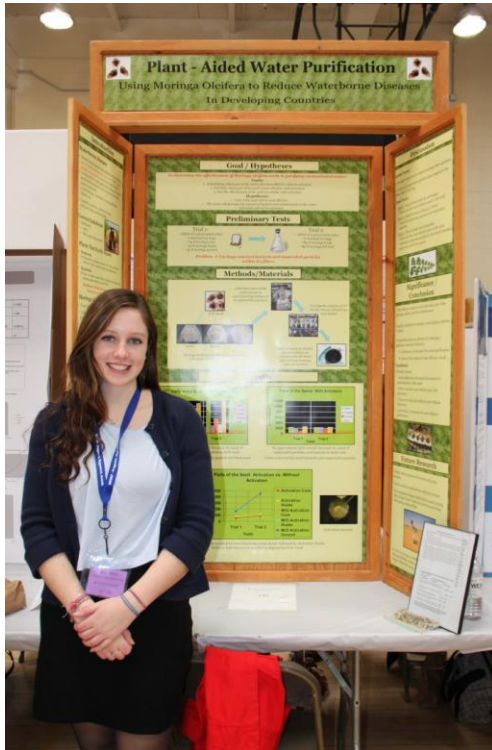


Increasing the Efficiency of Solar Tracking Systems

ABSTRACT

Previous research has shown that a solar tracking system can improve the output of a solar cell by 30%. However, tracking devices are not widely used in solar installations because they are inefficient because they use high speed/low torque motors. This creates a load mismatch with current tracking systems which require a low speed and high torque input. Expensive gearboxes are often used to solve this problem, nearly defeating the purpose of a tracking system. This research has focused on replacing these inefficient mismatched motors with a material called muscle wire, a shape memory alloy that contracts when electric current is applied. The muscle-wire tracking system consists of a muscle-wire gear assembly, a differential photodetector and electronic driver circuitry. Once designed and completed, the prototype was tested outdoors, and results showed that it was able to precisely track the sun, providing a 24% increase in energy output over the control stationary cell. Additionally, calculations demonstrated that over the course of a day of tracking the sun, the muscle wire used only .00147 KWH of electricity. When scaled up, it is projected to provide a 45% greater net-output than other motor-based systems. This research has served as a proof-of-concept that will allow solar tracking systems to be more efficient, cost effective, more widely used.

and **Amanda Cesario**



Plant-Aided Water Purification: Using Moringa oleifera to Reduce Waterborne Diseases in Developing Countries

ABSTRACT

A major problem for people living in developing countries is waterborne diseases. These bacteria, such as cryptosporiosis, giardiasis and E-coli infection, are found in water that has been polluted or contaminated from human or animal waste. When such water enters the body, the disease can cause many flu-like symptoms which if not treated, can eventually lead to death. In developing countries most people do not have the equipment or money to purify their drinking water adequately. If a less expensive, more naturally sustainable water purification supplement could be created, both economic and health problems could potentially be decreased. My research is focusing on using a native plant to developing countries called *Moringa oleifera* purify water. The seeds of this plant can be used through a specific process to make this possible. For example, one of the first methods used included using tea bags in combination with the seeds to filter the water through them. Another method used was to grind up the raw seeds and mix them straight into the contaminated water. My research specifically tests the activation process of purification with the seeds, and the specific part of the seed that works most efficiently. This project could be of great significance to those living in developing countries, and provides an easy, sustainable solution to a major problem

won a spot at the International Sustainable World Olympiad (ISWEEEP) the same week by their research paper submission.

At ISWEEEP Michael and Amanda will compete against over 700 science fair winners from 50+ countries in Houston, Texas.

Thanks to the never-ending support by the District and High School Administration, the Yorktown Science Research program is not only getting bigger each year, it is also continuing to get stronger !!!!

We will let you know how our International representatives do as they “take on the world” at the Intel ISEF and the ISWEEEP in May 2011

We hope many people in the Yorktown community can join us for our end of the year Science Research Celebration & Symposium in the YHS Auditorium on Thursday, June 2nd at 7pm.

At the symposium you will get the chance to learn all of the projects being researched by the Yorktown Science Research 1st, 2nd & 3rd year research students.

For more information contact Michael Blueglass – yorktownhusker@aol.com

914-243-0561