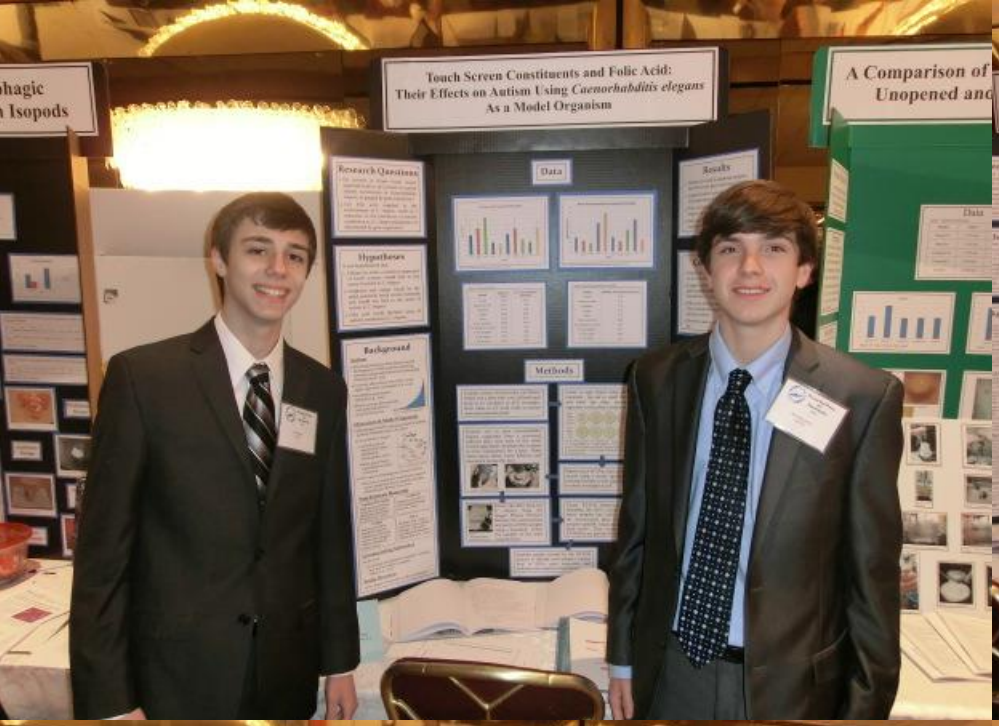
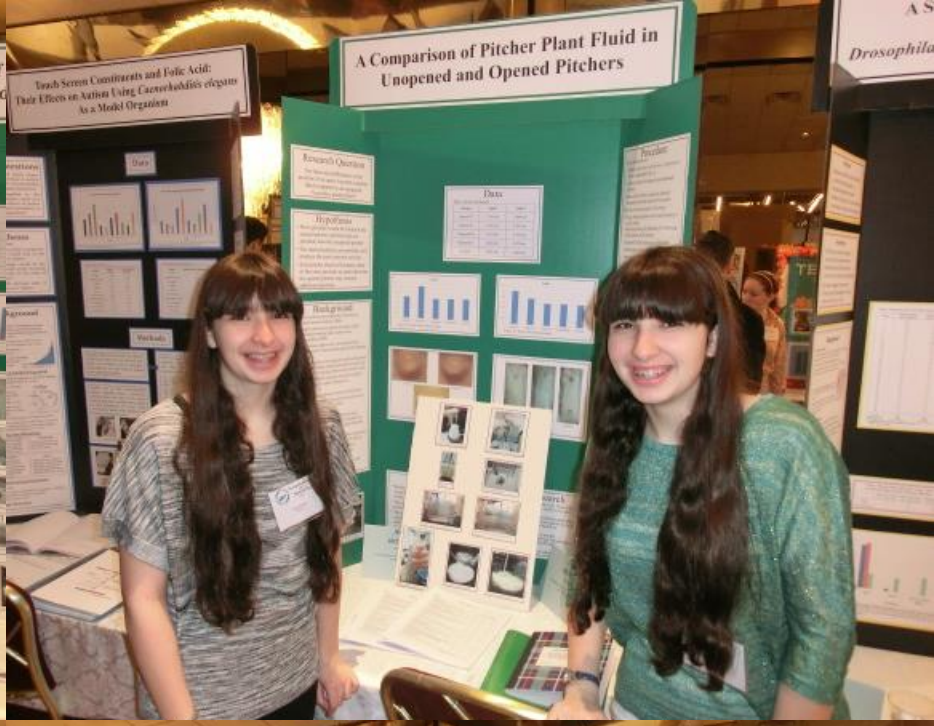

Science Research
2012-2013

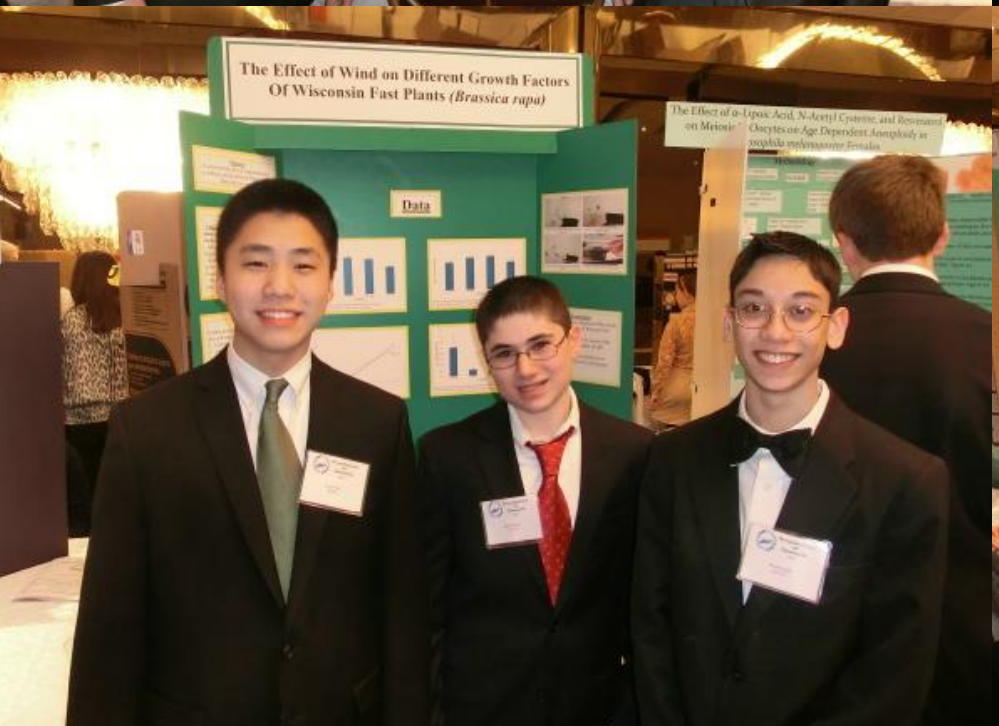

CONGRATULATIONS
COUGARETTES
EXIT
AUDITO

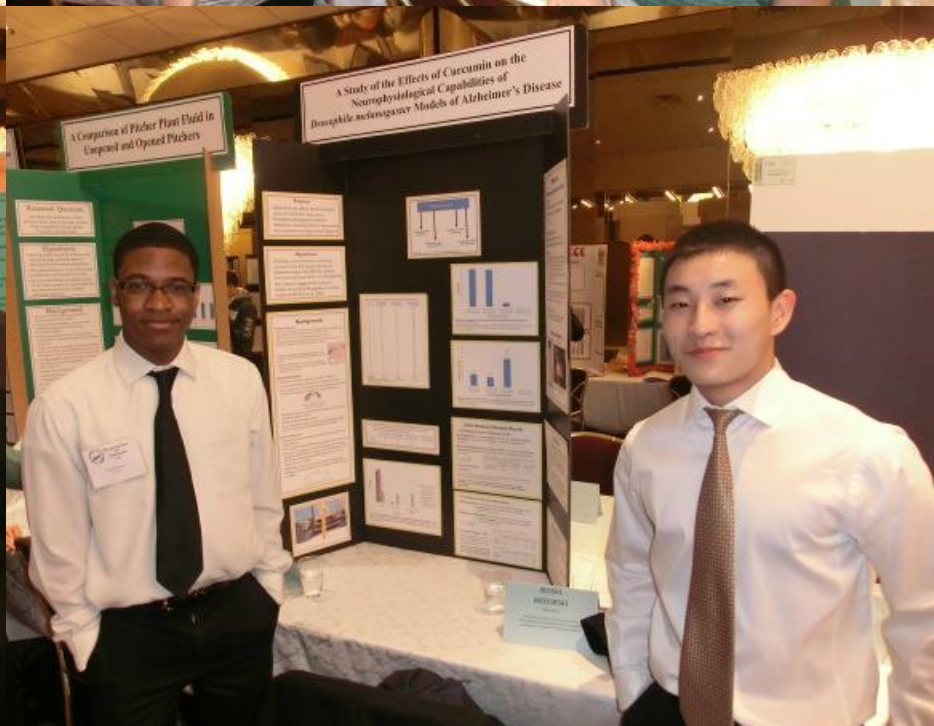

EXIT
CONGRATUL ATIONS

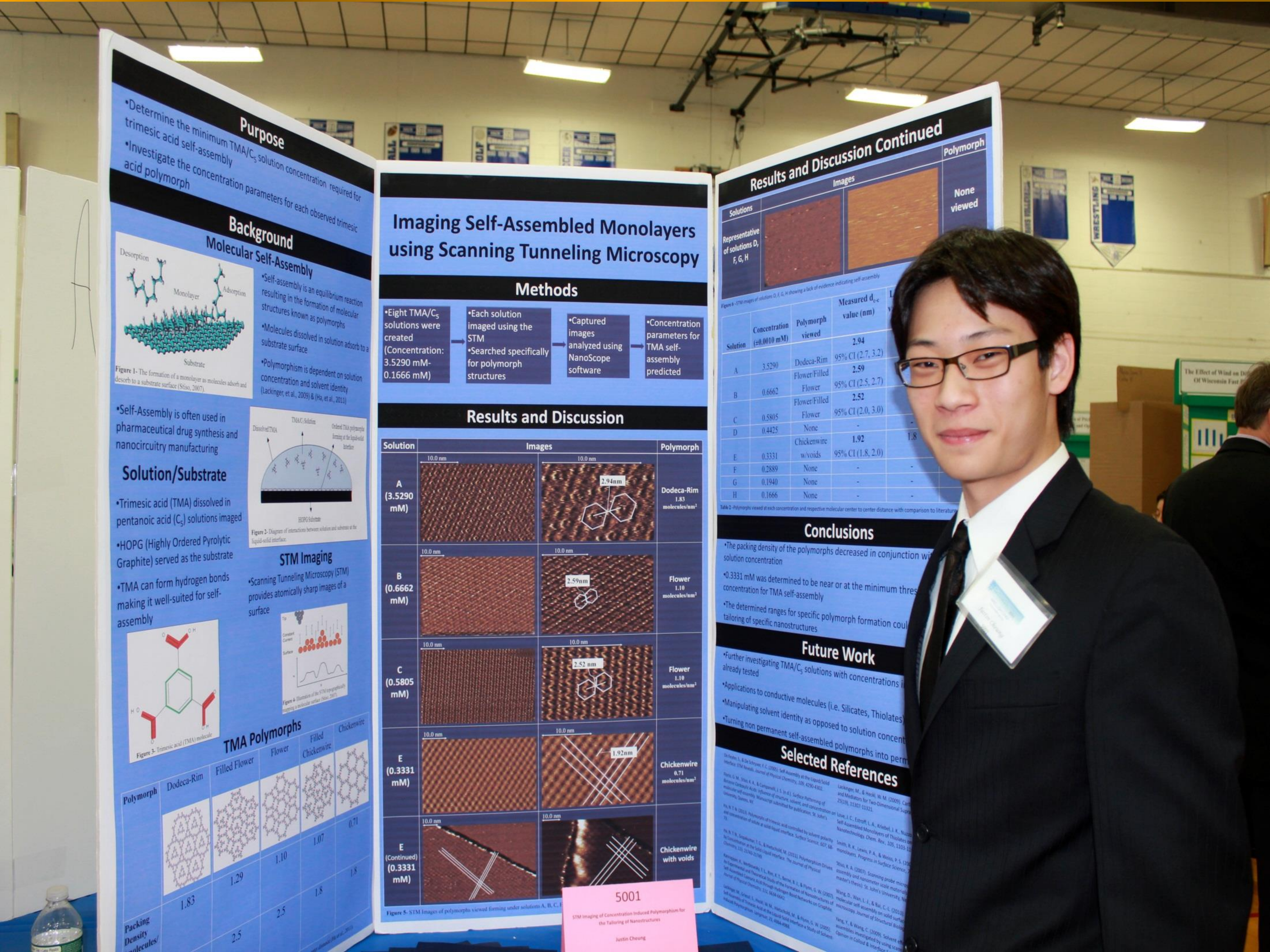

EXIT
CONGRATULATION
COUGARETTES


Touch Screen Constituents and Folic Acid: Their Effects on Autism Using Caenorhabditis elegans As a Model Organism
Data
Research Questions
Results
Hypotheses
Methods
Background


A Comparison of Pitcher Plant Fluid in Unopened and Opened Pitchers
Touch Screen Constituents and Folic Acid: Their Effects on Autism Using Caenorhabditis elegans As a Model Organism
Data
Research Question
Hypothesis
Background
Methods


The Effect of Wind on Different Growth Factors Of Wisconsin Fast Plants (Brassica rapa)
Data


A Comparison of Pitcher Plant Fluid in Unopened and Opened Pitchers
A Study of the Effects of Curcumin on the Neurophysiological Capabilities of Drosophila melanogaster Models of Alzheimer's Disease


Purpose
•Determine the minimum TMA/C5 solution concentration required for trimesic acid self-assembly
•Investigate the concentration parameters for each observed trimesic acid polymorph
Background
Molecular Self-Assembly
•Self-assembly is an equilibrium reaction resulting in the formation of molecular structures known as polymorphs
•Molecules dissolved in solution adsorb to a substrate surface
•Polymorphism is dependent on solution concentration and solvent identity (Lackinger, et al., 2009) & (Ha, et al., 2011)
Figure 1- The formation of a monolayer as molecules adsorb and desorb to a substrate surface (Stiso, 2007).
•Self-Assembly is often used in pharmaceutical drug synthesis and nanocircuitry manufacturing
Solution/Substrate
•Trimesic acid (TMA) dissolved in pentanoic acid (C5) solutions imaged
•HOPG (Highly Ordered Pyrolytic Graphite) served as the substrate
•TMA can form hydrogen bonds making it well-suited for self-assembly
Figure 3- Trimesic acid (TMA) molecule
STM Imaging
•Scanning Tunneling Microscopy (STM) provides atomically sharp images of a surface
TMA Polymorphs
Polymorph
Dodeca-Rim
Filled Flower
Flower
Filled Chickenwire
Chickenwire
Packing Density
1.83
1.29
1.10
1.07
0.71
2.5
2.5
1.8
1.8
Imaging Self-Assembled Monolayers using Scanning Tunneling Microscopy
Methods
•Eight TMA/C5 solutions were created (Concentration: 3.5290 mM-0.1666 mM)
•Each solution imaged using the STM
•Searched specifically for polymorph structures
•Captured images analyzed using NanoScope software
•Concentration parameters for TMA self-assembly predicted
Results and Discussion
Solution
Images
Polymorph
A (3.5290 mM)
10.0 nm
2.94nm
Dodeca-Rim
1.83 molecules/nm²
B (0.6662 mM)
10.0 nm
2.59nm
Flower
1.10 molecules/nm²
C (0.5805 mM)
10.0 nm
2.52 nm
Flower
1.10 molecules/nm²
E (0.3331 mM)
10.0 nm
1.92nm
Chickenwire
0.71 molecules/nm²
E (Continued) (0.3331 mM)
10.0 nm
Chickenwire with voids
Figure 5- STM images of polymorphs viewed forming under solutions A, B, C,
5001
STM Imaging of Concentration Induced Polymorphism for the Tailoring of Nanostructures
Justin Cheung
Results and Discussion Continued
Solutions
Images
Polymorph
Representative of solutions D, F, G, H
None viewed
Solution
Concentration (±0.0010 mM)
Polymorph viewed
Measured d c-c value (nm)
A
3.5290
Dodeca-Rim
2.94
95% CI (2.7, 3.2)
B
0.6662
Flower/Filled Flower
2.59
95% CI (2.5, 2.7)
C
0.5805
Flower/Filled Flower
2.52
95% CI (2.0, 3.0)
D
0.4425
None
E
0.3331
Chickenwire w/voids
1.92
95% CI (1.8, 2.0)
1.8
F
0.2889
None
G
0.1940
None
H
0.1666
None
Conclusions
•The packing density of the polymorphs decreased in conjunction with solution concentration
•0.3331 mM was determined to be near or at the minimum concentration for TMA self-assembly
•The determined ranges for specific polymorph formation could tailoring of specific nanostructures
Future Work
•Further investigating TMA/C5 solutions with concentrations already tested
•Applications to conductive molecules (i.e. Silicates, Thiolates)
•Manipulating solvent identity as opposed to solution concentration
•Turning non permanent self-assembled polymorphs into perm
Selected References
The Effect of Wind on
WRESTLING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2008-09
Siemens Competition
Math : Science : Technology
Semifinalist
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Siemens 2012
Siemens 2012
Siemens 2012


A Comparison of Learning Between Wild Type and Neurologically Impaired Fruit Flies
Purpose
Procedure
Hypothesis
Data/Analysis
Background


Investigating the Existence and Degree Of Cold Tolerance in Melittobia digitata and Armadillium vulgare
Data


The Effects of Colored Overlays on Computer Vision Syndrome


Investigating Intergenerational Relationships Between Senior Citizens and Teenagers Through Social Networking
Investigating the Existence and Degree Of Cold Tolerance in Melittobia digitata and Armadillium vulgare
Data


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2009-10
Siemens Competition
Math : Science : Technology
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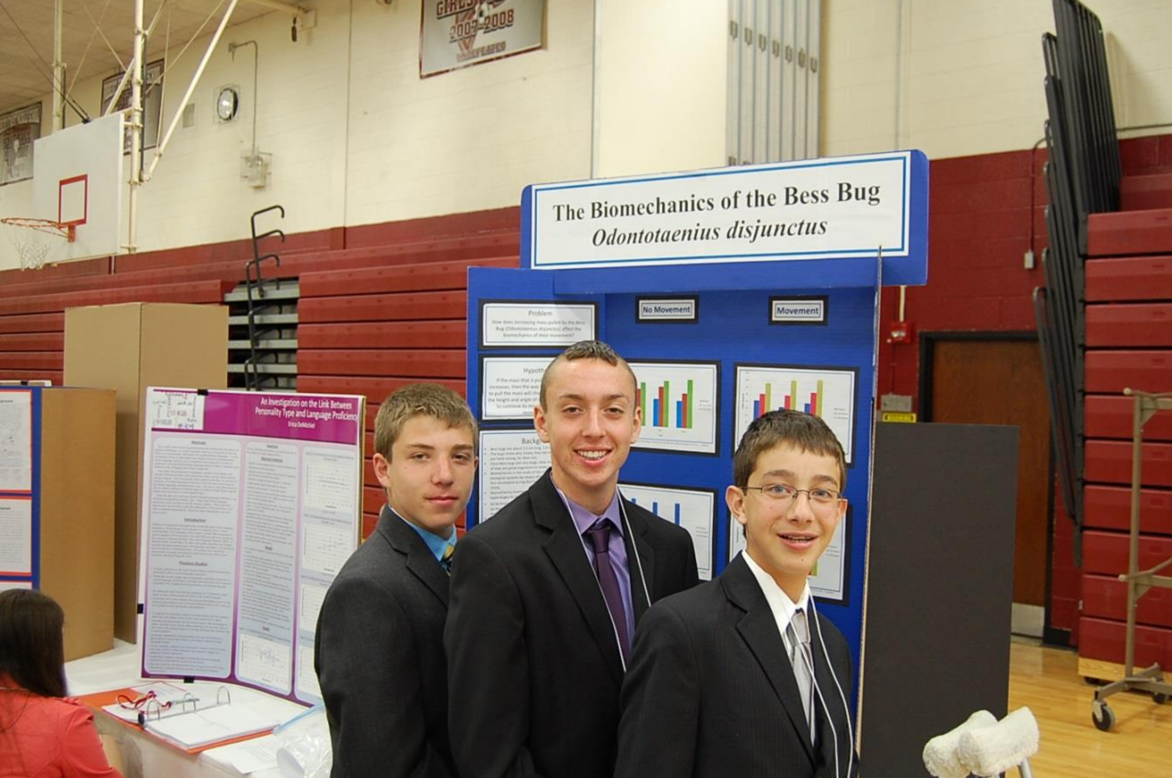
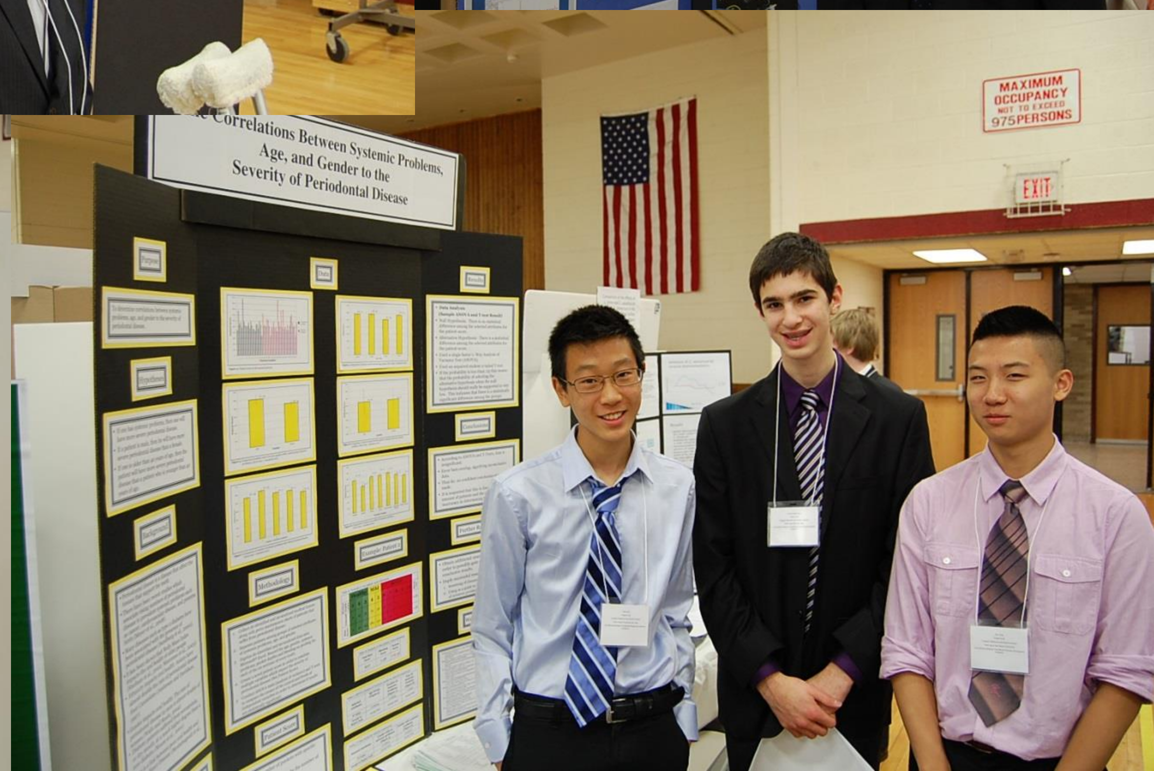
SIEMENS
CollegeBoard
CHEMISTRY
NO CHEMICAL DISPOSAL PERMITTED DOWN THE DRAIN
How Do Wild Type Fruit Flies (Drosophila melanogaster) Condition in a Single Y-Maze Compared to Alzheimer's Model Flies?
Data/Analysis
Procedure


The Biomechanics of the Bess Bug
Odontotaenius disjunctus
Problem
No Movement
Movement
An Investigation on the Link Between Personality Type and Language Proficiency


What Effect Does Pickup Position Have on the Frequency Output of an Electric Guitar?
Problem
Faraday's Law
Analysis and Conclusions


A Survey Study of School Nurses' Knowledge On the Primary Care of Students with Diabetes
Nicotine Treatments for Fragile X Drosophila Mutants Using a Social Interaction Assay
Specific Aims
Methodology
Background
Sample Survey Questions
Abstract
Fragile X Syndrome


Correlations Between Systemic Problems, Age, and Gender to the Severity of Periodontal Disease
MAXIMUM OCCUPANCY NOT TO EXCEED 975 PERSONS
EXIT


Notification System Program Methodology
Data Acquisition
Notification
Conclusion
Real Life Applications
Power plant solar flare early detection system
Personal solar flare notification application
Limitations
The interpretation of the data pieces can only be made once a flare spikes and drops back down
ROAR
Dr. Fred Kruger 2011-12


EXIT
WARNING


EXIT
AUDIT


Challenge your mind
Connect to the future
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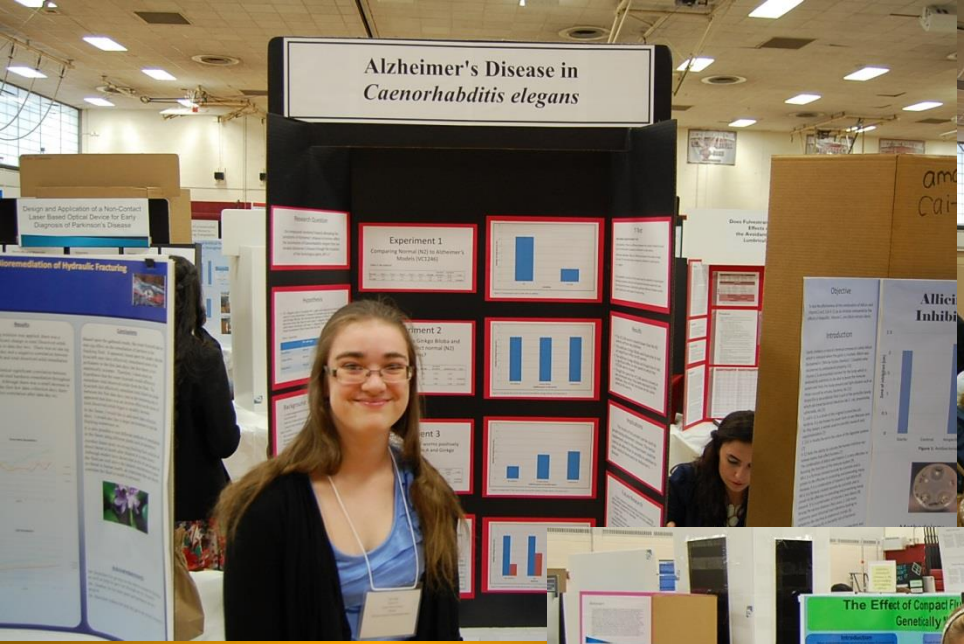
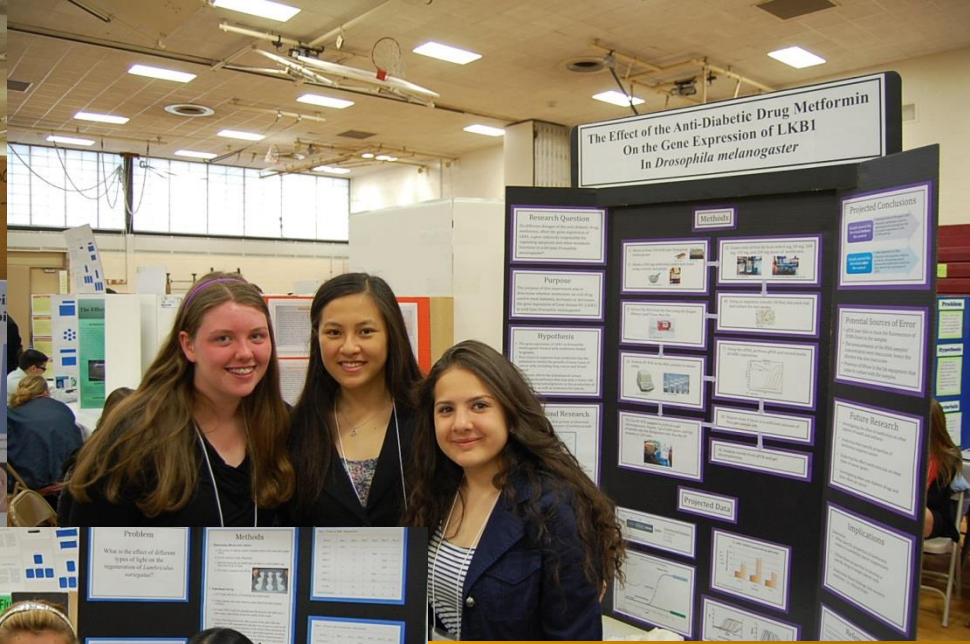
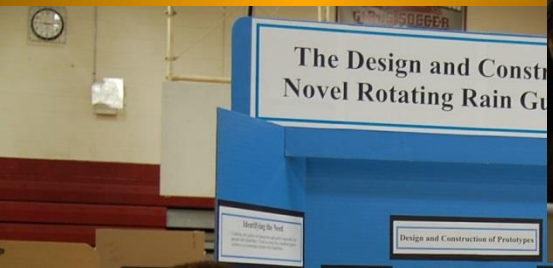
Math : Science : Technology
Semifinalist
Matthew Kim
CollegeBoard
The Million Degree Solar Corona
NO CHEMICAL DISPOSAL PERMITTED DOWN THE DRAIN
EMERGENCY SHOWER
SAFETY SHOWER


Alzheimer's Disease in
Caenorhabditis elegans
Experiment 1


The Effect of the Anti-Diabetic Drug Metformin
On the Gene Expression of LKB1
In Drosophila melanogaster
Research Question
Methods
Purpose
Hypothesis
Projected Conclusions
Potential Sources of Error
Future Research
Implications
Presented Data


Problem
Methods
Hypothesis

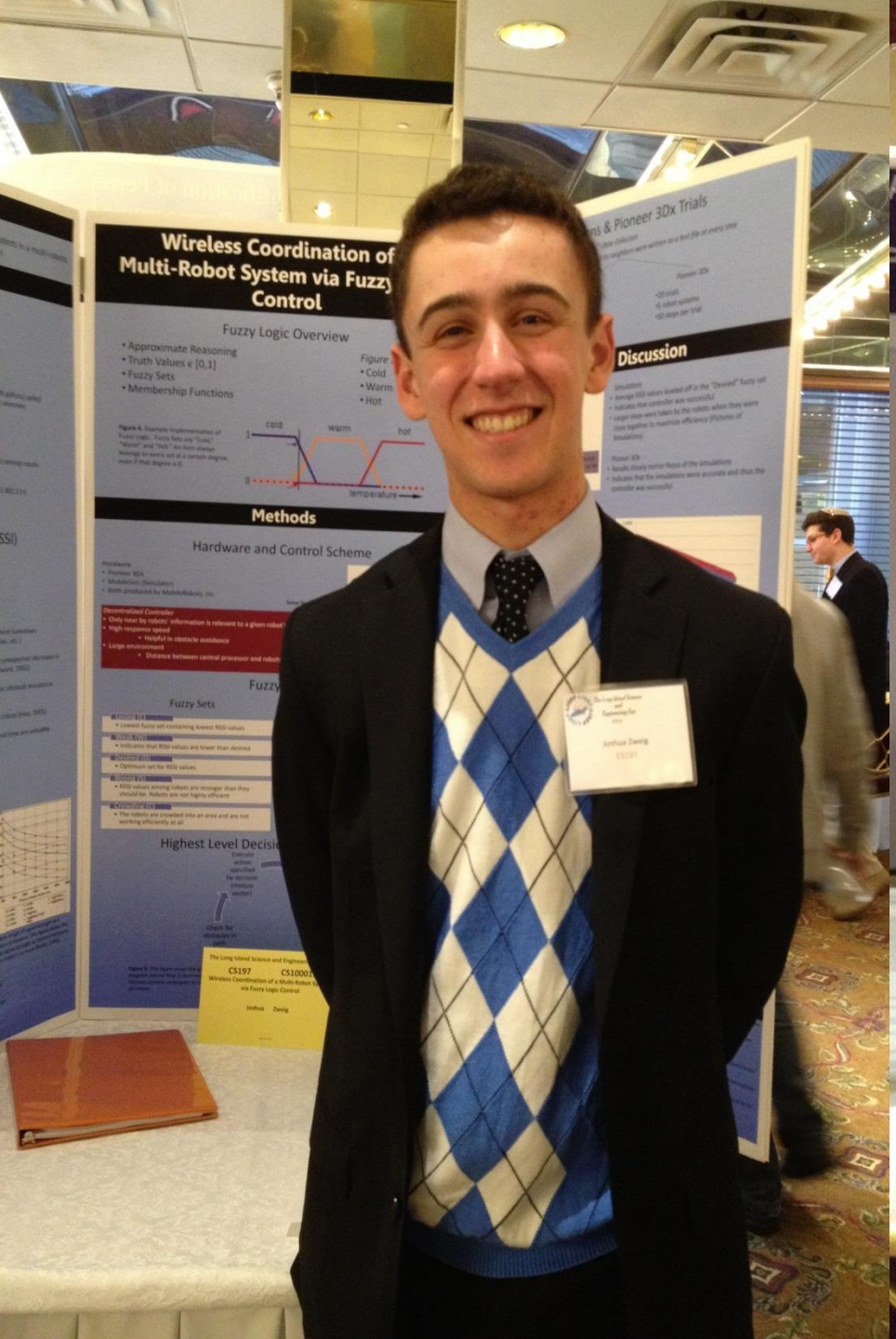

The Design and Constr
Novel Rotating Rain Gu
Design and Construction of Prototypes
Renovations

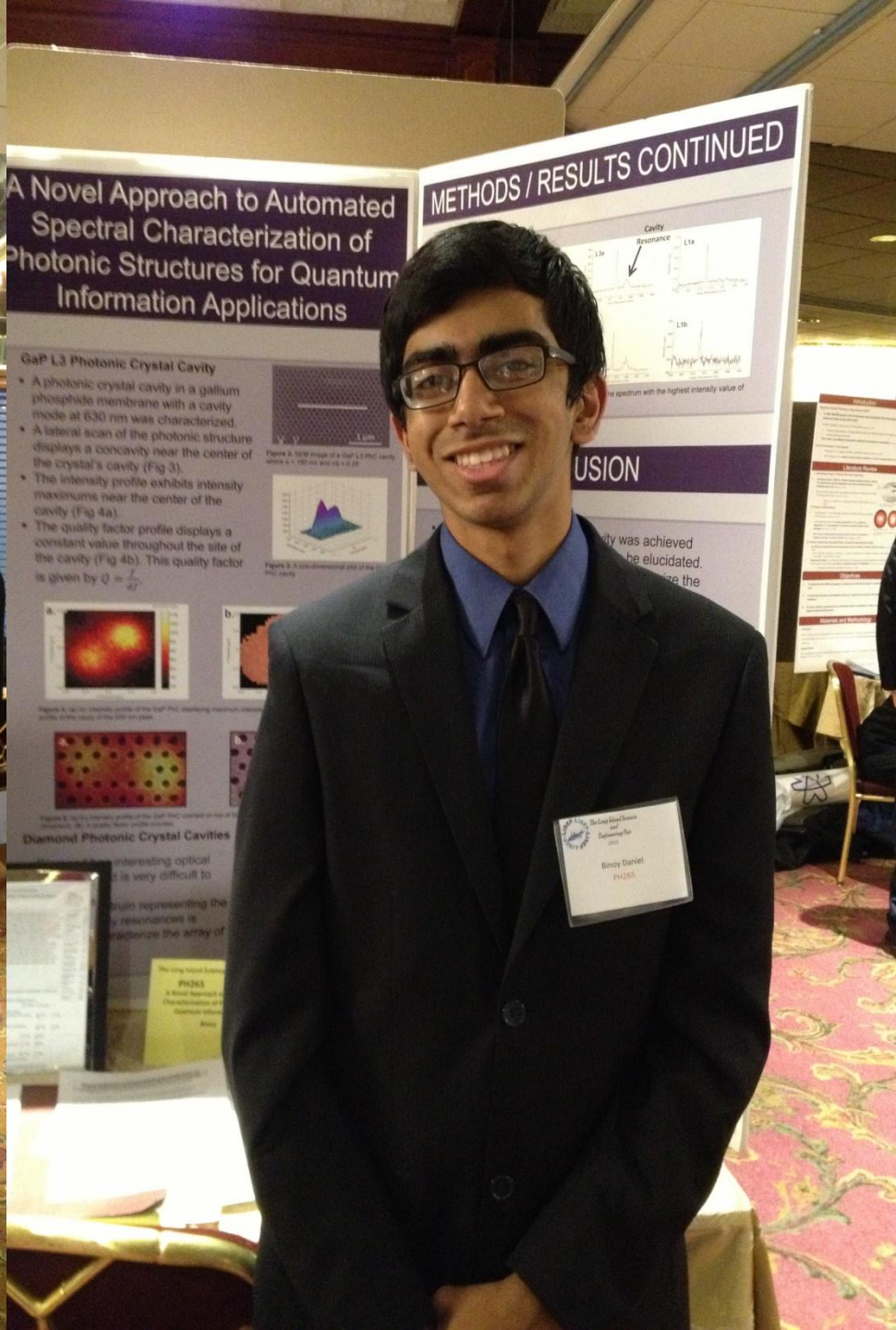

n Antidepressant on the
e Shrimp (Artemia salina)
The Effect of a More Acidic Environme
Mussel Shells and Mussel Bioremedia

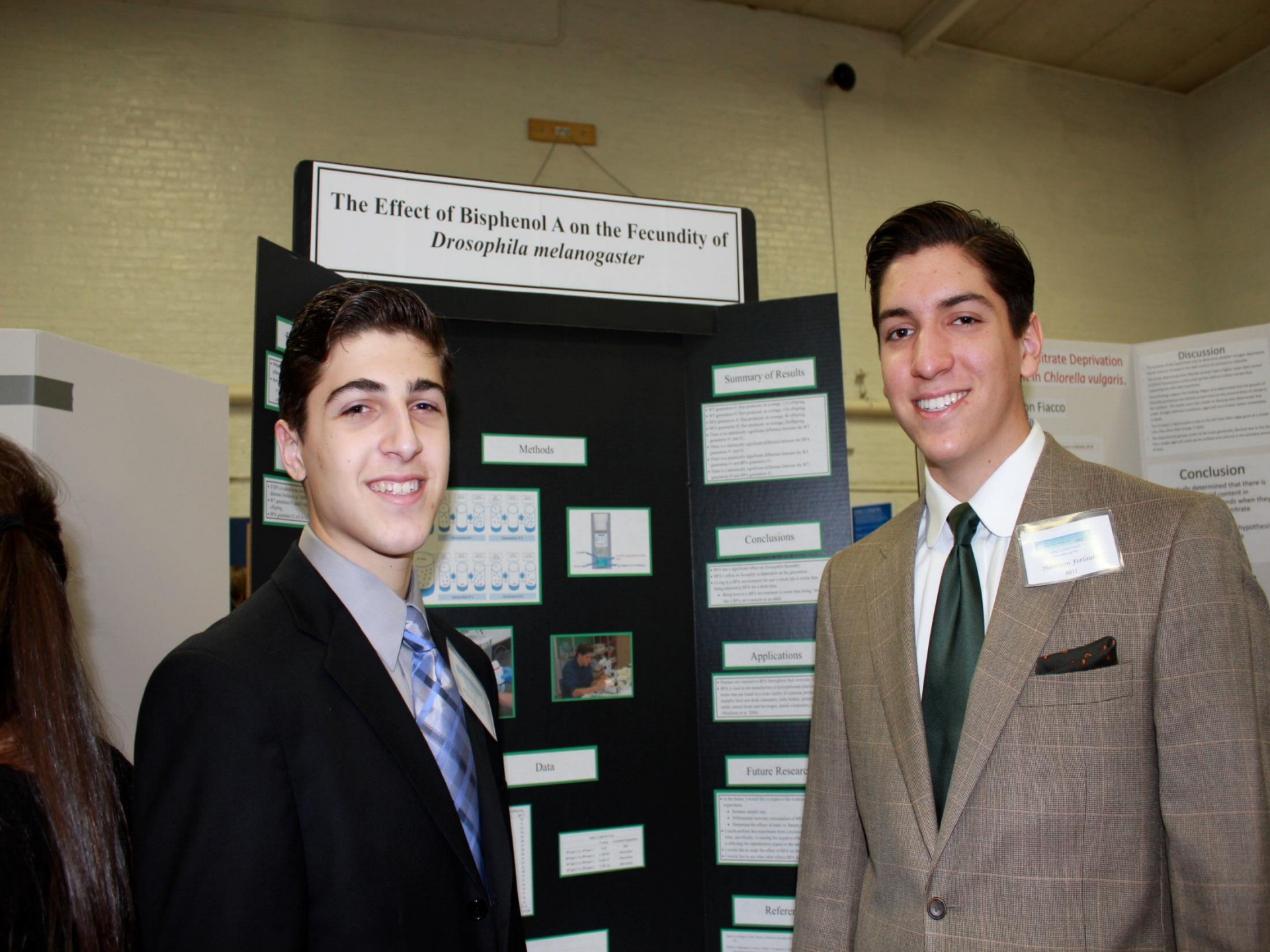

ation Between
cetylsalicylic ac
Data


Andromeda → Forms + Permission
NYSSEF →
FRI!!
Jan 17, 2013 - per 8 - odd → Middle school - LAB Closed
Water Drop Group Act 235 - 4:00 pm
- Kayla + Trinity

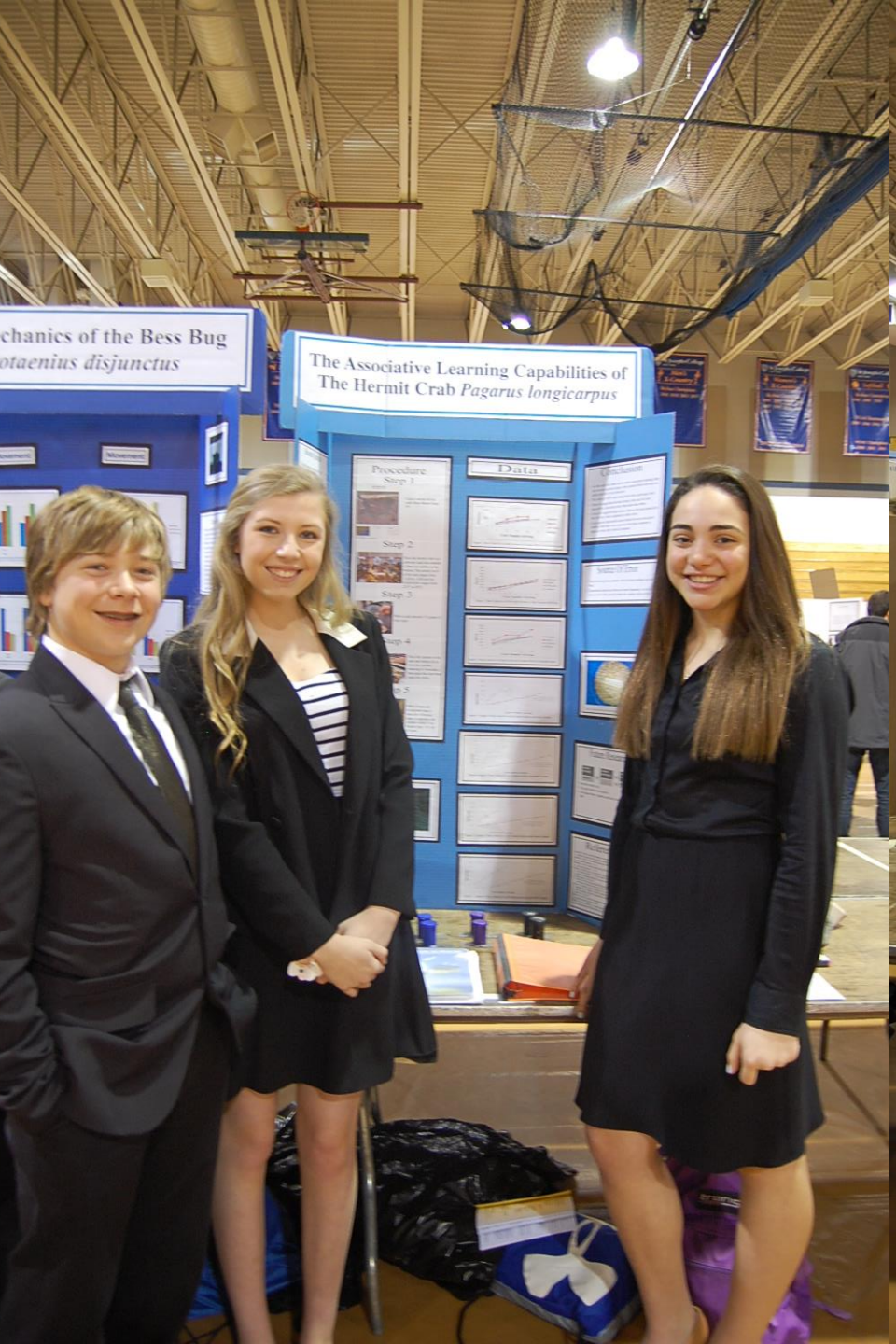

EXIT
COMMACK HIGH SCHOOL


Wireless Coordination of
Multi-Robot System via Fuzzy
Control
Fuzzy Logic Overview
• Approximate Reasoning
• Truth Values ∈ [0,1]
• Fuzzy Sets
• Membership Functions
cold
warm
hot
temperature
Methods
Hardware and Control Scheme
Fuzzy Sets
Discussion
Joshua Zwig

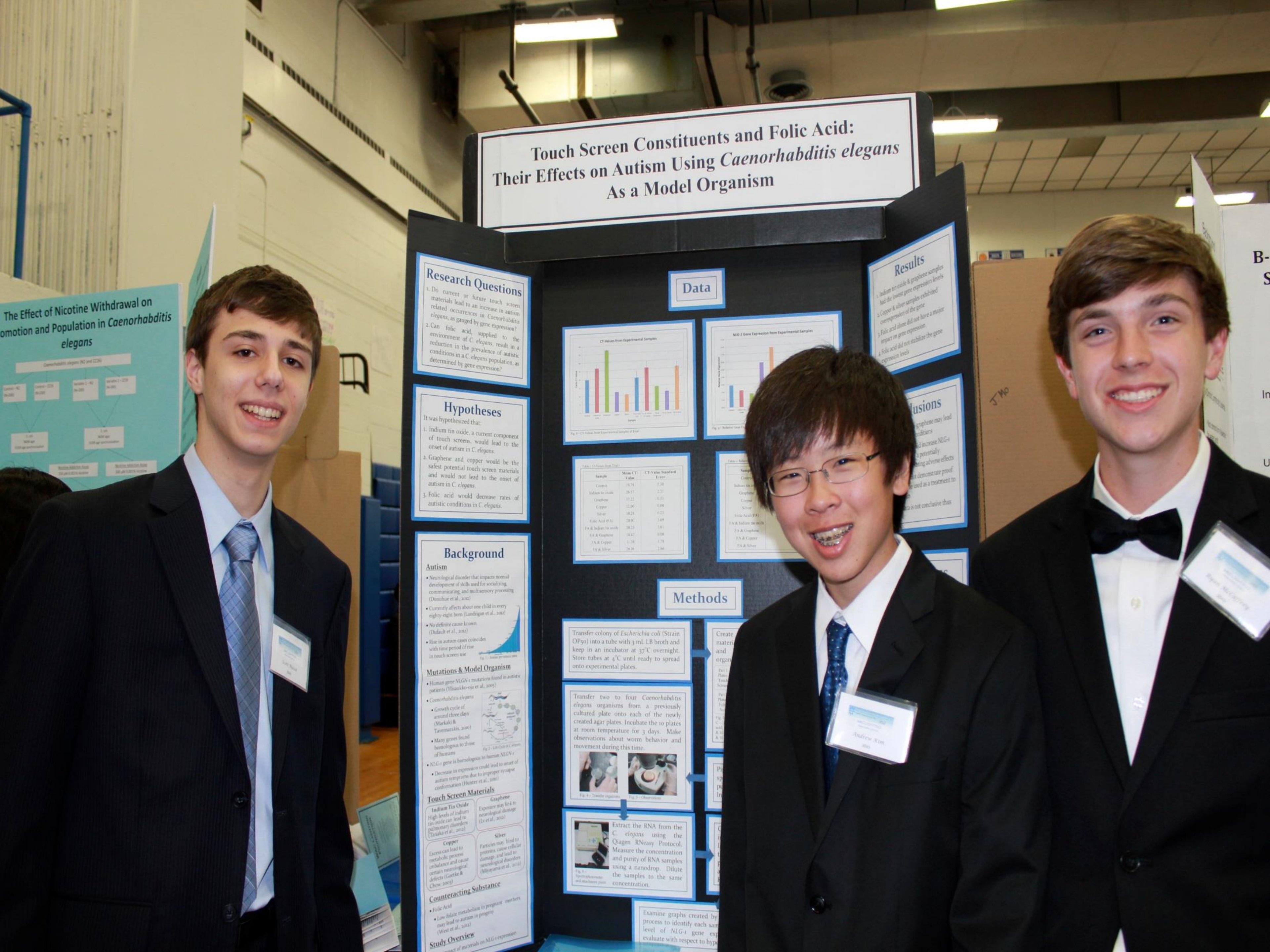

A Novel Approach to Automated
Spectral Characterization of
Photonic Structures for Quantum
Information Applications
METHODS / RESULTS CONTINUED
GaP L3 Photonic Crystal Cavity
• A photonic crystal cavity in a gallium phosphide membrane with a cavity mode at 630 nm was characterized.
• A lateral scan of the photonic structure displays a concavity near the center of the crystal's cavity (Fig 3).
• The intensity profile exhibits intensity maximums near the center of the cavity (Fig 4a).
• The quality factor profile displays a constant value throughout the site of the cavity (Fig 4b). This quality factor is given by $Q \approx \frac{f}{\Delta f}$.
Diamond Photonic Crystal Cavities
Cavity
Resonance
L3a
L1a
L1b
USION
Binoy Daniel
PH265


The Effect of Bisphenol A on the Fecundity of
Drosophila melanogaster
Methods
Data
Summary of Results
Conclusions
Applications
Discussion
Conclusion

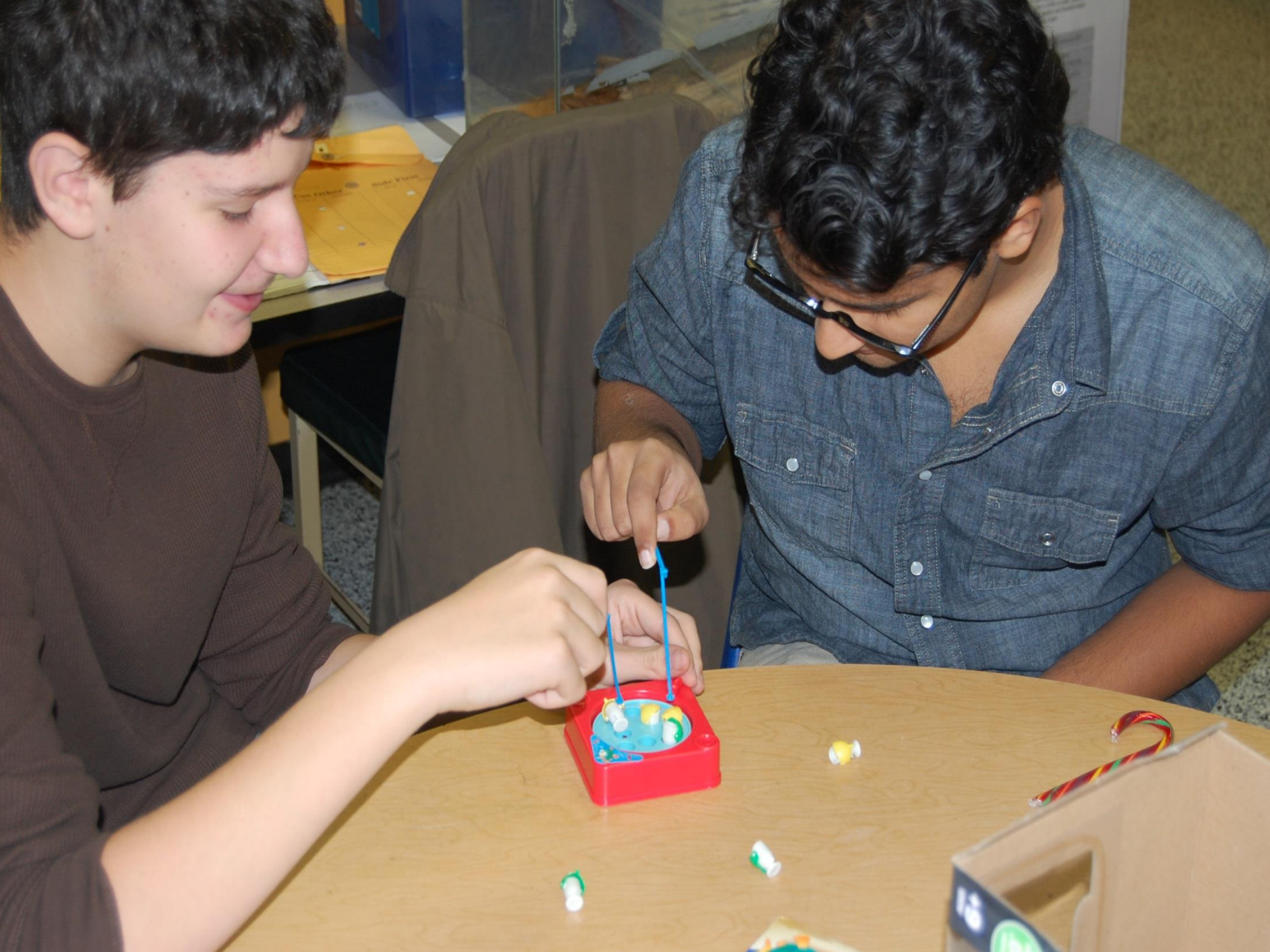

GRAND AWARD
FIRST PLACE
GRAND AWARD
FIRST PLACE
GRAND AWARD
FIRST PLACE


chanics of the Bess Bug
otaenius disjunctus
The Associative Learning Capabilities of
The Hermit Crab Pagarus longicarpus
Procedure
Step 1
Step 2
Step 3
Step 4
Step 5
Data


Impact of the Location of a Solar Cell,
in Relationship to the Focal Length of a
Fresnel Lens on Power Production
Data Collection
Data
Background
Hypothesis
Method
Other Data (Percent
Increase over Control)



Touch Screen Constituents and Folic Acid:
Their Effects on Autism Using Caenorhabditis elegans
As a Model Organism
Research Questions
1. Do current or future touch screen materials lead to an increase in autism related occurrences in Caenorhabditis elegans, as gauged by gene expression?
2. Can folic acid, supplied to the environment of C. elegans, result in a reduction in the prevalence of autistic conditions in a C. elegans population, as determined by gene expression?
Hypotheses
It was hypothesized that:
1. Indium tin oxide, a current component of touch screens, would lead to the onset of autism in C. elegans.
2. Graphene and copper would be the safest potential touch screen materials and would not lead to the onset of autism in C. elegans.
3. Folic acid would decrease rates of autistic conditions in C. elegans.
Background
Data
Results
Methods
Transfer colony of Escherichia coli (Strain OP50) into a tube with 3 mL LB broth and keep in an incubator at 37°C overnight. Store tubes at 4°C until ready to spread onto experimental plates.
Transfer two to four Caenorhabditis elegans organisms from a previously cultured plate onto each of the newly created agar plates. Incubate the 10 plates at room temperature for 3 days. Make observations about worm behavior and movement during this time.
Extract the RNA from the C. elegans using the Qiagen RNeasy Protocol. Measure the concentration and purity of RNA samples using a nanodrop. Dilute the samples to the same concentration.
The Effect of Nicotine Withdrawal on
omotion and Population in Caenorhabditis elegans

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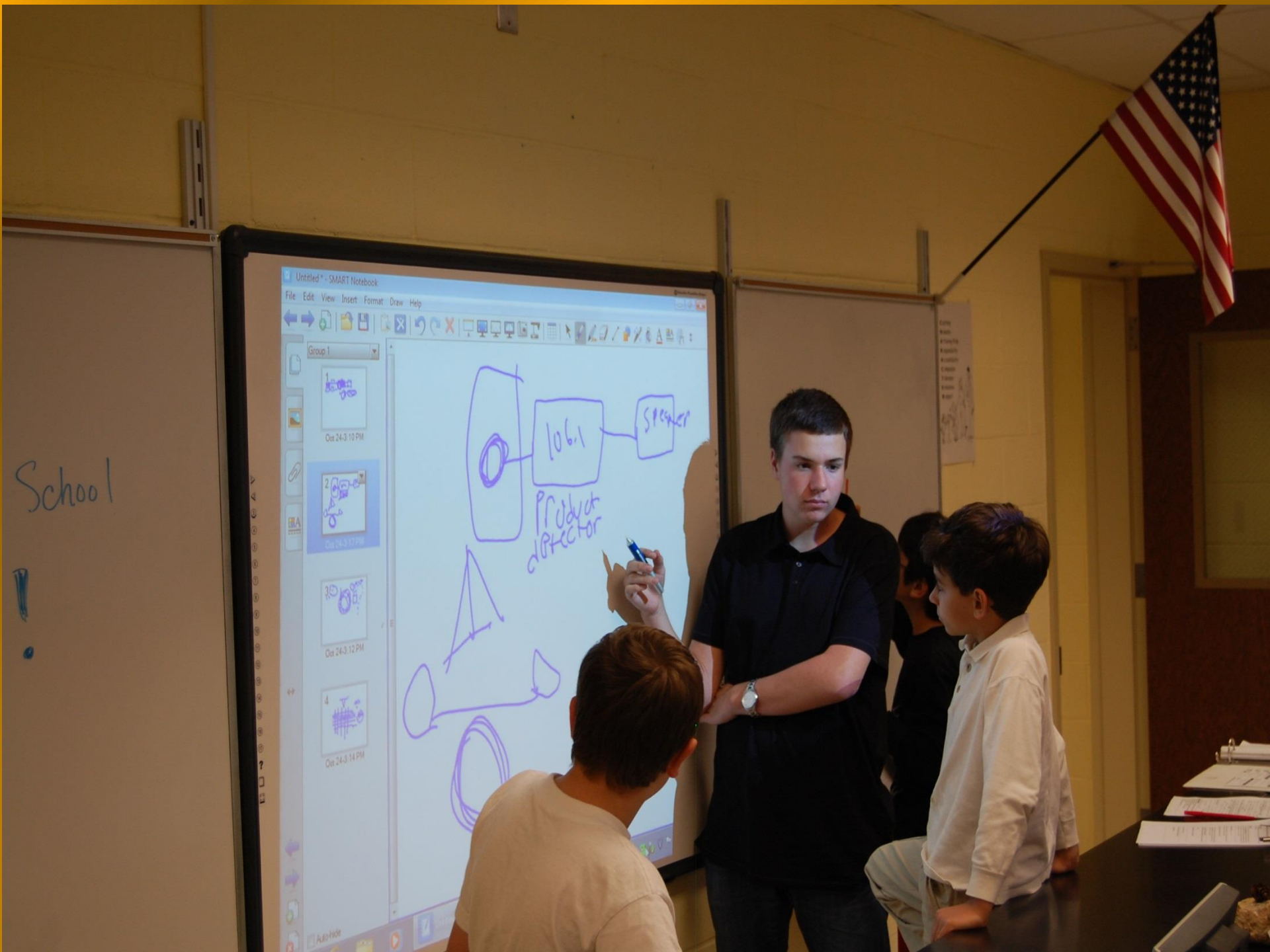
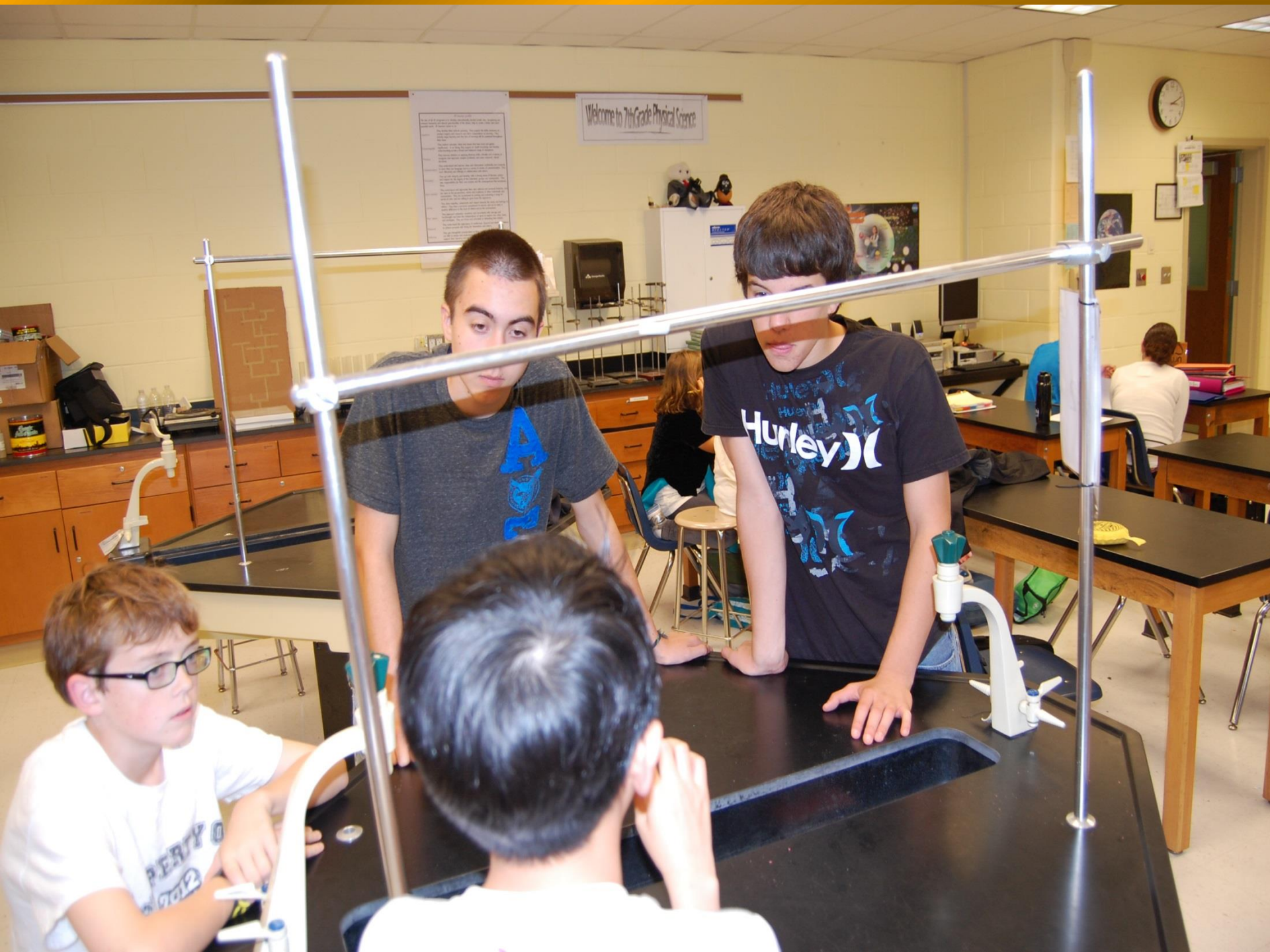
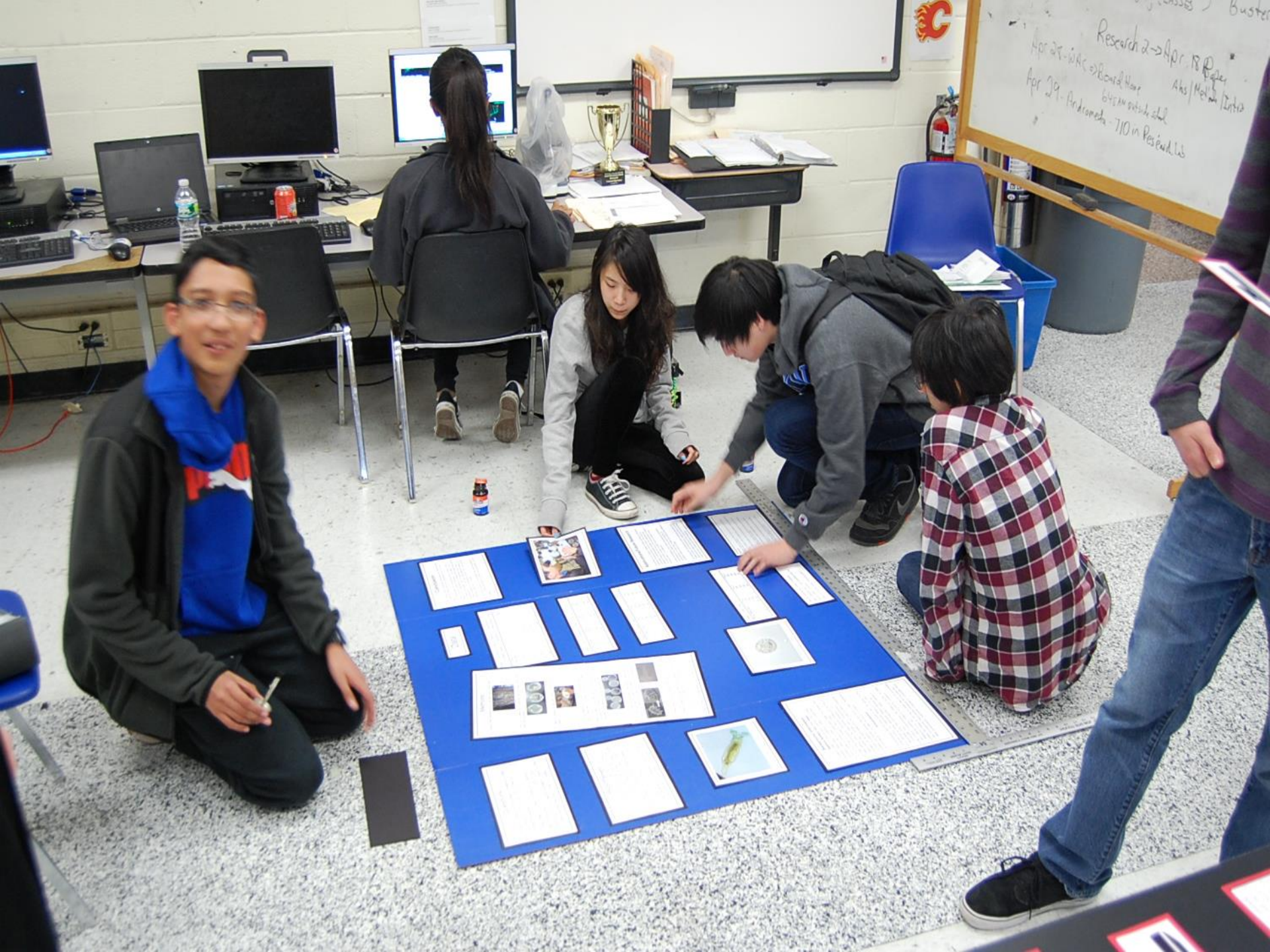

Untitled * - SMART Notebook
File Edit View Insert Format Draw Help
Group 1
106.1
School

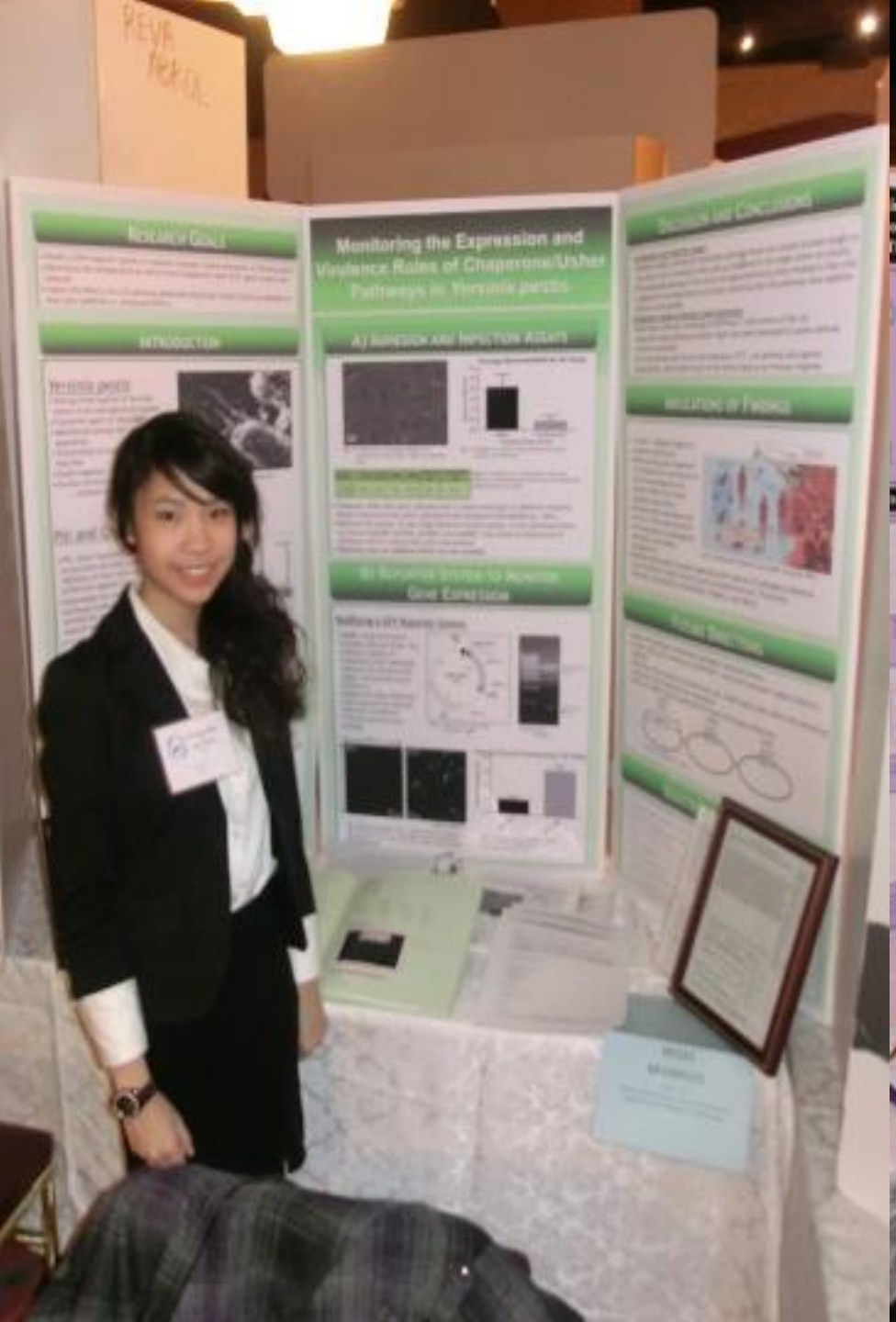

Welcome to 7th Grade Physical Science
Hurley

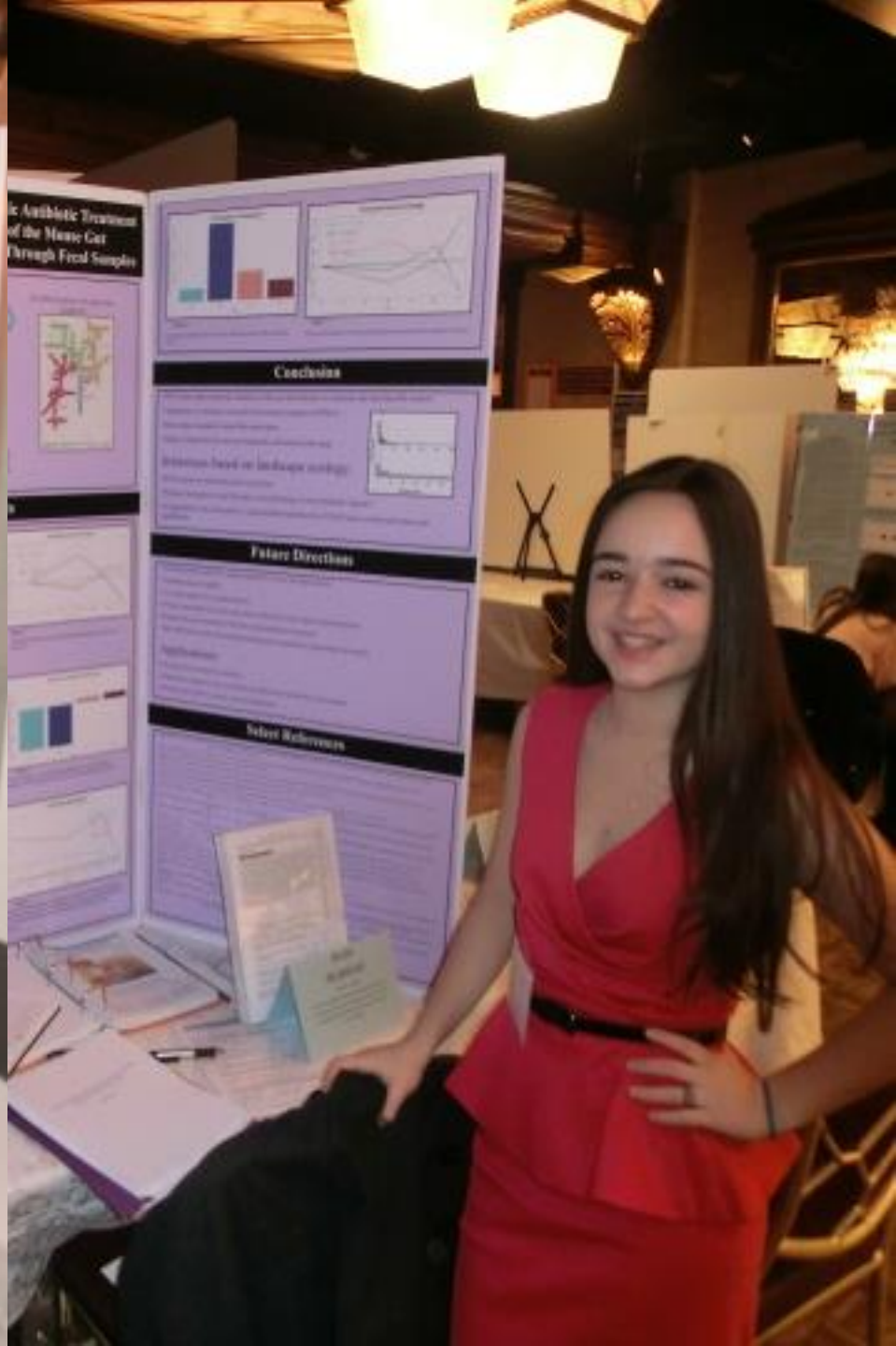

Scott
Tyvek
Tyvek
Tyvek


BROOKHAVEN
NATIONAL LABORATORY
BROOKHAVEN
NATIONAL LABORATORY
Office of Educational Programs
Brookhaven
National Laboratory
Charles J.
EDER




tidepressant on the
hrimp (Artemia salina)


Monitoring the Expression and
Virulence Roles of Chaperone/Usher
Pathways in Yersinia pestis


Conclusion
Future Directions
Select References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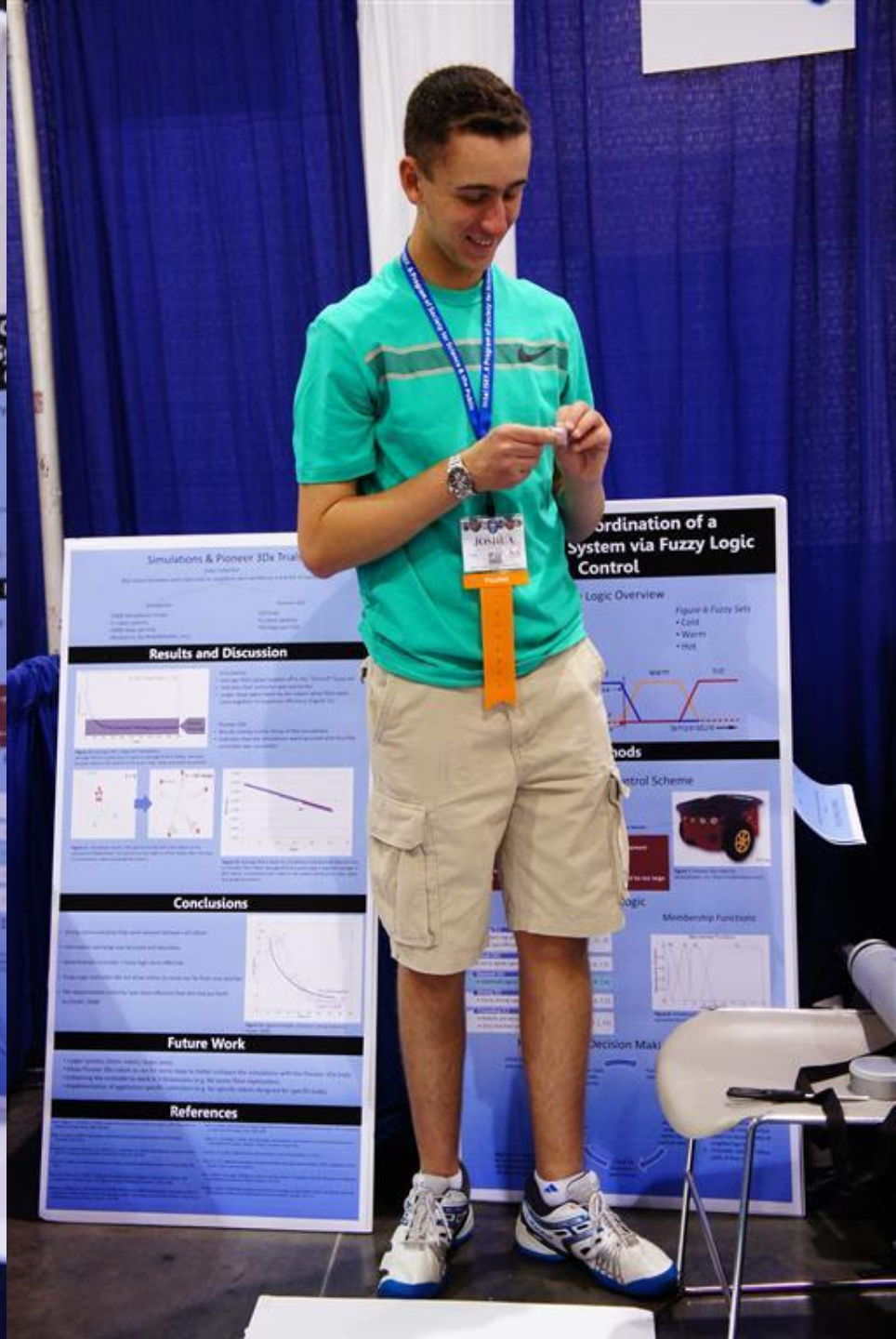
COUGARETTES


WESTWARD
WESTWARD

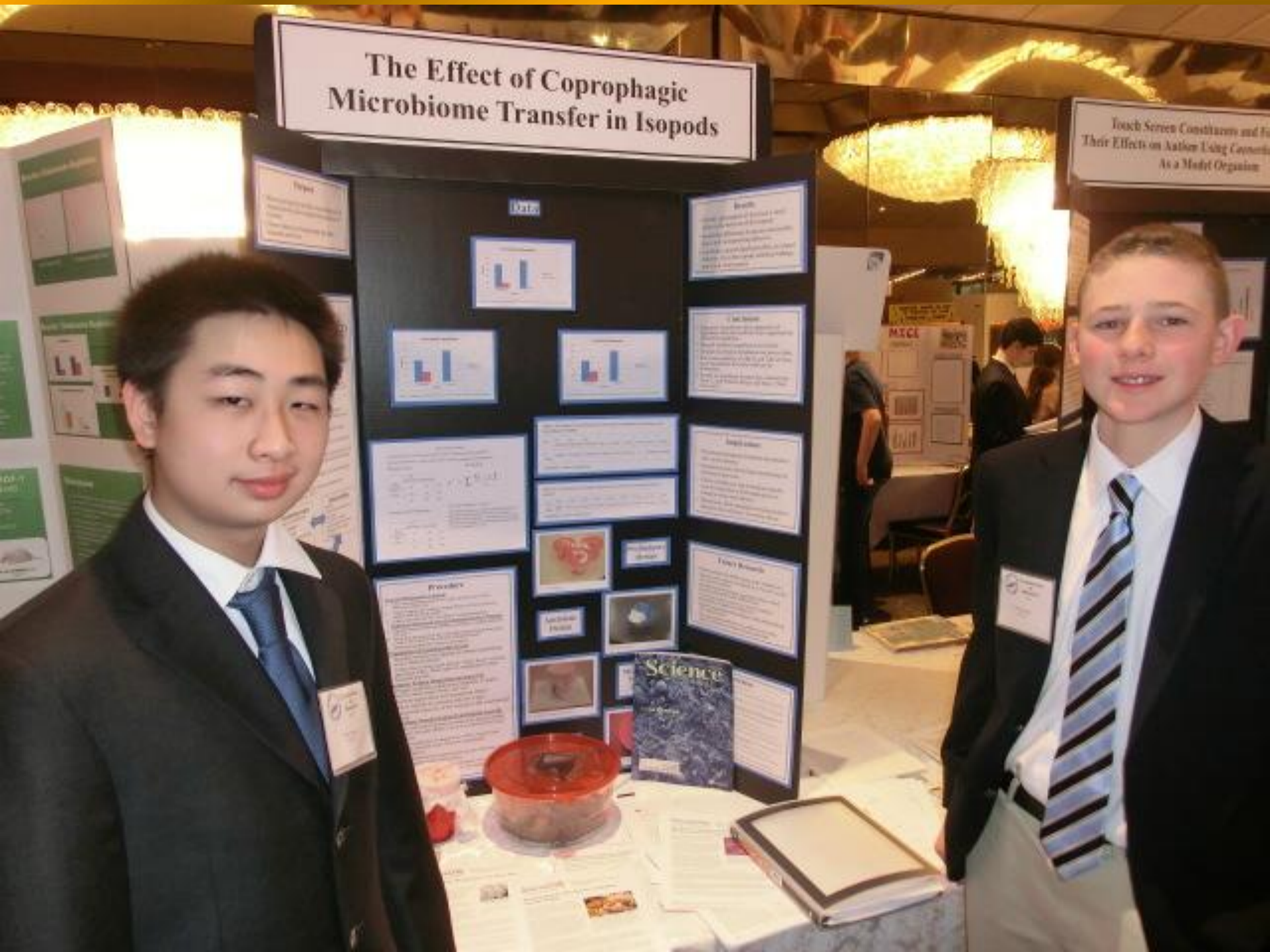

Lab
Table #5
A&F
1892


EXIT
CONGRATULATIONS
COUGARETTES


CS028
Goal
Background
Wireless
Multi-Robot
JOSHUA


Results and Discussion
Conclusions
Future Work
References
ordination of a
System via Fuzzy Logic
Control
JOSHUA


CONGRATULATIONS
COUGARETTES


The Effect of Coprophagic Microbiome Transfer in Isopods
Data
Science


NO SMOKING


NO CHEMICAL DISPOSAL PERMITTED DOWN THE DRAIN
EMERGENCY SHOWER
SAFETY SHOWER
CollegeBoard




Kimwipes


Science
Mathematics
Technology
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Proud School of a
2010-11
Siemens Compe
Math : Science : Technolo
Semifinalist
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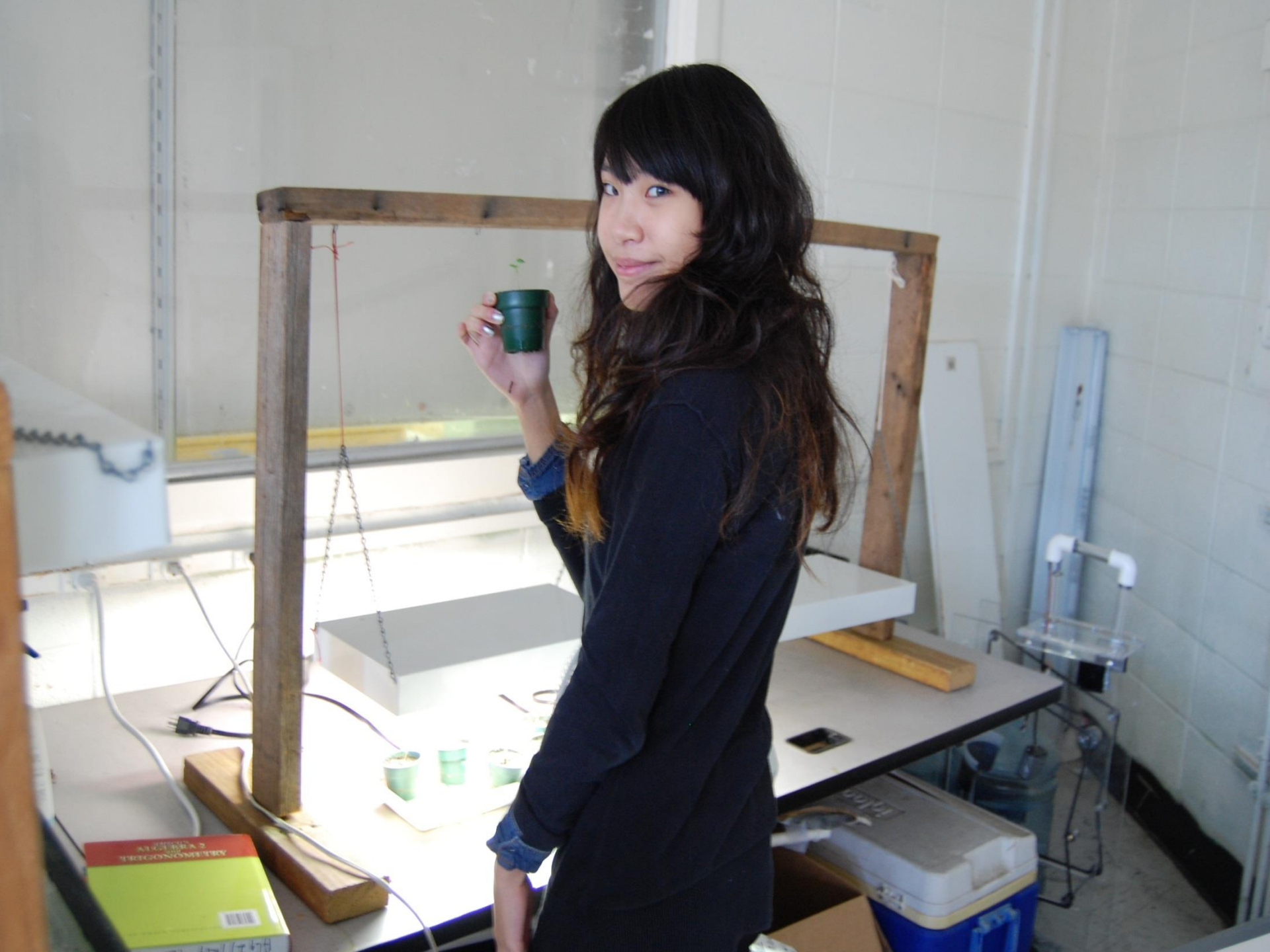
SUM 41


ALGEBRA 2
TRIGONOMETRY


Congrats to Kayla(Layla) Neville Co-author
Any old comp
JET FLO
CORNER FILTER


RVCA


An Investigation of the Testis-Specific Protein in *Cercopithecus lomamiensis*
Research Goals
Background
Methodology
Data
Results
Future Research
Selected References
3003


A Comparative Analysis of the Over Expression of Genes Using Serial Analysis of Gene Expression
Research Goal
Data
Methodology
Conclusions
Background


Lab
Table #2
Welcome to 7th Grade Physical Science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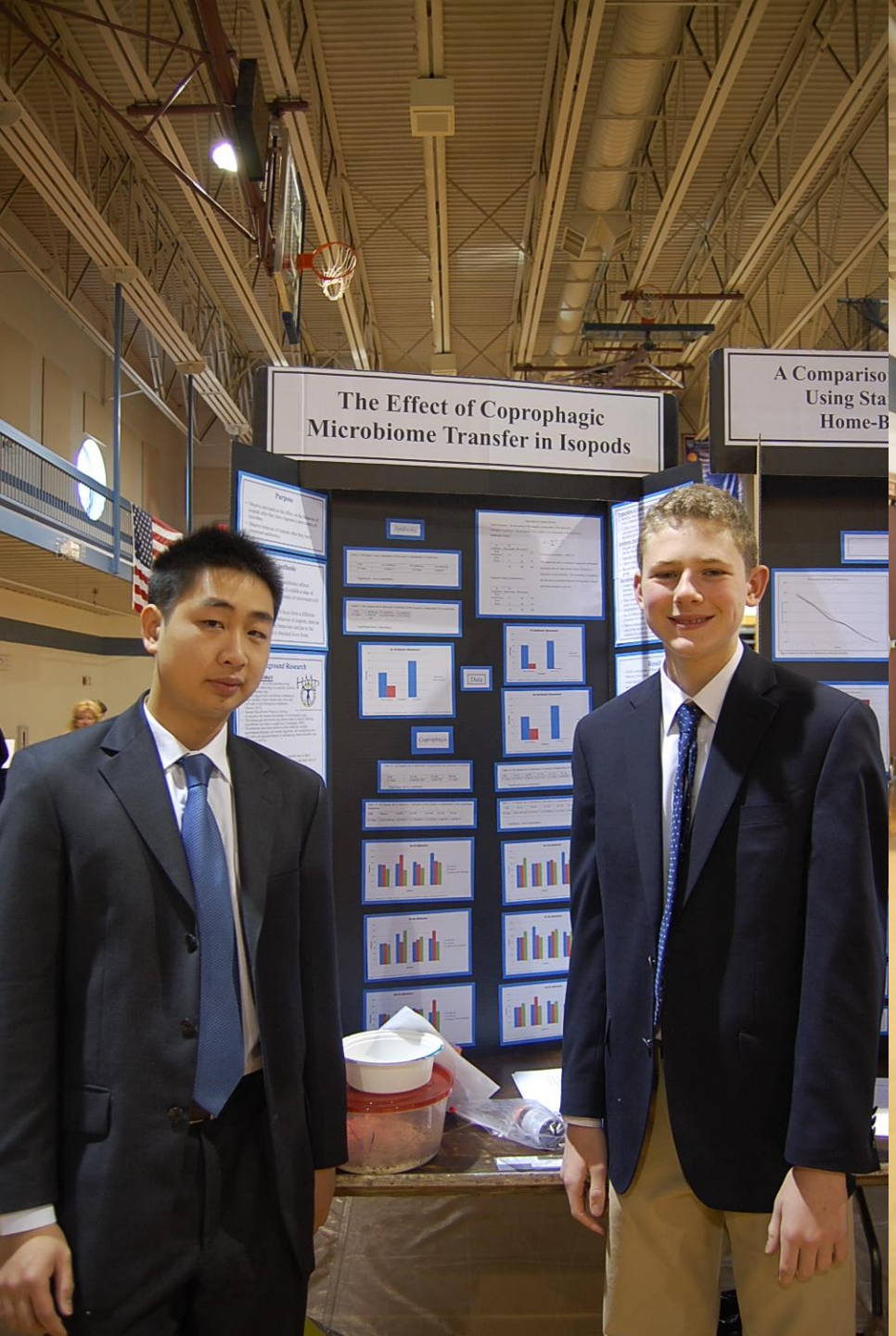
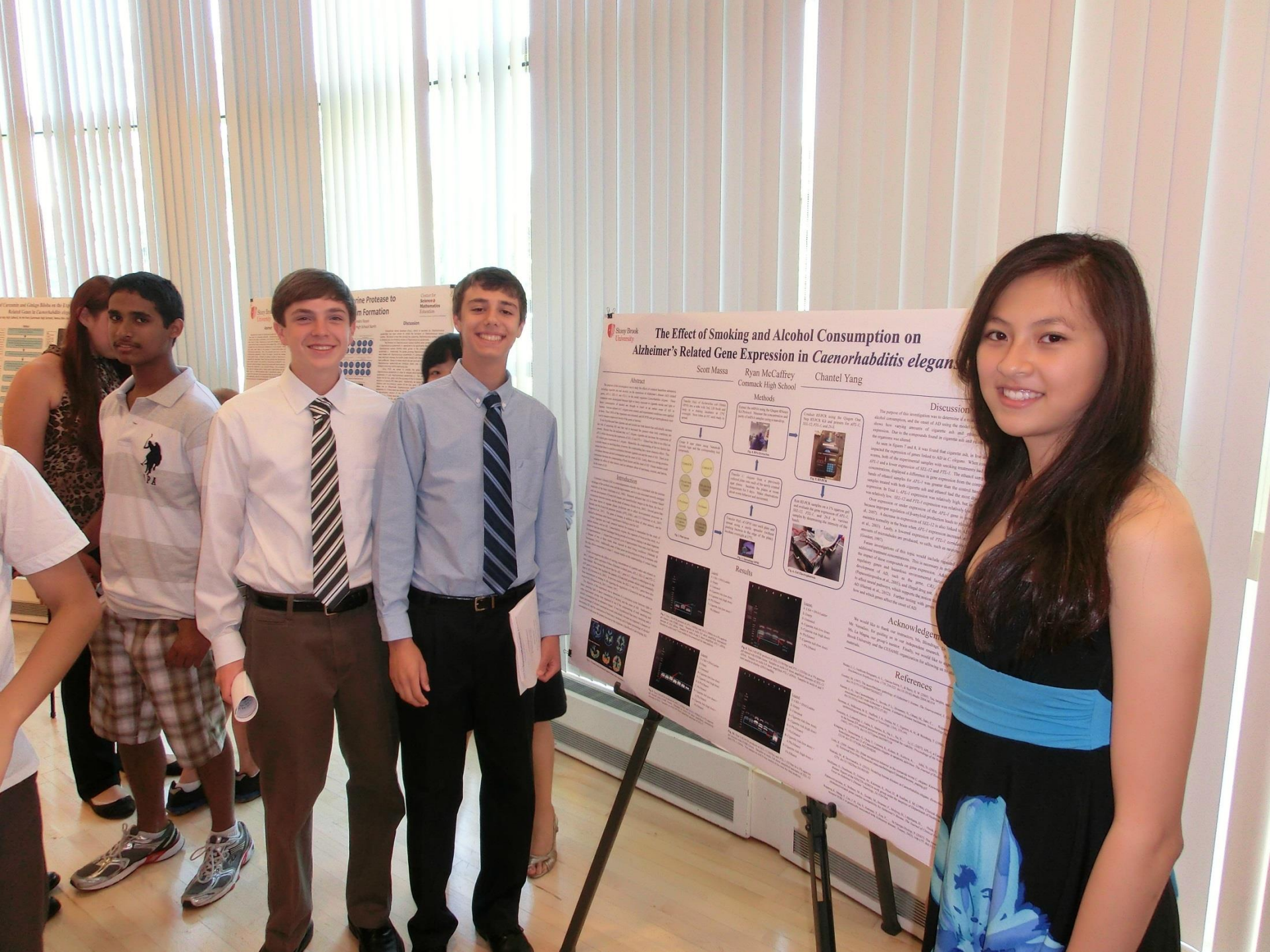
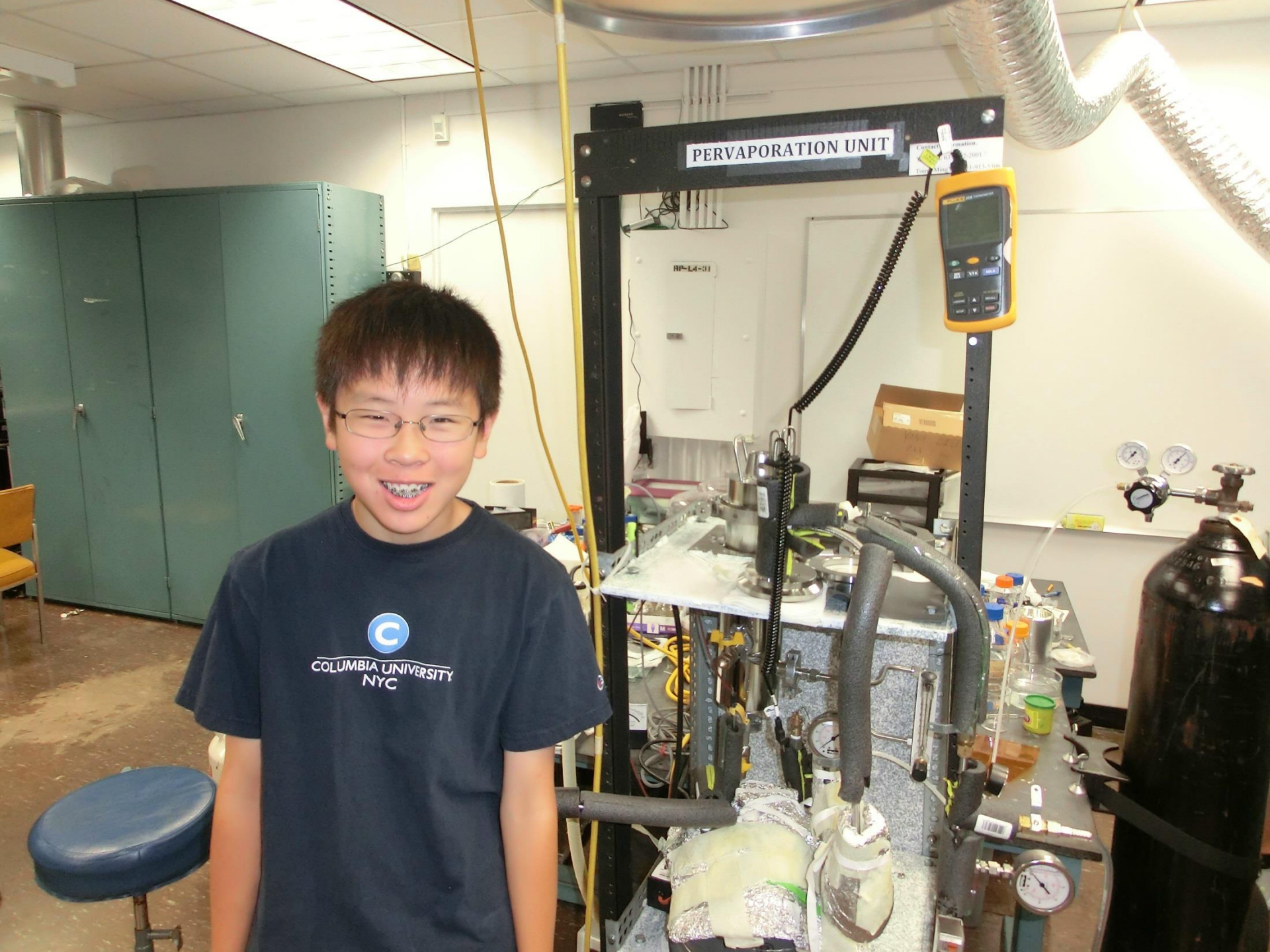
CollegeBoard
CAROLINA
OHIO STATE
NIKE


The Effect of Coprophagic Microbiome Transfer in Isopods
Data

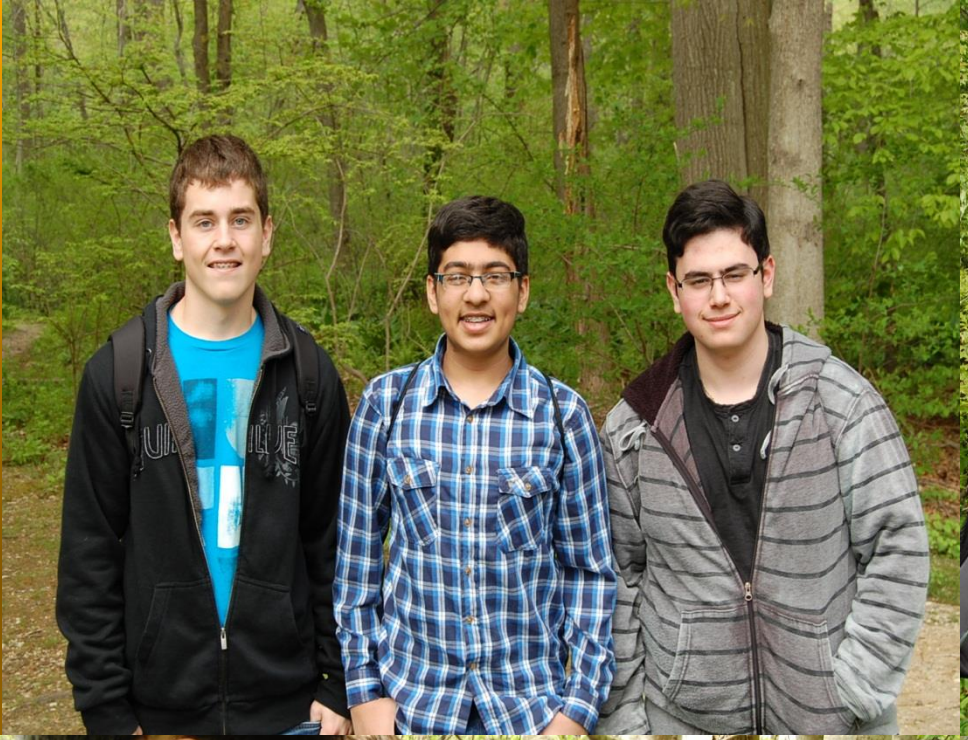

The Physical Structure and Water Filtering Ability Of the Water Hyacinth (Eichhornia crassipes)
Data
Results:
Real Life Applications:

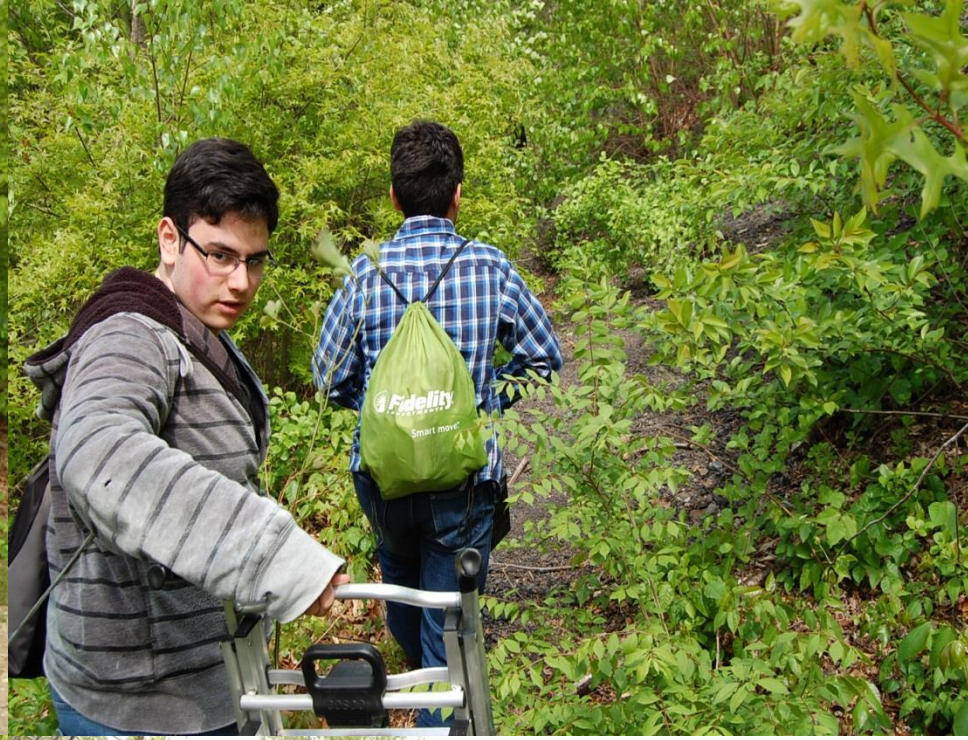

N_2 line #4
chemistry


The Effect of Smoking and Alcohol Consumption on
Alzheimer's Related Gene Expression in Caenorhabditis elegans
Scott Massa
Ryan McCaffrey
Commack High School
Chantel Yang
Abstract
Introduction
Methods
Results
Discussion
Acknowledgements
References


PERVAPORATION UNIT
COLUMBIA UNIVERSITY
NYC


SUNY
NEW PALTZ

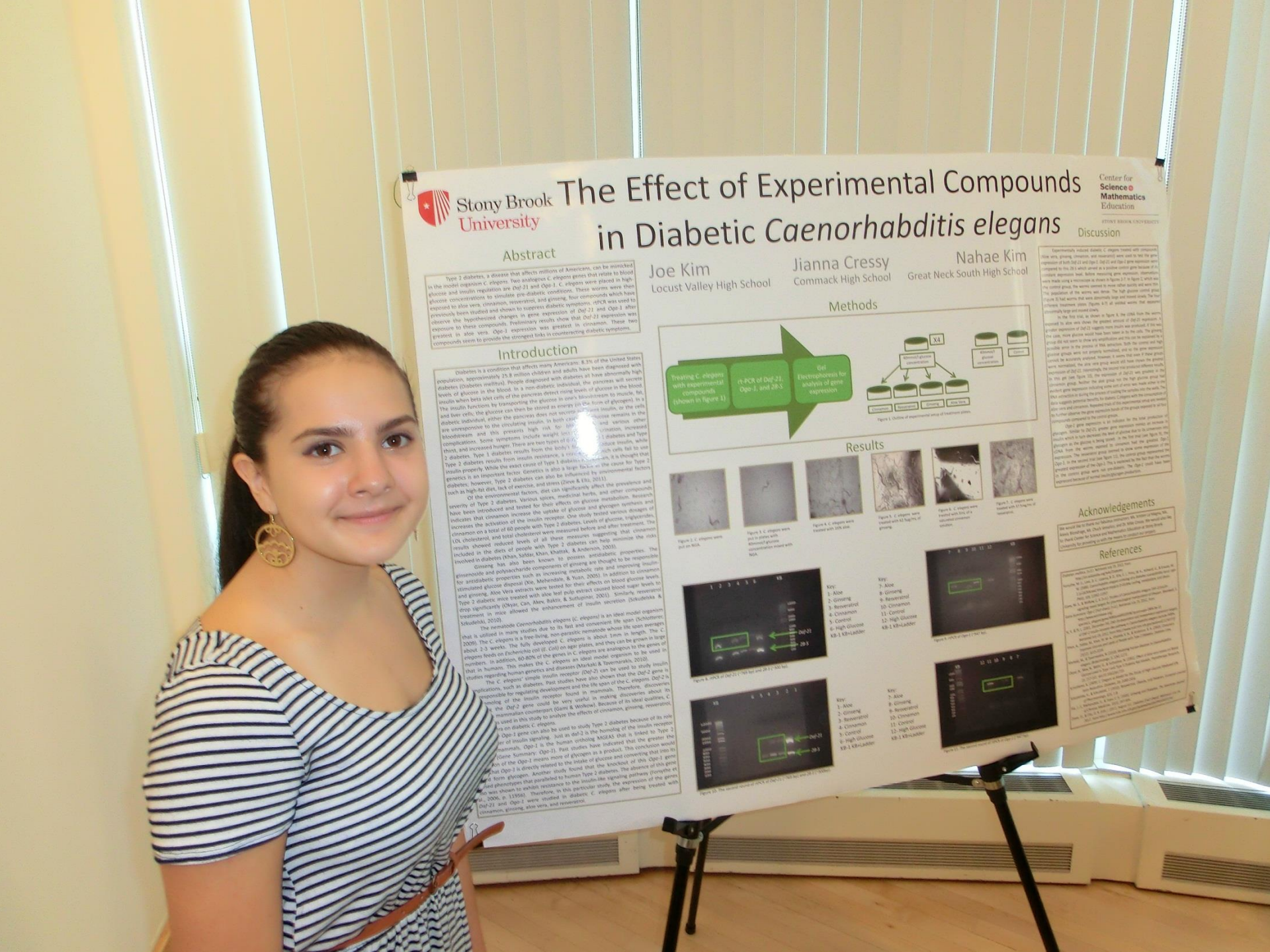


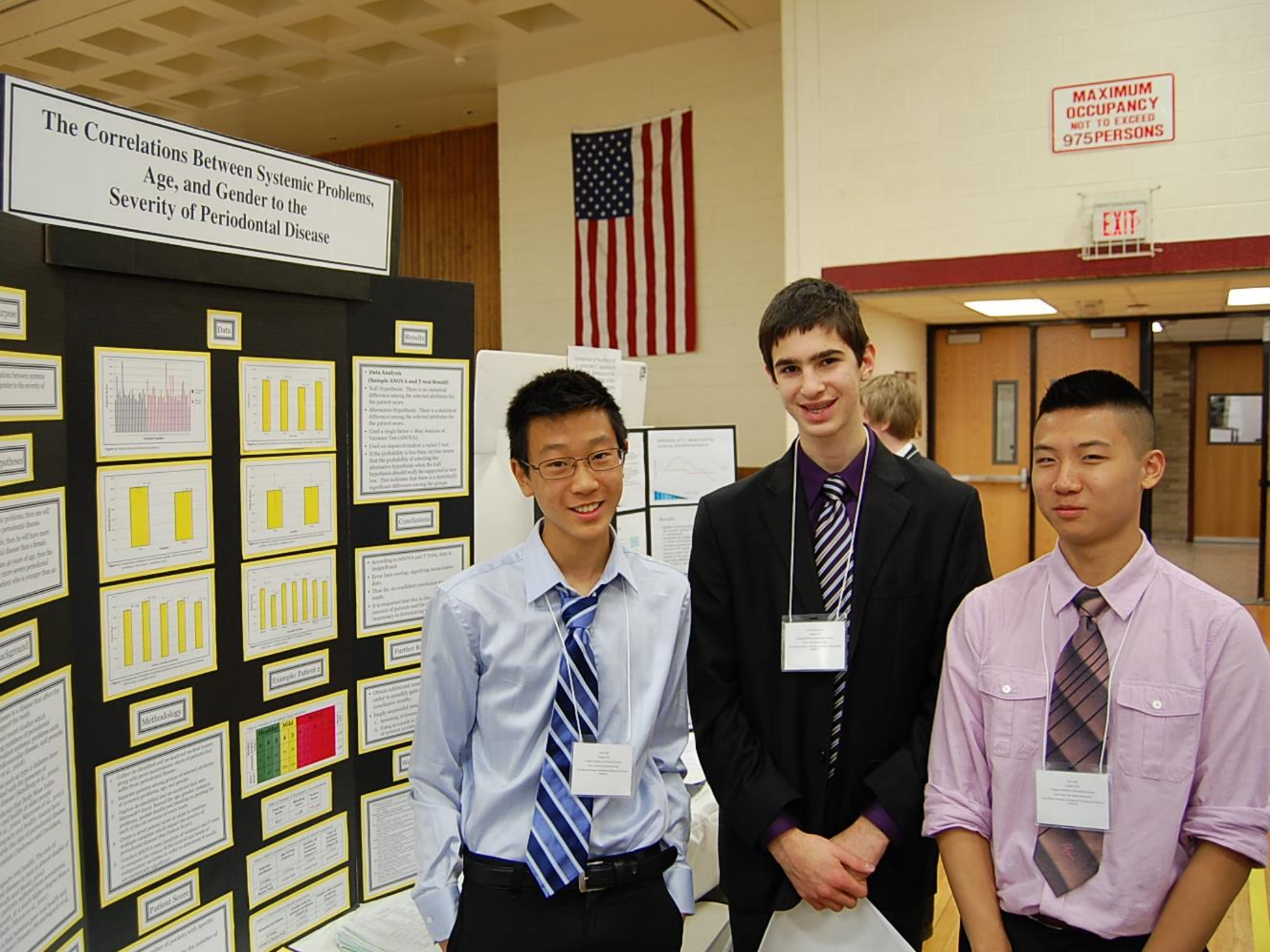

Fidelity
Smart move


Scott

General Procedure of Generation of Transgenic fish
Zebrafish
Microinjection
Embryonic development
Transgenic fish
What if a GloFish® escapes?
WHY THOSE NAMES?
KIMTECH


KEEP BAG!
200 FEE


Stony Brook University
The Effect of Experimental Compounds in Diabetic Caenorhabditis elegans
Center for Science & Mathematics Education
Abstract
Joe Kim
Locust Valley High School
Jianna Cressy
Commack High School
Nahae Kim
Great Neck South High School
Introduction
Methods
Treating C. elegans with experimental compounds (shown in figure 1)
rt-PCR of Daf-21, Ogr-1, and 28-S
Gel Electrophoresis for analysis of gene expression
Results
Discussion
Acknowledgements
References


The Correlations Between Systemic Problems, Age, and Gender to the Severity of Periodontal Disease
Data
Results
Conclusion
Methodology
Example Patient 2
Patient Score
MAXIMUM OCCUPANCY NOT TO EXCEED 975PERSONS
EXIT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JUDGE

A Practical Notification System to Identify Incoming Sudden Ionospheric Disturbances

Notification System Program Methodology

Antenna → Pre Amplifier → Sound Card → Filtering → Fourier Transform

(Graphic created by Finalist)

Data Acquisition

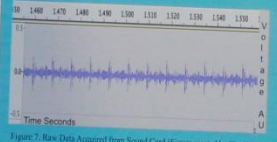


Figure 7. Raw Data Acquired from Sound Card (Figure created by Finalist)

Filtering

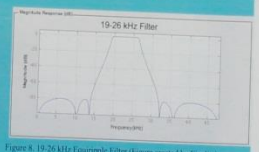


Figure 8. 19-26 kHz Equiripple Filter (Figure created by Finalist)

Fourier Analysis

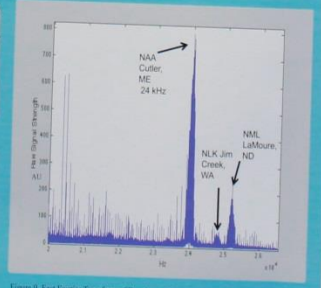
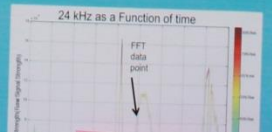
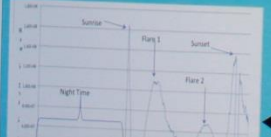


Figure 9. Fast Fourier Transform of Raw Data (Figure created by Finalist)

Storage of data



Recognition

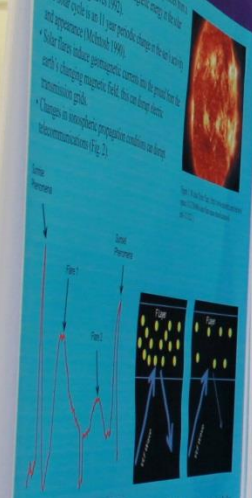


Notification

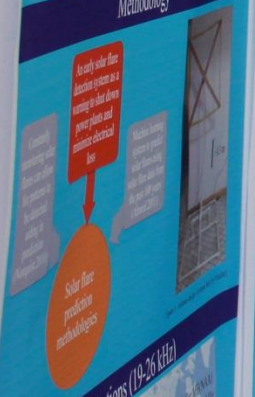
Figure 12. IPhone Notification Information (Figure created by Finalist)

Background

- Solar flares are the sudden release of high energy particles from the sun caused by the build up of magnetic energy in the solar atmosphere (Hargreaves 1992).
- The Solar cycle is an 11 year periodic change in the sun's activity and appearance (Mehltretter 1969).
- Solar flares induce geomagnetic currents in the ground due to the earth's changing magnetic field, this can disrupt electric transmission grids.
- Changes in ionospheric propagation conditions can disrupt telecommunications (Fig. 2).



Methodology



Introduction/ Literature Review

The Big Bang theory

Conclusion

- The goal of this investigation was achieved: A notification system to identify sudden ionospheric disturbances.
- Overall, the program achieves the desired goal, but could be improved to compare if a solar flare is seen through out all the VLF stations.

Real Life Applications

- Power plant solar flare early detection system
- Personal solar flare notification application
- Mathematically finding the peaks in any piece of data

Limitations

Limitations

- To make the software work correctly a functioning antenna and radio frequency front end must be used
- The program needs to be calibrated for each VLF station used
- The interpretation of the data preces can only be made once a flare spikes and drops back down

Future Research

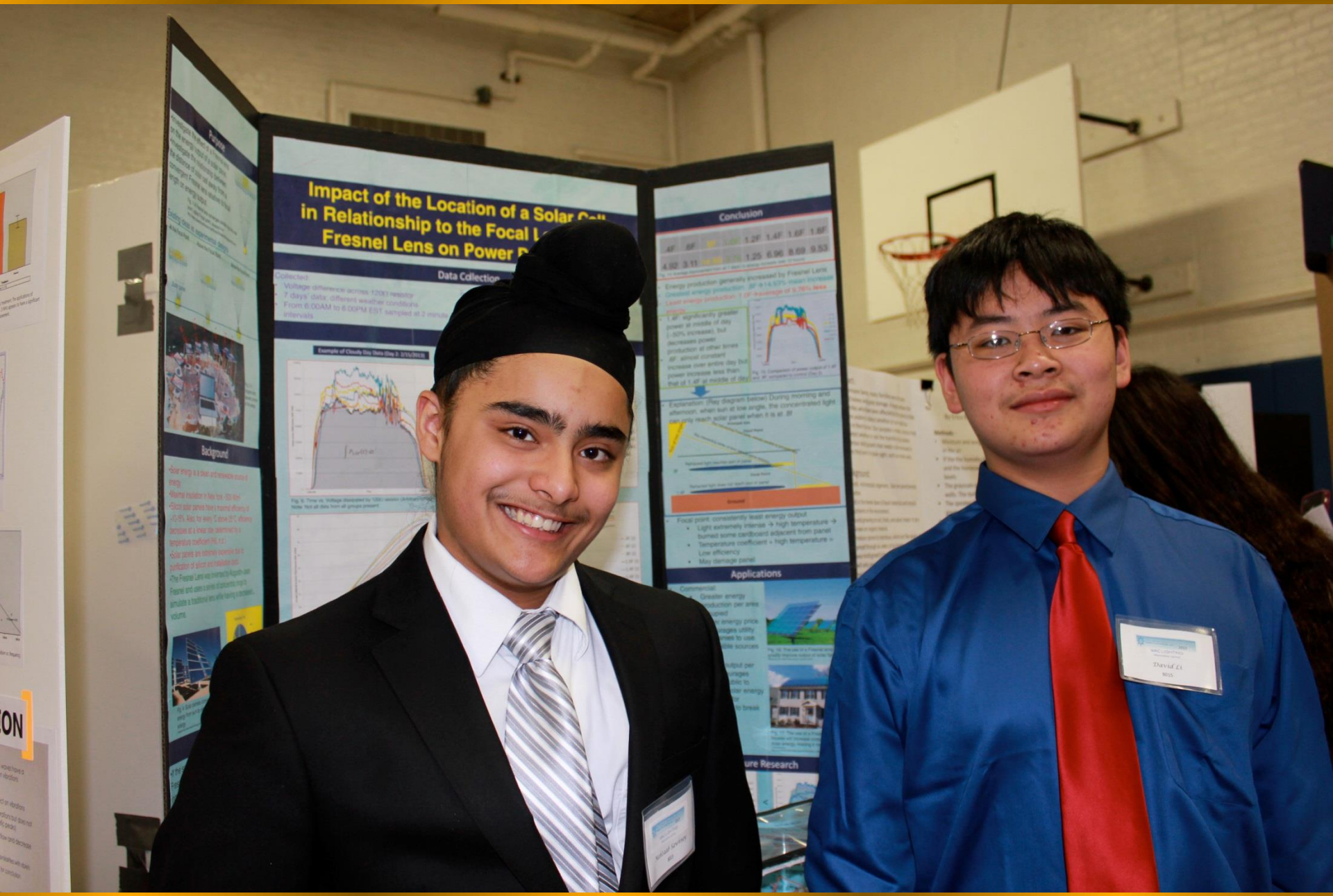
- Solar Flare Detection
- Solar storm detection
- VLF wave sound circuit
- Sunset/Sunrise phenomena
- Optimal antenna
- Earthquake VLF wave analysis
- Solar storm prediction
- Noise in data
- Night time data research

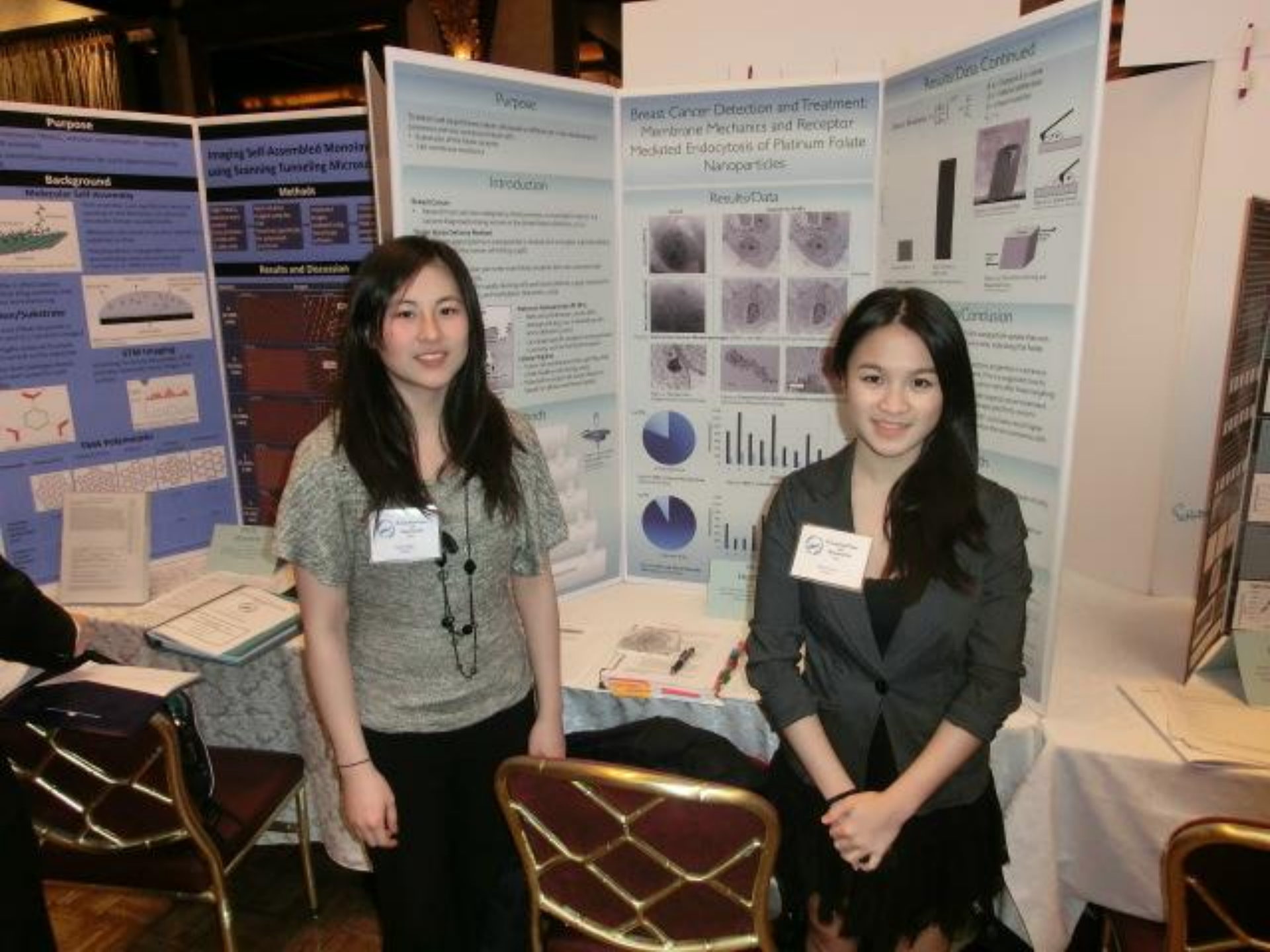
Selected Refe

Investig of the pion i

The Accelerator

- On collision, the kine resulted in the emissi which were collected
- Events were selecte vertex and from 0-92


Impact of the Location of a Solar Cell
Fresnel Lens on Power
Data Collection
Conclusion
Applications
Background

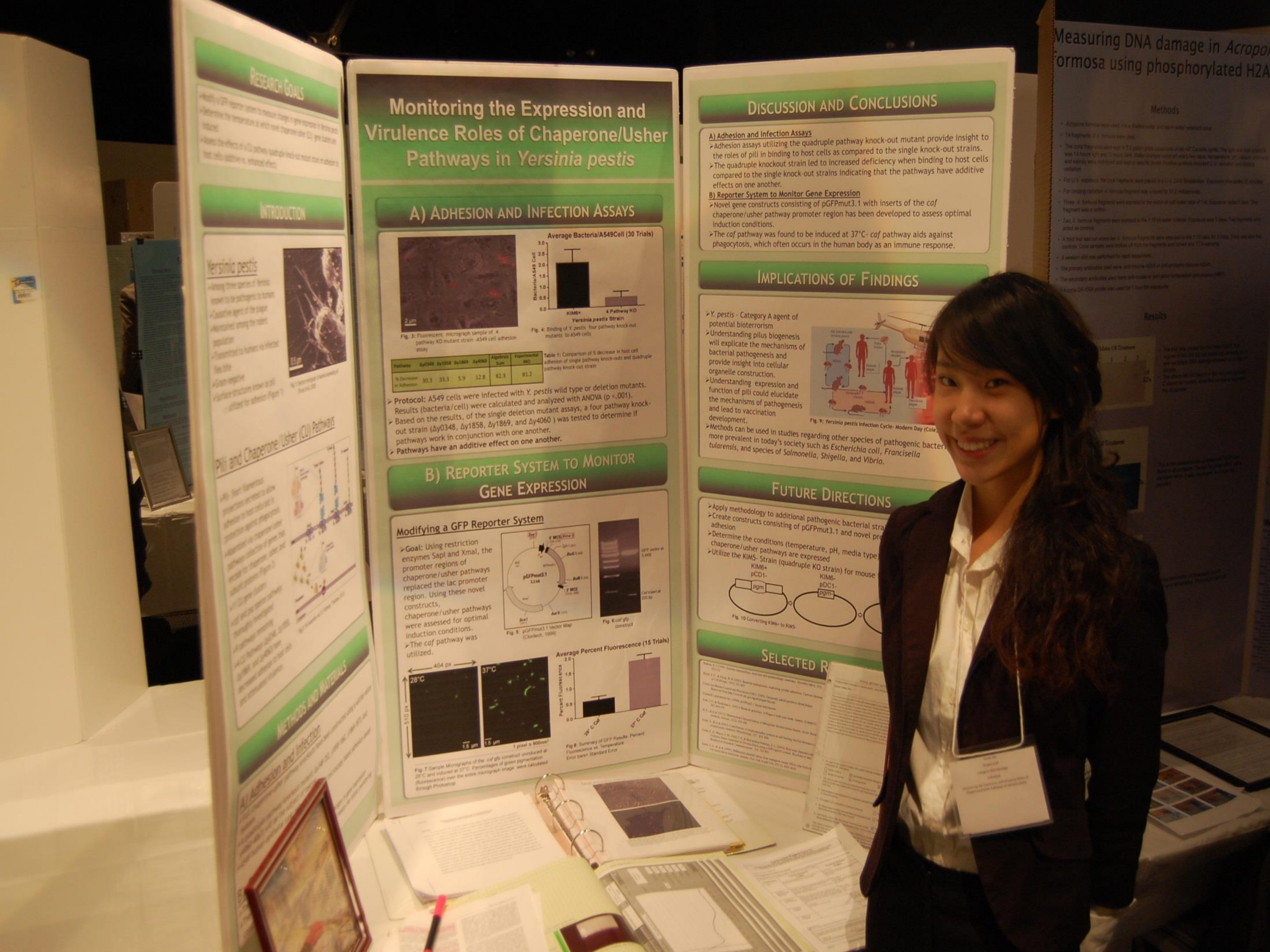

Purpose
Background
Purpose
Introduction
Breast Cancer Detection and Treatment: Membrane Mechanics and Receptor Mediated Endocytosis of Platinum Folate Nanoparticles
Results/Data
Results/Data Continued

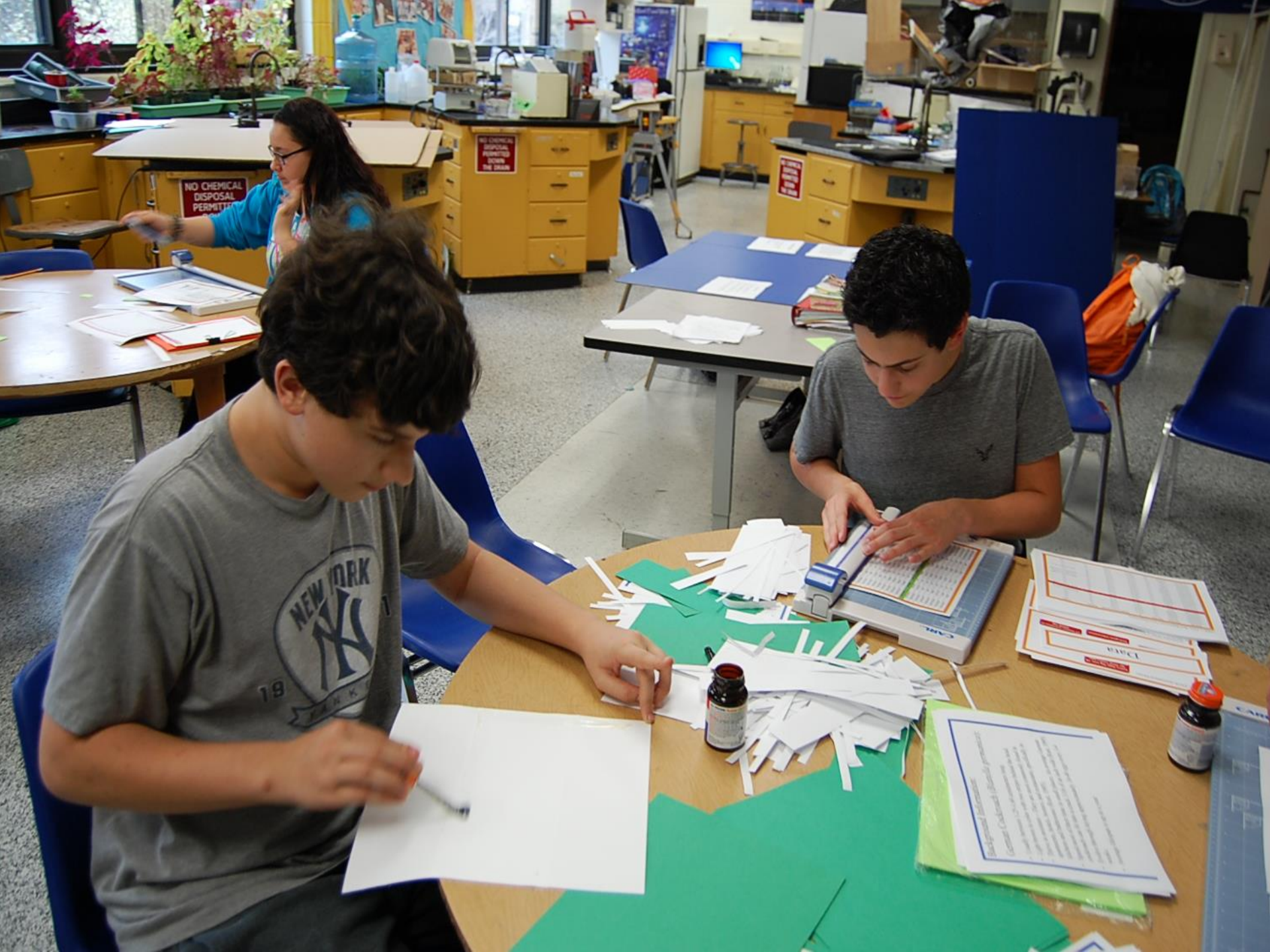

NO CHEMICAL DISPOSAL PERMITTED DOWN THE DRAIN
CollegeBoard
EMERGENCY SHOWER
SAFETY SHOWER


Cal
WESTWARD


COMMACK
VOLLEYBALL


Clean all cages
Tomt Brian poop plate


Monitoring the Expression and Virulence Roles of Chaperone/Usher Pathways in Yersinia pestis
Research Goals
Introduction
Yersinia pestis
Pili and Chaperone/Usher (CU) Pathways
Methods and Materials
A) Adhesion and Infection
A) Adhesion and Infection Assays
Average Bacteria/A549Cell (30 Trials)
KIM6+
4 Pathway KO
Yersinia pestis Strain
Bacteria/A549 Cell
Fig. 3: Fluorescent micrograph sample of 4 pathway KO mutant strain -A549 cell adhesion assay
Fig. 4: Binding of Y. pestis four pathway knock-out mutants to A549 cells
Table 1: Comparison of % decrease in host cell adhesion of single pathway knock-outs and quadruple pathway knock-out strain
Pathway | Δy0348 | Δy1858 | Δy1869 | Δy4060 | Algebraic Sum | Experimental 4KO
% Decrease in Adhesion | 30.3 | 33.3 | 5.9 | 12.8 | 82.3 | 81.2
Protocol: A549 cells were infected with Y. pestis wild type or deletion mutants. Results (bacteria/cell) were calculated and analyzed with ANOVA (p <.001).
Based on the results, of the single deletion mutant assays, a four pathway knock-out strain (Δy0348, Δy1858, Δy1869, and Δy4060) was tested to determine if pathways work in conjunction with one another.
Pathways have an additive effect on one another.
B) Reporter System to Monitor Gene Expression
Modifying a GFP Reporter System
Goal: Using restriction enzymes SapI and XmaI, the promoter regions of chaperone/usher pathways replaced the lac promoter region. Using these novel constructs, chaperone/usher pathways were assessed for optimal induction conditions.
The caf pathway was utilized.
pGFPmut3.1
Fig. 5: pGFPmut3.1 Vector Map (Clontech, 1999)
Fig. 6: caf gfp construct
464 px
510 px
28°C
37°C
1.5 µm
1 pixel ≈ 900nm
Average Percent Fluorescence (15 Trials)
Percent Fluorescence
28° C Caf
37° C Caf
Fig. 7 Sample Micrographs of the caf gfp construct uninduced at 28°C and induced at 37°C. Percentages of green pigmentation (fluorescence) over the entire micrograph image were calculated through Photoshop
Fig. 8: Summary of GFP Results- Percent Fluorescence vs. Temperature Error bars= Standard Error
Discussion and Conclusions
A) Adhesion and Infection Assays
Adhesion assays utilizing the quadruple pathway knock-out mutant provide insight to the roles of pili in binding to host cells as compared to the single knock-out strains.
The quadruple knockout strain led to increased deficiency when binding to host cells compared to the single knock-out strains indicating that the pathways have additive effects on one another.
B) Reporter System to Monitor Gene Expression
Novel gene constructs consisting of pGFPmut3.1 with inserts of the caf chaperone/usher pathway promoter region has been developed to assess optimal induction conditions.
The caf pathway was found to be induced at 37°C- caf pathway aids against phagocytosis, which often occurs in the human body as an immune response.
Implications of Findings
Y. pestis - Category A agent of potential bioterrorism
Understanding pilus biogenesis will explicate the mechanisms of bacterial pathogenesis and provide insight into cellular organelle construction.
Understanding expression and function of pili could elucidate the mechanisms of pathogenesis and lead to vaccination development.
Methods can be used in studies regarding other species of pathogenic bacter more prevalent in today's society such as Escherichia coli, Francisella tularensis, and species of Salmonella, Shigella, and Vibrio.
Fig. 9: Yersinia pestis Infection Cycle- Modern Day (Cole
Future Directions
Apply methodology to additional pathogenic bacterial stra
Create constructs consisting of pGFPmut3.1 and novel pr adhesion
Determine the conditions (temperature, pH, media type chaperone/usher pathways are expressed
Utilize the KIM5- Strain (quadruple KO strain) for mouse
KIM6+ pCD1-
KIM6- pDC1-
pgm
Fig. 10 Converting KIM6+ to KIM5-
Selected R
Measuring DNA damage in Acropo formosa using phosphorylated H2A
Methods
Results


NO CHEMICAL DISPOSAL
NEW YORK


Conclusion
As a result of the information collected through experimentation, memories can be better and more accurately recalled from collaborations than individually.
Certain types of questions posed challenges in the ability to recall accurate details more than others did. There was a difference in accuracy of answers between some questions more than in others. For example, question number 2 was answered much less accurately than question number 3, as well as others.
This change in accuracy could be due to a number of reasons. Some hypothesized explanations are how the questions were ordered, the wording of the question, or the intensity of the question (main details or more meticulous details in the scene).
It was observed that questions that were more blunt were easier to answer, such as "What activity was the girl participating in?". Every individual answered that question correctly.
However, questions that were not straight forward, or were asking more meticulous details, such as "How many ponytails did the girl have her hair in?" and "How many lights were on?".
Interfere with Healthy Sleep Habits Among Adolescents
Participant


Plants


Cougar Science
Commack Science Research
"Students Taking Their Interests In New Directions"
Cougar Curiosity
Data
COMMACK


science
research