INQUIRE. INNOVATE. INSPIRE.

# Intel Science Talent Search 2013 Semifinalists

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# Intel STS 2013 Semifinalists

**The Intel Science Talent Search (Intel STS)** is the nation's most prestigious pre-college science competition. Alumni of STS have made extraordinary contributions to science and hold more than 100 of the world's most coveted science and math honors, including the Nobel Prize and the National Medal of Science. The Intel STS recognizes 300 students and their schools as semifinalists each year to compete for $1.25 million in awards. From that select pool, 40 student finalists are then invited to Washington, DC in March to participate in final judging, display their work to the public, meet with notable scientists, and compete for the top award of $100,000.

The semifinalists of the Intel Science Talent Search (Intel STS) 2013 were selected from among 1,712 entrants representing 467 high schools in 42 states, the District of Columbia, Guam, and two U.S. overseas schools.

Each of the 300 students named a semifinalist in the Intel STS 2013 will receive a $1,000 award for his or her outstanding research. Additionally, to recognize excellence in teaching and school support of individual student research, every school will receive an award of $1,000 for each semifinalist named in the Intel STS 2013. This award is used to further excellence in science, math, and/or engineering education.

Colleges and universities regard the Intel STS semifinalist award to be evidence of exceptional academic promise. Each semifinalist is provided with a certificate of accomplishment, which may be sent with his or her applications for college admission and scholarships. A listing in this book, as well as official publication at www.societyforscience.org/sts, is also documentation of this honor.

Many Intel Science Talent Search projects are the product of a research environment in which scientist mentors dedicate themselves to the intellectual development and technical training of students. The 2013 semifinalists, Intel, and Society for Science & the Public acknowledge with gratitude the guidance, expertise, and patience of the experienced researchers who supported many of these projects.

From this group of 300 Intel STS 2013 semifinalists, 40 finalists will be chosen to attend the Intel Science Talent Institute in Washington, DC from March 7–13, 2013. During their trip to Washington, these finalists will undergo further judging and share $630,000 in awards.

## ARIZONA

**Gilbert**

**Mesquite High School**
***Lu, Amy Diane, 18***
The Effect of Music Sound Distraction on Learning Behavior of Rats

**Phoenix**

**Desert Vista High School**
***Dai, Annie, 17***
Development of "Smart" Hydrogels for Three-Dimensional (3D) Dynamic Tactile Displays

## CALIFORNIA

**Atherton**

**Menlo School**
***Sauer, Christopher P., 17, Portola Valley***
Computational Discovery and Analysis of Boolean Relationships between Cancer Mutations Identified from RNA-Seq

**Chatsworth**

**Sierra Canyon School**
***Mehrotra, Pavan N., 17, Simi Valley***
Facile, Single Step Conversion of Biomass to Electricity

**Davis**

**Davis Senior High School**
***Jin, Benjamin E., 17***
Developing Lympho Lab: Modeling Ionic Fluxes in T-Lymphocytes

**Folsom**

**Vista del Lago High School**
***Buch, Shyamal, 17***
Beyond the Nanostructure in Solar Cells

**Fremont**

**Mission San Jose High School**
***Chen, Kevin, 17***
Development of a Low-Cost Analyzer for Ferroelectric Characterization

***Zhang, Yejia, 17***
Potent Anti-Cancer and Anti-Inflammatory YD-3 Drug Synthesis: A Novel and Expedient Approach

**Fullerton**

**Troy High School**
***Tao, Emily, 17, Placentia***
A New Reaction Mechanism for the Atmospheric Formation of Sulfuric Acid

**Irvine**

**University High School**
***Xu, Haotian, 18***
Design and Build a Low-Cost System for In-Home Measurement of Brain Signals in Cochlear Implant Users, Allowing Automatic Artifact Removal and Remote Monitoring of Patients

***Xue, James, 17***
Rubberized Concrete: A Green Structural Material with Enhanced Energy-Dissipation Capability

***Xue, William, 17***
Heat Induction and IR Thermography for Non-Destructive Assessment of Rebar Corrosion

**La Canada**

**La Canada High School**
***George, Kavitha, 17***
New Multicomponent Synthesis Protocol for Facile Generation of Fluorinated Amino Acids

**Los Altos**

**Los Altos High School**
***Liu, Jerry, 17, Mountain View***
Modeling the Lithiation of Crystalline-Amorphous Silicon Nanowires using the Lattice Boltzmann Method

**Moraga**

**Campolindo High School**
***Vittimberga, Brooke Ashley, 17***
Development of T-Cell Functional Assays to Measure Regulatory Activity of Myeloid-Derived Suppressor Cells in Tolerant Kidney Transplant Patients

**Oakland**

**The College Preparatory School**
***Zhang, Kelly, 17, Orinda***
Fluorescent Imaging for Nano-Detection (FIND) of Cancer Cells for Future Surgery

**Palo Alto**

**Castilleja School**
***Dean, Victoria Lee, 18***
Automated Search for Lyman-Alpha Emitters in the DEEP3 Galaxy Redshift Survey

**Gnyanam Academy**
***Vasudevan, Sahana, 15***
Minimizing the Number of Carries in the Set of Coset Representatives of a Normal Subgroup

**Henry M. Gunn High School**
***Jiang, Helen, 17***
Asymmetrical and Heterogeneous Single-Particle Volume Reconstruction of the Transcription Pre-Initiation Complex using a Novel Non-Reference Based Pipeline

***Tung, Laura Hsia, 17***
Synthesis of Novel Phosphonium-Based Ionic Liquids and Analysis of Their Properties

***Yu, George, 17***
Feasibility of Single-Molecule Imaging with a Free Electron Laser Optimized via Genetic Algorithm

**Salinas**

**Salinas High School**
***Sinha, Aradhana, 16***
Triforine Sensitivity in Lettuce

**San Diego**

**Canyon Crest Academy**
***Rao, Vaishnavi Lakshminarasimha, 17***
Activity-Dependent Regulation of Nitric Oxide Expression: Novel Form of Neurotransmitter Plasticity

**Point Loma High School**
***Palmer, Corlin, 17***
Reducing Forest Depletion through the Utilization of Palm Waste for the Production of Charcoal

**San Diego Jewish Academy**
***Fagan, Melissa Rachel, 17***
Creation of Alginate Microparticles as a Novel Drug Delivery Vehicle

**Torrey Pines High School**
***Mahata, Sumana, 17***
Single Nucleotide Polymorphisms Reveal Novel Insights into the Onset and Severity of Hereditary Angioedema

**Westview School**
***Wang, Suyang Kevin, 18***
Application of Impedance-Based Cell Assays for Identifying Inhibitors of Oncogene Addicted Pathways

**San Francisco**

**Lowell High School**
***Kwan, Kitty, 17***
Dynamic Intracellular Zones of Microtubule Assembly during Epithelial Cell Height Change

**San Jose**

**Bellarmine College Preparatory School**
***Buduma, Nikhil, 18***
Modulation of Phagocytosis in *Tetrahymena thermophila* by Histamine and the Antihistamine Diphenhydramine: The Development of a Novel Flow Cytometric Drug Screening Protocol

***Sur, Debnil, 17, Sunnyvale***
Properties of Dwarf Ellipticals in Low-Density Environments

**Lynbrook High School**
***Ho, Johnny, 17***
Gene Network Analysis of Mental Disorders using Bootstrapped Bayesian Multinets on Gene Expression Data

***Khare, Eesha, 17, Saratoga***
Design and Synthesis of Hydrogenated $TiO_2$-Polyaniline Core-Shell Nanorods for Flexible High-Performance Supercapacitors

***Takahashi, Jack Ryan, 17, Saratoga***
Wnt Independent β-catenin Activation Is Associated with Increased Pulmonary Artery Smooth Muscle Cell Proliferation in Idiopathic Pulmonary Arterial Hypertension

***Xu, Eric, 17***
The Effects of Hydrostatic and Uniaxial Pressure on the Crystallographic Structure and Optical Properties of Scintillator CsI(Tl) for Nuclear Radiation Detection

**The Harker School**
***Bhattacharya, Paulomi, 18, Cupertino***
A Novel AAA-ATPase p97/VCP Inhibitor Lead for Multiple Myeloma by Fragment-Based Drug Design: A Computational Binding Model and NMR/SPR-Based Validation

***Celik, Deniz, 17, Sunnyvale***
Computation of the Cell Phone-Induced SAR Distribution in a 3D Multi-Layered Model of the Human Head/Brain using Finite Element Analysis

***Chen, Jenny, 17, Fremont***
RNAi of Rec12 in *Schizosaccharomyces pombe*: The Effect of Meiotic Recombination Inhibition on Fungicide Resistance

***Luo, Andrew, 17, Los Altos***
The Kinematics of Andromeda's Diffuse Ionized Gas Disk

***Modi, Payal Nikhil, 17, Fremont***
Understanding the Chemical Inhomogeneities in Globular Clusters: Examining M4 and M5 for Trends in Elemental Abundances

***Swaminathan, Ashvin Anand, 17, Cupertino***
Surreal Analysis: An Analogue of Real Analysis for Surreal Numbers

**San Ramon**

**Dougherty Valley High School**

***Chen, Andrew, 17***
Utilizing Novel Graphene Oxide Langmuir-Blodgett Film Catalysts to Enhance the Cost Efficiency of a PEM Fuel Cell

***Pan, Grace Annette, 17***
Investigating Effects of Ferroelectricity on Current Properties in Electron Tunneling Junctions

***Sauer, Eric Michael, 18***
PDFClearance: An Improved Method of Detecting Malicious Embedded JavaScript in Portable Document Files (PDFs) using Syntactic Analysis

***Wang, Andrew, 17***
Characterization of Controlled Release Dynamics of Doxorubicin to Cancer Cells within PLGA — Lecithin — PEG Hybrid Nanoparticles

***Wen, Lily, 17***
Regenerative Medicine: A Novel Micropatterning Approach to Clarify How Cells Transmit Extracellular Matrix Signals

**Saratoga**

**Saratoga High School**

***Bedekar, Niharika Milind, 17***
A Novel Environmentally Promising Alternative to Lead-Based Piezoelectric Materials — A Study of Lead Free $(NaK)(NbSb)O_3$-$LiTaO_3$-$BaZrO_3$ Ceramics

***Chow, Amanda Yuling, 17***
Electrocatalytic Hydrogenation of Furfural using Solid Polymer Electrolyte Electrolyzer

***Garbe, Kevin, 17***
Patterns in the Coefficients of Powers of Polynomials over a Finite Field

**South San Francisco**

**El Camino High School**

***Hu, Daniel Alexander, 17***
Beyond Timoshenko: Exact Solutions to Two-Variable Vibration Equations Not Found in Any Textbooks

## COLORADO

**Colorado Springs**

**Cheyenne Mountain High School**

***Volz, Sara, 17***
Optimizing Algae Biofuels: Artificial Selection to Improve Lipid Synthesis

## CONNECTICUT

**Danbury**

**Danbury High School**

***Kerr, Ryan Daniel, 17***
Biological Control of Ticks to Prevent Lyme Disease using Entomopathogenic Nematodes

**Glastonbury**

**Glastonbury High School**

***Chowdhary, Kaitavjeet, 17***
Morphogenesis of and Chromosome Segregation in *Escherichia coli* Branching Mutants

**Greenwich**

**Greenwich High School**

***Le Breton, Stephen Adam, 17***
*In vivo* Regeneration of Tooth Enamel using an Innovative Hydrophilic Polymer-Coated Retainer

***Zhang, Annie, 16, Cos Cob***
Graphene Oxide as a Novel Biosensor in Targeted Delivery of Chemotherapy Drugs

**Hamden**

**Hamden Hall Country Day School**
***Buhimschi, Alexandru D., 17, New Haven***
Improved and Novel Methods for Activation of Psoralens as *in situ* Anti-Cancer Agents

**New Haven**

**Hopkins School**
***Meng, Ashley, 17, Shelton***
The Where and When of Antibody-Secreting Cell Differentiation and Interactions: Exploration of the Subcapsular Sinus Microenvironment within Lymph Nodes

**Wallingford**

**Choate Rosemary Hall**
***Zhang, Yifan, 17***
Prestin Is Targeted to the Basolateral Membrane using a Tyrosine Motif

## FLORIDA

**Jacksonville**

**Episcopal High School of Jacksonville**
***Forsyth, Alexander William, 17, Atlantic Beach***
Using Virtual Screening to Identify Novel DNA Methyltransferase 1 Small Molecule Inhibitors as a Treatment for DNMT1 Overexpression Caused Cancer

**Melbourne**

**West Shore High School**
***Chin, Michelle Man-Si, 17***
Genetic Engineering: Improving Drought Resistance by Identifying the Underlying Mechanisms of Mitogen-Activated Protein Kinase 4 and its Interaction with Substrate MKS1

**Sarasota**

**Out-of-Door Academy**
***Wenger, Brittany, 18***
Global Neural Network Cloud Service for Breast Cancer

**West Palm Beach**

**Alexander W. Dreyfoos School of the Arts**
***Wan, Christopher, 17, Wellington***
Modeling Estuarine Salinity using Artificial Neural Networks

## GEORGIA

**Atlanta**

**The Westminster Schools**
***Chin, Lillian Tiffany, 17, Decatur***
Agent-Based Modeling of Collective Cell Movement during Wound Healing

**College Park**

**Woodward Academy**
***Dave, Ronak Mahendra, 18, Atlanta***
Elevation Change Alters the Genome-Wide Levels of 5-Hydroxymethylcytosine in Blood

**Cumming**

**South Forsyth High School**
***Mudalegundi, Vijeth, 17***
Gene Expression Analysis in a Mouse Model Expressing Mutant Huntington

**Duluth**

**Duluth High School**
***Li, Jonathan Rong, 17***
Kinetically Controlled Synthesis of Silver Nanoplates and Nanodisks via a Solvothermal Route

**Marietta**

**George Walton Comprehensive High School**
***Goldshlager, Gil, 17***
Characterizing *x*-Monotone and Outerplanar Thrackles

**Milton**

**Milton High School**
***Selvakumar, Raja, 17, Alpharetta***
Gastro Microbial Fuel Cell: A Novel Implementation of a GMFC in Capsular Nanorobotics

## ILLINOIS

**Aurora**

**Illinois Mathematics and Science Academy**
***Sha, Carrie, 17, Plainfield***
Development of Novel Sensor to Reduce Postural Kyphosis

**Barrington**

**Barrington Community High School**
***Kim, Jihoon, 17, Inverness***
Ubiquitous Heart Rate Monitoring using a Webcam

**Chicago**

**The University of Chicago Laboratory High School**
***Gunderman, Lane, 18***
Investigating the Fenna-Matthews-Olson Complex using Molecular Dynamics Simulations: Exploring the Mechanics of Energy Transport in Photosynthesis

***Zhang, Shuodan, 18***
LIN28 Represses miR-150 Maturation in MLL-Associated Leukemia

**Evanston**

**Evanston Township High School**
***Goetz, Laura Gould, 18***
Identifying Genetic Modifiers of Polyglutamine Expansion Toxicity in *Caenorhabditis elegans*

## INDIANA

**Carmel**

**Carmel High School**
***Vavilala, Vaibhav, 17, Indianapolis***
Effects of Self-Action in a Neural Network with Hebbian Learning

***Vemuri, Harsha, 17***
PT-Symmetric Lattices with a Local Degree of Freedom

**Munster**

**Munster High School**
***Kondamuri, Nathan Sai, 18, Dyer***
The Improved Efficiency of a Solar Cell Based on Modified Photosynthetic Pigments

***Kraft, Peter, 17***
Synthesis and Analysis of Novel Coordination Polymers Containing 3- or 4-Pyridylnicotinamide and Benzenedicarboxylates

## IOWA

**Ames**

**Ames High School**
***Fan, Bo, 16***
Integration of Two Kinetic Analysis Methods for Evaluation of the Effect of a New Catalyst on Reducing the Energy Consumption of $CO_2$ Capture

**Iowa City**

**West High School**
***Ye, Ivan Bochuan, 18, Coralville***
Tetrahedron-Based Orthogonal Simultaneous Scan for Cone-Beam CT

## KENTUCKY

**Louisville**

**duPont Manual High School**
***Mundkur, Naethan Sid, 17***
Investigation into the Thermal and Rheological Properties of CuO Nanofluids for Heat Transfer Applications

**Park Hills**

**Notre Dame Academy**
***McFadden, Monica, 18, Ft. Wright***
Biobarrier Filtration of Water Contaminants

## MARYLAND

**Clarksville**

River Hill High School
***Thakor, Jai, 17***
A Nanofiber-Hydrogel Conduit as a Guide to Nerve Regeneration

**Ellicott City**

Centennial High School
***Wang, Helen, 17***
Strength in Numbers: Design and Synthesis of Glycoprotein-Based Multivalent Glyco-Ligands for Influenza Hemagglutinin and Human Galectin-3

**Poolesville**

Poolesville High School
***Patel, Anand Vijaykumar, 17, Germantown***
Searching for Transverse Wave Instabilities in the Maryland Centrifugal Experiment

***Zeng, Joy Shuang, 17, Gaithersburg***
Targeted Thermal Ablation of Cancer Cells using Biosurfactant Functionalized Carbon Nanotubes

**Rockville**

Richard Montgomery High School
***Zhang, David, 17, Boyds***
Sodium Abundance of Sungrazing Comets from Multi-Spacecraft Photometric and Morphological Analysis

**Silver Spring**

Montgomery Blair High School
***Chen, Richard, 18, North Potomac***
Ultrastructural Variations in Glycogen Synthesis

***Chen, Sharon, 17, Potomac***
Analysis and Development of Algorithms for the Densest k-Subgraph Problem

***Ilangovan, Diwakaran, 17, Gaithersburg***
The Perception of Vertical Visual Perturbation While Walking

***Skarda, Jinhie Lee, 17***
Analysis of Jovian Decametric Emission using the Long Wavelength Array Station 1

***Zbarsky, Samuel, 17, Rockville***
On Improved Bounds for Bounded Degree Spanning Trees for Points in Arbitrary Dimension

**Timonium**

Dulaney High School
***Tang, Lisa Ann, 17, Lutherville***
Applying Tripartite Split GFP Complementation Technology to Study RAGE Interactions and Signaling

## MASSACHUSETTS

**Acton**

Acton-Boxborough Regional High School
***Johnson, Jacob Paul Smullin, 17, Boxborough***
Integrative Genomic Analysis of a Mouse Model of Malignant Breast Cancer Reveals Crucial and Novel Cancer Drivers

**Amherst**

Amherst Regional High School
***Kundu, Shohini, 17***
Reconstructing the History of Past Inundations in Lake Daija, Lake Amida, and Lake Ryuoo and Analyses of Their Intensities

**Boston**

Commonwealth School
***Herrup, Rachel, 18, Cambridge***
A Diagnostic Device using Laminar Flow and Colorimetric Analysis

The Winsor School
***Walsh, Jennifer Ming, 18, Chestnut Hill***
Searching for the Oldest, Most Metal-Poor Stars from the SkyMapper Survey

**Brookline**

Brookline High School
***Klein, Aaron J., 17***
On Rank Functions of Graphs

**Foxborough**

Foxborough High School
***Chattopadhyay, Aheli, 17***
Engineering Nanoscale Energy Storage Devices from *C. aegagropila* Algae Cellulose Dispersed in Graphene

**Lexington**

Lexington High School
***Bhupatiraju, Surya Narayanaraju, 17***
On the Complexity of the Marginal Satisfiability Problem

**Milton**

Milton Academy
***Cho, Haejun, 18, Fort Lee, New Jersey***
Simulations of Three Shell Supernova Remnants (SNRs) for the Nuclear Spectroscopic Telescope Array (NuSTAR)

**Newtonville**

Newton North High School
***Anand, Giridhar M., 17, West Newton***
Disordered Protein Regions, Their Interactions, and Roles in Human Disease: Measurement via Disease-linked Genetic Variants

***Chen, Christina, 18, Newton***
Apollonian Equilateral Triangles

**Worcester**

Massachusetts Academy of Math & Science
***Aiylam, Dhroova, 16, Shrewsbury***
Modified Stern-Brocot Sequences

## MICHIGAN

**Ann Arbor**

Ann Arbor Pioneer High School
***Mayukha, Ananya, 17***
Swara Yatra: An Exploration into the Musical Preferences of Autistic Children

Ann Arbor Huron High School
***Popova, Lilia, 17***
Elucidating Environmental and Genetic Mechanisms of Magnetically Altered Plant Growth

**Bloomfield Hills**

Andover High School
***Sun, Cuthbert, 17, West Bloomfield***
The Interactions between Ccq1, Tpz1, Poz1 And Rap1 — Protein Components of Fission Yeast Telomeres — and Insight into the Telomerase Regulation Mechanism

**Okemos**

Okemos High School
***Fu, Martina, 17***
U.S. Cancer Mortality Rates Are Underestimated by the Standard U.S. 2000 Population. How to Correct It?

***Parker, Greg, 18***
Laser-Induced Breakdown Spectroscopy with a Yb Fiber Oscillator

**Troy**

**Troy High School**
***Yang, Phillip, 17***
Osteocytic Osteolysis in a Large Animal Model of Postmenopausal Osteoporosis and Metabolic Acidosis

## MINNESOTA

**Arden Hills**

**Mounds View High School**
***Duffy, Connor Vo, 16, Lino Lakes***
Enhanced Drug Delivery via PEG-cross-linked Mucin Hydrogels

**Plymouth**

**Wayzata High School**
***Lai, Jenny, 18***
Development of an ELISA Prototype to Detect the Presence of Novel Peptide TUF1 in Serum and Its Role in Stress Management

***Zhao, Roy, 17, Medina***
New Models for HIV Latency

**Stillwater**

**Stillwater Senior High School**
***Ylitalo, Andy, 17***
Functionalization of Hexagonal Boron Nitride Monolayers and Analysis with Transmission Electron Microscopy

## MISSISSIPPI

**Oxford**

**Oxford High School**
***Ding, Taide, 18***
Developing a Hurricane Landfall Model for Wind and Storm-Surge Prediction in the Northern Gulf Coast

## MISSOURI

**Chesterfield**

**Chakraborty Homeschool**
***Chakraborty, Uttara, 17***
A New Stochastic Algorithm for Proton Exchange Membrane Fuel Cell Stack Design Optimization and its Markov Chain Analysis

**Columbia**

**Rock Bridge High School**
***Shang, Charles, 17***
New Multidimensional Scaling and Markov Networks Based Methods for Protein Model Quality Assessment

## NEBRASKA

**Omaha**

**Millard North High School**
***Jain, Nimansha, 17***
Regulatory Motifs that Control the Trafficking and Assembly of Gap Junctions Formed of Connexin32

## NEW JERSEY

**Hackensack**

**Academy for Engineering & Design Technology**
***Chong, Julie, 18, Harrington Park***
Electrochemical Synthesis and Characterization of Titania ($TiO_2$) Nanotubes for Application in Dye-Sensitized Solar Cells

***Kim, Paul, 18, Paramus***
Fabrication and Characterization of Functionalized Multi-Wall Carbon Nanotube Filters for Cd(II) Ion Removal

**Academy for Medical Science Technology**
***Chan, Jennifer, 18, Upper Saddle River***
Activation-Induced Cytidine Deaminase (AID): A Common Target for ER-Dependent and ER-independent Breast Cancer Therapies

***Radin, Daniel Pierce, 18, Glen Rock***
Lifeguard Inhibition of Fas-Mediated Apoptosis as a Possible Mechanism of Chemoresistance

**Academy for the Advancement of Science and Technology**
***Guo, Michelle, 16, Ho-Ho-Kus***
Identification of Novel Mechanisms of Resveratrol and Metformin in a Diabetic Model of Alzheimer's Disease

***Sung, Janice Yejin, 18***
A Novel Role of SIRT3 in Reprogramming Breast Cancer Metabolism

**Academy for Telecommunications and Computer Science**
***Knyszek, Michael, 17***
Growth of Pure and Co-Doped Single Crystalline Potassium Tantalate

**Jersey City**

**Dr. Ronald E. McNair Academic High School**
***Savitsky, Kimberly, 17***
The Analysis of Boating Motions on Biodiversity: The Duck River

**Lawrenceville**

**Lawrenceville School**
***Mago, Aashna, 17, Newtown, Pennsylvania***
A Novel EZH2 Histone Methyltransferase Inhibitor: Potential Advancement in Epigenetic Cancer Therapy

**Lincroft**

**High Technology High School**
***Chen, Angelica, 17, Morganville***
Towards the Prediction of Successful Outcome of Transcatheter Aortic-Valve Replacement (TAVR)

***Schneider, Eric, 17, Freehold***
On the Workday Number for Finite Multigraphs in a Variation of Cops and Robbers

**Livingston**

**Livingston High School**
***Kania, Krishan, 17***
Making an IMPACT: Advancing the Computation of Next-Generation Sequencing Data

***Nie, Alexander, 17***
Gelatin Hydrogels as a Cellular Scaffold: The Effect of Glucose on Gel Structure and Fibroblast Behavior

**Millburn**

**Millburn High School**
***Lim, Keonho Chris, 17***
The Effects of (2*S*,4*R*)-4-Fluoroproline Substitutions on Interchain Hydrogen Bonding Behavior in Collagen Triple Helices: A Computational Study

***Xie, Emma, 17***
Biodiesel Production from Microalgae via Solar-Powered Super-Critical Water Gasification

**Morristown**

**Morristown High School**
***Wong, Catherine, 17***
A Novel Design for Wireless Low-Cost Cardiac Examination over the Mobile Phone Platform: Telemedicine for the Developing World

**Teaneck**

**Ma'ayanot Yeshiva High School for Girls**
***Applebaum, Eliana, 17***
A New Approach to Cancer: The Effects of Titanium Dioxide ($TiO_2$) Nanoparticles on Human Cervical Adenocarcinoma (HeLa) Cell Membrane Mechanics

## NEW MEXICO

**Albuquerque**

**Manzano High School**
***Cordwell, Katherine, 17***
Lower Central Series Quotients of Finitely Generated Algebras Over the Integers

## NEW YORK

**Armonk**

**Byram Hills High School**
***Arditi, Rose Lynn, 17, Bedford***
Manganese-Enhanced Magnetic Resonance Imaging (MEMRI) for Measuring *in vivo* Hippocampal Structure and Function in a Mouse Model of Fear Memory Resilience and Susceptibility

***Blum, Zachary, 17***
Evaluating Executive Functioning, Processing Speed, and P300 Event-Related Potential as Predictors of Memory in Younger and Older Adults

***Bricker, Jonathan Tyler, 17***
Acute and Chronic Effects of Ethanol on GABA-mediated Synapses in the *Rattus norvergicus* Cortex and Cerebellum

***Di Capua, Christopher August, 17***
A Comparison of Conventional CPR and CPR Utilizing a Novel Automatic Transport Ventilator: The Automated Ventilator with Assisted Compressions (AVAC)

***Fishberger, Gregory, 17, Bedford***
A Novel Zinc Finger Protein Targeted Approach to Active DNA Demethylation of VEGF-A

**Bellmore**

**John F. Kennedy High School**
***Pollock, Joshua Phillip, 17, Merrick***
Emotional Face Recognition

**Briarcliff Manor**

**Briarcliff High School**
***Moretto, Mark, 17***
Deep Impact Spectral Observations of Naturally Occurring Mini-Outbursts

**Bronx**

**Bronx High School of Science**
***Bushlow, Megan, 17, Kew Gardens***
Perceived Cohesion, Flexibility, Communication, and Satisfaction in the Families of Adolescents with Eating Disorders

***Chittampalli, Yashaswini, 17, New York***
APOBEC1-Mediated Editing of Amyloidogenic RNA Transcripts in Microglia

***Donenfeld, Daniel Brian, 17***
The Dynamics of Emulsion Separation: A Microscopic Investigation at the Interface

***Liebman, Emma, 17, New York***
"Poor Health" or a "Healthy Income": The Bidirectional Relationship of Health and Different Measures of Income

***Rahman, Rishad, 17, New York***
Study of Swimming and Metaboly in *Euglena*

***Ruiz, Amanda Elyssa, 17, Bellerose***
Model Systems for the Analysis of Pax5 Function on V(D)J Recombination

**Burnt Hills**

**Burnt Hills-Ballston Lake High School**
***Scibelli, Samantha Marie, 17***
Census of Blue Stars in the Eighth Data Release of the Sloan Digital Sky Survey

**Cedarhurst**

**Lawrence High School**
***Chapin, Arielle Bryn, 17, Atlantic Beach***
Do Adolescent Males Have an Advantage in Spatial Learning?

***Chen, Andrew, 17, North Woodmere***
Incorporation of Graphene into Organic Polymer Solar Cells via Chemical Functionalization with Metal Nanoparticles

***Tse, Alexandra Leigh, 17, North Woodmere***
Grit *vs.* IQ: Assessing the Relative Impacts of Effort & Intelligence in Academic Success Among "Tweens"

**Chappaqua**

**Horace Greeley High School**
***Liu, Angela, 17, Mount Kisco***
Defibrillation of the Heart by Light: Simulation of Optogenetics in Cardiac Tissue

***Peng, Jiayi, 17***
A Cellular Automaton Model for Critical Dynamics in Neuronal Networks

**Cross River**

**John Jay High School**
***Fulop, Daniel, 17, South Salem***
Can MicroRNAs Revert Cirrhotic Hepatic Stellate Cells to a Healthy Quiescent State?

***Pawlak, Kevin, 17, South Salem***
Determining Efficacy of QSI-Antibiotic Combination Therapy against *Pseudomonas aeruginosa*

**Croton-on-Hudson**

**Croton-Harmon High School**
***Traver, Chris, 17***
Investigating Noise Pollution using Smartphones and Citizen Scientists

**Dix Hills**

**Half Hollow Hills High School East**
***Bansal, Puja, 17***
Three Dimensional Molecular Imprinting for the Detection of Viral Pathogens

***Goyal, Rohan, 16, Melville***
Human Immunodeficiency Virus Induces Pro-Apoptotic Features in Renal Cells through the Down Regulation of Vitamin D Receptor

***Jin, Tammy, 17, Melville***
Variable M3-S2 Linker Tension Modulates N-Methyl D-Aspartate Receptor Activity in a Subunit Specific Manner

***Kim, Jonathan J., 17, Deer Park***
Determining the Cell Cycle Stage of Cells in Developing Hair Follicles

***Patil, Abhinav, 17, Melville***
Geometric Phase as a Systematic Error in the Proton EDM Experiment

***Tannenbaum, Robert, 17, Melville***
Enhancement of Graphene-based Supercapacitor Devices in Both Symmetric and Asymmetric Electrochemical Cell Environments

**Dobbs Ferry**

**Dobbs Ferry High School**
***Wang, Chloe, 16***
Effects of Water Vapor on Hydrogen Permeation through a Metal Membrane

**East Meadow**

**East Meadow High School**
***Wang, Anson, 17***
Regulation of Memory Protein PKMzeta in Alzheimer's Disease

**East Setauket**

**Ward Melville High School**
***McAuliffe, Phoebe Blyth, 17, Seatuket***
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***Singhal, Sanjula, 17, Lake Grove***
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***Zheng, Gloria, 17, South Setauket***
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**Farmingdale**

**Farmingdale High School**
***Gupta, Nakul, 17***
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**Fort Edward**

**Babbitt Homeschool**
***Babbitt, Matthew, 17***
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**Fresh Meadows**

**St. Francis Preparatory School**
***Arora, Aishvarya, 17, Middle Village***
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**Great Neck**

**John L. Miller Great Neck North High School**
***Chirinos, Deriam, 16***
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***Dong, Menglu, 17***
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***Zhuang, Julia, 17***
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**North Shore Hebrew Academy High School**
***David, Yonatan, 17, Syosset***
Exploration of the Chiral Magnetic Effect in Quark Gluon Plasma via Charge-Separation Measurements

**William A. Shine Great Neck South High School**
***Kim, David, 17***
Packing *versus* Covering in the Euclidean Plane

***Zhou, Cyrus, 17***
Accelerated Lateral Ventricle Growth in Normal Individuals as Well Cognitive Decliners

**Greenlawn**

**Harborfields High School**
***Wax, Jacob Gary, 17***
Investigating the Sensitivity and Specificity of the Potentiometric Biosensor Mechanism through Bacteria and Bacterial Spore Cross Testing

**Hewlett**

**George W. Hewlett High School**
***Kay, Jason Michael, 17***
Why Do Bullies Bully? An Examination of the Role of Intrinsic and Extrinsic Factors in Motivating and Enabling Bullying Behavior

**Hewlett Bay Park**

**Stella K. Abraham High School for Girls**
***Sosnowik, Avigael, 17, Lawrence***
The Coactivation of Positive and Negative Feelings: Film Genres' Effects on Adolescent Emotions

**Jericho**

**Jericho Senior High School**
***Joshi, Sonia M., 17***
Concomitant Protease Inhibitor Administration: Saquinavir and Ritonavir Reduce Septic Complications Minus Cognition

***Lam, Samuel, 17, Old Westbury***
Tai Ch Pilot Study: Assessing Quality of Life, Mood States, and Salivary Cortisol Levels in Chinese Americans after Breast Cancer Diagnosis

***Liu, Brendan, 17***
Polyvinylamine Grafted Electrospun Polyacrylonitrile Membranes for Cr(VI) Adsorption

***Shen, Michael R., 16***
FTO and RPGRIP1L Regulate Proliferation in 3T3-L1 Adipocytes and OXPHOS Gene Expression in HepG2 Hepatocytes

***Wu, Raymond, 17***
A Model of the Action Potential in a Cardiac Myocyte and the Effects of Duration on Ion Currents

**Kings Park**

**Kings Park High School**
***Cox, Wesley, 17***
Design of an Electromagnetic Energy Harvester for Wildlife Tracking

***Mutlu, Kenan, 17***
The Effects of Shifting the Subject of Suspense during Cognitive Appraisal in Relation to Suggestibility and Cued Recall Capacity

***Sridhar, Mayuri, 17***
Computational Analysis of the DNA-Binding Mechanism of the p53 Tumor Suppressor and its Inactivation through the R249S Mutation

**Latham**

**Shaker High School**
***Jaggi, Sahir, 17, Cohoes***
Layer-by-Layer 3-D Constructs of Adherent and Non-Adherent Cells in Hydrogel

**Lincolndale**

**Somers High School**
***Zheng, Simon, 16, Somers***
Off-Axial Rocking Motion and Wavy Deformation in Triple-Walled Carbon Nanotubes

**Mamaroneck**

**Mamaroneck High School**
***Bernstein, Joby B., 17, Larchmont***
The Scaffolded Grader: Activation of Embodied Sensory Experiences Influences Abstract Judgment

**Manhasset**

**Manhasset High School**
***Fiacco, Nick, 17***
Localization of Pkc1p with the Septins in Sporulating *S. cerevisiae* Is Dependent on *GIP1* Expression

**Merrick**

**Sanford H. Calhoun High School**
***McNamara, Emma Ann, 17***
Female Dominance Hierarchies as a Predictor of Relative Canine Size Dimorphism in the *Macaca* genus

**New City**

**Clarkstown High School North**
***Lee, Joan Yujae, 16, Congers***
An Investigation of the Effects of Interactions between Procedural and Declarative Systems on Memory Consolidation in Old Adults and Adolescents

**New Hyde Park**

**Herricks High School**
***Krishna, Meenakshi, 17, Williston Park***
Hypoxia and Nitric Oxide Regulate Angiogenesis Inhibitors in Injury and Disease

***Pleat, Benjamin Isaac, 17, Rosyln***
A Novel Approach to Locating Geothermal Systems in Relation to Geodetic Crustal Deformation and Strain Rate Tensors

**New York**

**Regis High School**
***Kindschuh, William, 17, Brooklyn***
Comparison of a Hospital-Wide Antibiogram to that of an Associated Long Term Care Facility

**Stuyvesant High School**
***Chanthrakumar, Pran, 17, Staten Island***
The Behavioral Rescue of 5-$HT_{1A}$-R (-/-) Mice by DCP-LA and the Introduction of a Novel Paradigm for Anxiety in Rodents: the Pyramid Test

***Kaczmarek, Zofii, 17***
Why Do Word Breaks Speed Reading?

***Kandola, Amanpreet Singh, 17, Richmond Hill***
Identifying Memory-Encoding Neurons Associated with a Learned Experience through a Novel Image Analysis Algorithm

***Lee, Jongyoon, 18, Little Neck***
On the Caccetta-Häggkvist Conjecture

***Li, Miranda, 17***
Behavior Regulation in the Social Ant *Cerapachys biroi*

***Majumdar, Antara, 17, Astoria***
Genomic Instability Induced By Long-Term Exposure to Polychlorinated Biphenyls (PCBs)

***Solimano, Jamie Lee, 17***
Super-Resolution STED Microscopy Provides Insight into the Dynamics of Intraflagellar Transport and Reveals Novel Distribution of Adenylate Cyclase III in Primary Cilia

***Wallach, Jordan Andrew, 17***
Optimizing the Ionic Conductivities of Imidazolium-Based Ionic Liquids by Varying Tethering Groups

***Yao, Carolyn, 17, Whitestone***
The Number of Features Used to Identify a Word Depends on the Number of Possible Words

***Zang, Ben, 17***
Effects of Vitamin A Deficiency and Helminth Infection on the Internal Gastrointestinal Microbiome

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**Wellington C. Mepham High School**
***Wald, Corey, 17, Bellmore***
The Sky's the Limit — An Investigation of Cloud Cover on Major League Baseball Performance

**Ossining**

**Ossining High School**
***Hersh, Caleb, 17***
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***McQuaid, Daniel Conor, 17***
Identification of Post-Translational Regulation Sites on the KLF6 Tumor Suppressor as Novel Targets for Cancer Therapies

***Rude, Eitan David, 17, Briarcliff Manor***
Caloric Restriction Regulates the Expression and Activity of Hepatic and Hypothalamic Active Regulator of SIRT1 (AROS)

***Rude, Sam, 17, Briarcliff Manor***
Sustainable Fluidic Biochips Enhancing Cell Sensitivity and Longevity for Water Toxicity Measurements in the Field

**Plainview**

**Plainview-Old Bethpage John F. Kennedy High School**
***Shamul, James, 17, Old Bethpage***
A Search for Novel MicroRNAs Triggering Liver Cancer Development

***Zheng, Sunny, 17***
Cellulose Nanowhiskers: Enzymatic Hydrolysis and Incorporation in Epoxidized Polymers

**Pleasantville**

**Pleasantville High School**
***McCullagh, Colette Mary, 17***
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***Naik, Jeewan, 17***
A New *Aggregatibacter actinomycetemcomitans* Vector Based on pRK2319

**Port Washington**

**Paul D. Schreiber High School**
***Feldman, Drew, 17***
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***Kim, Minah, 17***
Inhibition of the FabI Enoyl-ACP Reductase from *Burkholderia pseudomallei*

**Rochester**

**Our Lady of Mercy High School**
***Armstrong, Emily, 17, Penfield***
Wavefront Measurements of High-Power UV Lasers with a Hartmann Sensor

**Roslyn Heights**

**Roslyn High School**
***Aalami, Arshia, 17, Roslyn***
My Paper Is Fantastic! Gender Differences in Self-Promotion and Their Effects on Perceptions of a College Essay

***Kumar, Arvind, 16***
A Model of Dropout Propensity Among Heterogeneous Adolescents: The Role of Resilience

***Levine, Ethan, 17, Roslyn Estates***
Why the Mommy Track Doesn't Lead to the State House: The Effect of Candidate Gender and the Age of Their Children on Voter Perceptions

***Sherman, Alain Emil, 17***
Doctor Who? Factors Related to the Selection of the Primary Care Physician

**Rye Brook**

**Blind Brook High School**
***Lubkin, Alex, 18***
Feasibility Assessment of a Novel Solid Oxide Fuel Cell Powered Hybrid Electric Vehicle

**Saint James**

**Smithtown High School East**
***Spiezio, Nicholas, 17***
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***Zhang, Michael, 18***
Role-Inducted Perspective Visual Behavior during Scene Free-Viewing

**Scarsdale**

**Scarsdale High School**
***Evans, Kathryn Elizabeth, 17***
Diversity and Evolution of Endogenous Retroviruses in Afrotherians

***Minke, Madeleine, 17***
N1 Auditory Dampening: A High-Density Electrical Mapping Study

***Tanzer, Jamie, 17***
The Role of Microbial Proteases in the Elicitation of Allergy and the Formulation of the Enzyme Hypothesis

**Smithtown**

**Smithtown High School**
***Jain, Kavita, 17***
Demonstrating Relationships between the Morphology of the Trigeminal System and Feeding Performance in the American Alligator: A New Tool for Understanding Feeding Evolution

***Manepalli, Prady, 17***
An Effective Application of Graphene Oxide Nanoribbons as a Chemotherapeutic Drug Delivery System

**Staten Island**

**Staten Island Technical High School**
***Micek, Christopher, 17***
The Effects of Physical and Motor Imagery Training using the Wii Fit on the Maintenance of Standing Balance

**Suffern**

**Suffern High School**
***Silver, Benjamin, 17, Airmont***
The Relationship between White Matter Integrity and Self-Awareness in Multiple Sclerosis using Diffusion Tensor Imaging

**Syosset**

**Syosset High School**
***Long, Michelle Jiang, 17***
Elucidation of Qualitative and Quantitative Design Parameters of Synthetic Morphogenetic Gene Circuits for Cohesive, Patterned Microtissues

***Weiss, Jared Brandon, 17***
Automatic Annotation of Large Image Datasets via Human Gaze

**West Sayville**

**Sayville High School**
***Monastero, Rebecca Nicole, 17***
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**Westhampton Beach**

**Westhampton Beach High School**
***Beebe-Wang, Nicasia Joanne, 17, Westhampton***
Trait (Dopamine Transporter Gene) x State (Withdrawal) Interaction in Responsiveness to Cocaine Stimuli in Cocaine Addiction

**Yorktown Heights**

**Yorktown High School**
***Hamann, Linus, 17***
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***Tiwari, Tanvi, 17***
Optimization of Ground-Source Well Locations

## NORTH CAROLINA

**Durham**

**North Carolina School of Science and Mathematics**
***Carter, Landon, 16, Cary***
Design and Synthesis of Novel Tetraphenylporphyrin-Based Metal-Organic Frameworks for Photodynamic Therapy and Drug Delivery

***Chen, Yimo, 17, Jamestown***
Maximum SimRank: Characterizing Similarity in Networks

***Ge, William Hao, 17, Raleigh***
Differential Sequestration of TLR Agonists: a Novel Mechanism by which ApoE Isoform Regulates Immunoresponse in Humans

***Jiang, Christie, 17, Cary***
Chitosan-Modified Cellulose as Adsorbent to Collect and Reuse Nitrate from Groundwater

***Tsui, Elizabeth Llanes, 17, Goldsboro***
The Effect of Substrate Density on the Rate of Migration of NIH-3T3 Fibroblasts

***Wang, Yu, 17, Chapel Hill***
A Computational and Statistical Analysis on the Self-Assembly of Nanoparticles

***Xu, Amy, 18, Cary***
Electrodeposition of Group IV Chalcogenide Thin Film Solar Cells

**Raleigh**

**William G. Enloe High School**
***Chan, Jonathan, 17***
Elucidating the Light-Harvesting Mechanism of Highly Efficient Porphyrin-Sensitized Solar Cells

**Waxhaw**

**Marvin Ridge High School**
***Despo, Orion C., 17***
A Novel Computational Algorithm for RNA-seq Transcript Annotation Applied to the Human Pathogen Vector *Aedes aegypti*

## OHIO

**Mason**

**William Mason High School**
***Shrivastava, Peeyush, 17***
Investigations Into CaMKII Regulation of Cardiac Excitability

**Shaker Heights**

**Hathaway Brown School**
***Catanzaro, Alice, 17, Cleveland Heights***
Development of an Electrochemical Iridium Nanoparticle-Based Biosensor for the Determination of Cholesterol Levels in Human Serum

## OKLAHOMA

**Tulsa**

**Holland Hall School**
***Keglovits, Sarah Ann, 17***
Efficient Synthesis of Glycopeptides in Water

## OREGON

**Beaverton**

**Valley Catholic High School**
***Naidu, Yamini Tondamantham, 17, Portland***
Novel Application of an Allosteric, Bifunctional Ligand to Treat Parkinson's Disease through Characterization of Function and Signaling of Dopamine Receptors

**Eugene**

**South Eugene High School**
***Larson, Hannah Kerner, 18***
Classification of Some Fusion Categories of Rank FOUR

**Portland**

**Sunset High School**
***Shah, Naomi Chetan, 17***
The Toxicological Effect of Airborne Pollutants on Lung Health

**Westview High School**
***Tripathi, Raghav, 17***
Design and Synthesis of Novel Fatty Acid Binding Protein Inhibitors for Analgesic and Anti-Inflammatory Effects through Increases in Endogenous Anandamide Concentrations

## PENNSYLVANIA

**Allentown**

**Parkland High School**
***Wang, Joy Yiran, 17, Orefield***
Polyoxovanadate-Based Surfactants: The Search for an Effective Heterogeneous Catalyst

**Ambler**

**Wissahickon High School**
***Zhang, Charlie R., 17, Blue Bell***
Worms with a Sweet Tooth: Reinforcing and Withdrawal Effects of Sucrose in Planarians

**Bryn Mawr**

**The Shipley School**
***Danoff, Michelle, 18, Philadelphia***
Behavioral and Neural Correlates of Emotion Word Processing

**Fort Washington**

**Germantown Academy**
***Kallenbach, Jonah, 17, Ambler***
Characterizing and Identifying Interactions of Intrinsically Disordered Proteins

**Kennett Square**

**Unionville High School**
***Shea, Meghan Marjorie, 18, West Chester***
Optimizing the Coagulating Property of *Moringa oleifera* Seeds: A Novel Approach to Water Purification Techniques in Low-Income Countries

**Lansdale**

**North Penn High School**
***Xie, Lijia, 17***
Aberrant Methylation of the *RASSF1A* Gene as a Biomarker for the Detection of Hepatocellular Carcinoma

**Merion**

**Episcopal Academy**
***Christianson, Karen Electra, 17, Media***
Inhibitors and Activators of Human Histone Deacetylase 8 and Implications for New Disease Therapies

**York**

**Central York High School**
***Chen, Yanqi, 17***
Algal Biofuels: A Comprehensive Four-Year Study into the Optimization of Growth, Lipid Yields, and Lipid Extraction Techniques for Microalgae

## TENNESSEE

**Germantown**

**Houston High School**
***Padmanabha, Akshay, 16, Collierville***
Predicting, Detecting, and Treating Seizures through Vagus Nerve Stimulation

**Knoxville**

**Farragut High School**
***Haugh, Alison Rose, 18***
Decreasing the Cost of High Dimension Simulations using Community Land Model through Machine Learning and Emulation

**Nashville**

**Hume-Fogg Academic High School**
***Anderson, Zach Clarke, 17***
Reflection and Transmission Measurements at Variable Incidence Angles of a Zero Index Metamaterial

***Goyal, Abhi, 17***
The Culturing of Neurons on Graphene for High Resolution Scanning of Processes

***Gudibanda, Aditya, 17***
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***Patel, Meera Vijay, 18, Old Hickory***
*Helicobacter pylori* Alters the Tight Junction-Regulating Adhesion Protein BVES and Promotes Epithelial-Mesenchymal Transition in a Nontumorigenic Murine Gastric Epithelial Cell Line

**Martin Luther King, Jr. Magnet High School**
***Gungor, Busra, 17***
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***Guo, Melissa, 17***
Interfacing of Kinect Motion Sensor and NAO Humanoid Robot for Imitation Learning

***Zheng, Jenny Jie, 17***
Interaction of Integrin and Insulin Actions in the Insulin Resistant Liver

**Montgomery Bell Academy**
***Bowman, Adam Joseph, 17, Brentwood***
Apparatus and Analysis Techniques for Portable, Low-Voltage Pulsed Plasma Sources

## TEXAS

**Addison**

**Greenhill School**
***Cai, Jieyi, 17, Dallas***
Detection of Lysyl Oxidase-Like 2 for a Breast Cancer Diagnosis Method with Mini-Biosensors

**College Station**

**A&M Consolidated High School**
***Shi, Kensen, 17***
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**Denton**

**Texas Academy of Mathematics and Science**
***He, Jianing Jenny, 18, Plano***
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***Hong, Alex, 17, Allen***
Synthesis of Acrylonitrile-Based NONOate Bandages for Enhancement of Wound Healing

***Xiao, Larry, 17, Plano***
TEOS-MEK Modification of Natural Fibers in Polymer-Based Composites

**Houston**

**Michael E. DeBakey High School for Health Professions**
***Tran, Andy, 17***
Engineering Multiplexed Microfluidic Immunosensors for Point-of-care Acute Myocardial Infarction Diagnosis

**Pearland**

**Dawson High School**
***Wang, Haiyin Hein, 17***
Synthesis of Novel Mononuclear Coinage Metal Complexes and Their Photoluminescence Properties

**Plano**

**Plano Senior High School**
***Xu, Ray, 17***
Design of a Lock-in Amplifier for Terahertz Detector and Imager Arrays on Monolithic CMOS

**Plano West Senior High School**
***Yu, Kimberley, 17***
Genetic Modulation of Habenula Volume by Quantitative Trait Loci in BXD Recombinant Inbred Mice

**Port Lavaca**

**Calhoun High School**
***Gee, John, 16***
Developing an Automated Event Detection Algorithm for HIV-1 Protease's Flap Backbone Dihedral Change

**San Antonio**

**Northside Health Careers High School**
***Godfrey, Elizabeth Louise, 18, Helotes***
Preventing Foreign Object Damage of Jet Engines with a New Engine Intake

**Sugar Land**

**William P. Clements High School**
***Shen, Lilly, 18***
On the Column Extremal Functions of Forbidden 0-1 Matrices

## VIRGINIA

**Alexandria**

**Thomas Jefferson High School for Science and Technology**
***Brenner, Alec, 17, McLean***
Viscoelastic Modeling of Tidal Heating in Terrestrial Exoplanets

***Gondi, Suhas, 17, Centreville***
Investigating microRNA-Mediated Regulation of Class Specific Dendrite Morphogenesis

***Ho, Katherine, 17, McLean***
Real Time Apoptosis Imaging by an EB Conjugated Caspase 3 Activatable Probe

***Peng, Jennifer, 17, Oak Hill***
Investigating Rhodopsin Organization in Native and Model Membranes by Atomic Force Spectroscopy: A Computational Study on Its Feasibility

***Singh, Nalini, 17, Vienna***
Derivation of a Kirchhoff-Like Combination Law for the Quantum Capacitances of Molecules

***Wu, Katherine, 17, Vienna***
The Hydrolysis Engine Concept for Motor Proteins

**Arlington**

**Bishop O'Connell High School**
***Dantzler, Alexa Victoria, 17, Manassas***
Quantification of Perchloroethylene Residues in Dry Cleaned Fabrics

**Chantilly**

**Chantilly High School**
***Choudhary, Arrush, 17***
A Novel Method to Increase the Lipid Yield of *Chlorella vulgaris*: An Exploration of the Role of Cofactors on the Inhibition of Starch Synthase (E.C. 2.4.1.21)

**Richmond**

**Maggie L. Walker Governor's School**
***Bandyopadhyay, Saumil, 17, Glen Allen***
Universal Detection of Light and β-Radiation Enabled by Quantum-Mechanical Wavefunction Engineering, Photomodulated Electron Tunneling and Constricted Transport in Nanowires

## WASHINGTON

**Bellevue**

**Interlake High School**
***Zhou, Kat, 17, Kirkland***
On the Successive Quotients of Lower Central Series Ideals of Finitely Generated Associative Algebras

**Kennewick**

**Kamiakin High School**
***Thevuthasan, Sangeetha, 18***
Nanocrystalline Cellulose: An Emerging Excipient for Drug Delivery

## WEST VIRGINIA

**Wheeling**

**Wheeling Central Catholic High School**
***O'Leary, Vincent Jacob, 17***
A Multi-Year Analysis of Orconectid Crayfish Invasion Dynamics in West Virginia Utilizing Laboratory and Field Methodologies

## WISCONSIN

**Madison**

**James Madison Memorial High School**
***Shah, Sohil, 17***
Chemically Assembled Metal Oxide Heterojunctions

**Middleton**

**Middleton High School**
***Eom, Christopher, 18, Madison***
Paper-based Microfluidic Gradient Generator for Assaying Microglia Chemotaxis

**Milwaukee**

**University School of Milwaukee**
***Khanna, Kern, 17, Mequon***
Increasing the Efficiency of Petrophilic Microbes

## SOUTH KOREA

**Gyeonggi-do**

**Korea International School**
***Park, Peter Seho, 17***
Applications of Covering Systems to Pairwise Intersections of the Fibonacci, Riesel and Sierpiński Sequences

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