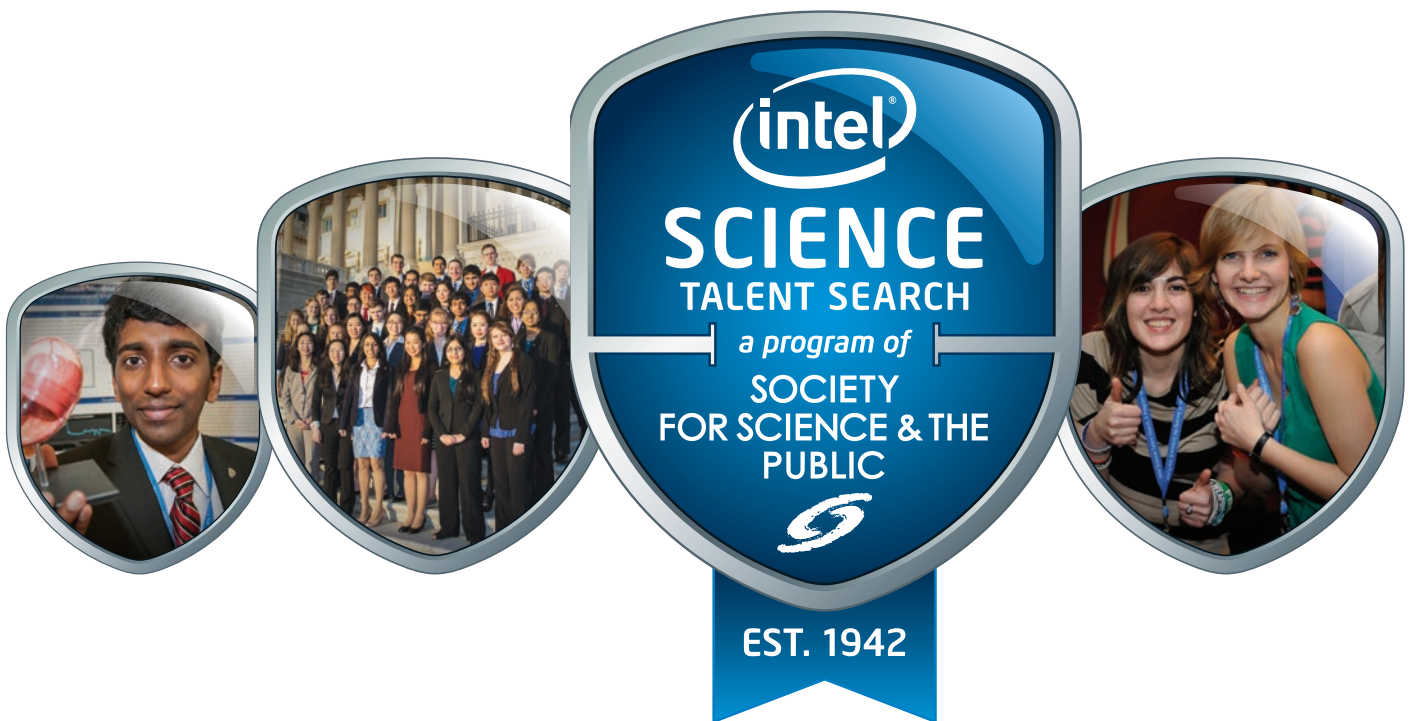


IT'S MIND ON  
MATTER



# INTEL STS 2014 Semifinalists





# 2014 Semifinalists

The Intel Science Talent Search (Intel STS), a program of Society for Science & the Public, 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 distinguished science and math honors, including the Nobel Prize and the National Medal of Science. Each year, 300 Intel STS semifinalists and their schools are recognized. From that select pool of semifinalists, 40 student finalists are 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) 2014 were selected from among 1,794 entrants representing 489 high schools in 45 states, the District of Columbia, and seven overseas schools.

Each of the 300 students named a semifinalist in the Intel STS 2014 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 2014. 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 [student.societyforscience.org/intel-sts](http://student.societyforscience.org/intel-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 2014 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 2014 semifinalists, 40 finalists will be chosen to attend the Intel Science Talent Institute in Washington, DC from March 6–12, 2014. During their trip to Washington, these finalists will undergo further judging and share \$630,000 in awards.

## ARIZONA

Phoenix

Brakensiek Home School

**Brakensiek, Joshua, 17**

Bounds on the Size of Sound Monotone Switching Networks Accepting Permutation Sets of Directed Trees

Tempe

Corona Del Sol High School

**Cao, Patric Thanh, 17**

A Novel Synthesis and Chemotherapeutic Study on a PEGylated Gold Nanorod Lytic Peptide and Its Effects on Prostate and Bladder Cancer Cells

## ARKANSAS

Little Rock

Little Rock Central High School

**Ji, Nathanael Yongxiang, 17**

Engineered Cell-cell Communication Utilizing Exosomes with miRNA and Protein

## CALIFORNIA

Cupertino

Cupertino High School

**Balakrishna, Ashwin, 17**

Optimal Control Strategies for Trajectory Optimization with Applications to Continuous Solar Flight

**Lee, Tanya, 17**

Emoticon Impact on Sentiment Analysis Precision

Monta Vista High School

**Jain, Nishant, 17**

Augmented Reality on Mobile Devices: Advancing Globally Accessible Anatomical Education

**Narkhede, Pradnya Nitin, 17**

Correction of the Delta-F508 Mutation in the CFTR Gene with the Use of Airway Epithelium-Delivered Zinc Finger Nucleases for Homology-Directed Genomic Editing

**Ng, Natalie, 17**

Advancing Precision Medicine: MicroRNA Prognostic Signatures and Prediction Models for Distant Metastasis Free Survival in Breast Cancer

**Shankar, Vishnu, 17**

The 3D Structure of Human DP Prostaglandin G-protein Coupled Receptor Bound to Selective Antagonists from GEnSeMBLE Predictions

Folsom

Folsom High School

**Zhou, Allan, 17**

The Role of Tyrosine Sulfation in Integrin Ligand Binding

Fremont

Mission San Jose High School

**Lu, Jonathan, 17**

Improved Peak Detection and Deconvolution of Native Protein Complex Electrospray Mass Spectra

Irvine

University High School

**Lee, Kevin, 17**

Strongly Coupled Electromechanical Modeling of the Heart in Moving Domains Using the Phase-Field Method

**Park, Jiho, 17**

Molecular Dynamics Simulations of Aromatase: Implications for Novel Drug Design

Los Angeles	<p><b><u>Marlborough School</u></b>  <b><i>Collier, Clara, 17</i></b>            Geometric Phases Revealed via Thermo-geometric Effects of Elastomers</p> <p><b><u>Milken Community High School</u></b>  <b><i>Bochkur Dratver, Milana Aerial, 17</i></b>            Radiation-Induced Reprogramming of Glioma Cells into Glioma Stem Cells</p> <p><b><u>Yeshiva University High School of Los Angeles</u></b>  <b><i>Willner, Moshe Joseph, 17</i></b>            Reconfigurable Orbital-Angular-Momentum and Polarization Manipulation of 100-Gbit/s QPSK Data Channels</p>
Morgan Hill	<p><b><u>Oakwood School</u></b>  <b><i>Gopisetty, Divya, 18</i></b>            Novel Treatment of Diabetic Neuropathy Through Interruption of Stress-Activated Pathway in <i>Caenorhabditis elegans</i></p>
North Hollywood	<p><b><u>Harvard-Westlake School</u></b>  <b><i>Siddarth, Divya, 17</i></b>            Generation of a Dipeptide Conformational Library and Determination of Protein-Protein Binding Sites for Drug Design</p> <p><b><i>Srivastava, Megha, 17</i></b>            Building an Optical pH Sensor for PET Probes Using Machine Learning Models</p>
Oak Park	<p><b><u>Oak Park High School</u></b>  <b><i>Sun, Cathy, 17</i></b>            Uncovering Complex Feedback Mechanisms in Feather Development</p>
Orinda	<p><b><u>Miramonte High School</u></b>  <b><i>Li, Jennifer, 17</i></b>            Engineering Novel Biochips for the Rapid and Sensitive Detection of Biomarkers</p>
Palo Alto	<p><b><u>Henry M. Gunn High School</u></b>  <b><i>Goronzy, Isabel Nadine, 17</i></b>            The Key to Pluripotency: Molecular Engineering of the PSpC1 Gene to Optimize Reprogramming Efficiency of Pluripotent Stem Cells</p> <p><b><i>Liu, Charles Xin, 17</i></b>            Integrated Meta-analysis of 64 Diseases Identifies Novel Relationship Between Systemic Sclerosis and Systemic Lupus Erythematosus</p> <p><b><i>Wang, Emily S., 17</i></b>            A New Light in Biosensing: Engineering Bright and Photostable Green Fluorescent Protein Mutants for Fluorescence Resonance Energy Transfer (FRET)</p> <p><b><u>Palo Alto High School</u></b>  <b><i>Venkatasubramaniam, Sidhanth Grover, 17</i></b>            A Novel Framework for Computer-Aided Detection of Breast Masses in Mammograms Using Unsupervised Feature Learning with Deep Networks</p>
Riverside	<p><b><u>La Sierra High School</u></b>  <b><i>Newton, Loren, 16</i></b>            A Novel Approach to Capture Wingtip Vortices</p>

**San Diego**

**Canyon Crest Academy**

***Chen, Eric S., 17***

Computer-aided Discovery of Novel Influenza Endonuclease Inhibitors to Combat Flu Pandemic

**Patrick Henry High School**

***Simpson, Sara Kornfeld, 17***

Neuronal Nonlinear Dynamics: From an Optical Illusion to Parkinson's Disease

**San Jose**

**Archbishop Mitty High School**

***Balasingam, Arjun, 17***

Energy-Delay Optimization of Variability-Prone Carbon Nanotube VLSI Circuits

**Leland High School**

***Wong, Courtney, 17***

Scattered Light from Quasars: Connecting Observations with Computer Simulations

**Lynbrook High School**

***Kong, Angela Xiangyue, 17***

The Transcription Factor Bcl11b Regulates Mammary Stem Cell Self-Renewal and Quiescence Partially Through Cell Cycle Progression Inhibitor CDKN1a/p21

***Wei, Jane, 17***

Oxidative Stress in Three Species of Anemone: the Estuarine Anemone *Nematostella vectensis*, and Marine Anemones *Edwardsiella lineata* and *Aiptasia pallida*

**Presentation High School**

***Thomas, Anna Teresa, 17***

Identification of TNFR1 as a Novel Preventative Target Against Maternal Infection Induced Interneuron Loss in Neuropsychiatric Disorders

**The Harker School**

***Bhetanabhotla, Vikas Chandra, 17***

Identification of Satellite Galaxies around Milky Way Galactic Analogs Using Machine Learning Algorithms

***Chen, Stephanie, 16***

Globular Clusters as Tracers of Dark Matter in Virgo Cluster Dwarf Elliptical Galaxies

***Fu, Christopher, 17***

Molecular Characterization and Rapid Generation of Human Rotavirus VP6-Specific Monoclonal Antibodies

***Gupta, Anika, 17***

Novel Drug Delivery Systems Targeting Cancer Stem Cells for Next-Generation Chemotherapy

***Jain, Saachi, 17***

MicroRNA-223 Promotes Macrophage Differentiation

***Misra, Sreyas, 17***

Design and Characterization of a Novel Single-headed and Hand-held PET Camera Using 511 keV Photon Collimation via Compton Scatter

***Periyakoil, Preethi, 17***

A Video-assisted, Time-lapse Analysis of the Effects of the ELF5 Transcription Factor on the Morphology and Proliferation Kinetics of Breast Cancer Cells

***Sridhar, Rahul, 17***

Understanding the Effect of Hinge Mutations on Domain-swapping in Antiviral Lectin Cyanovirin-N

***Sundar, Vikram, 17***

Computational Analysis of Novel Drug Opportunities Using Protein-Protein Docking

***Zhao, Albert, 17***

Oxygen Reduction Activity of Dodecyne-functionalized AuPd Nanoparticles

**San Ramon**

**California High School**

***Camenzind, Kathy, 17***

Quantifying Trapping Forces in a Simplified Optical Tweezers Setup

***Li, Charles, 17***

Solving the Mysteries of Reversible Messenger RNA Epigenetics

***Maiti, Esha, 17***

Stochastic Monte Carlo Simulations to Determine Breast Cancer Metastasis Rates and Tumor Distribution from Patient Survival Data

**Dougherty Valley High School**

***Chakicherla, Naveen, 18***

Structural Classification of Allergen IgE Epitopes by Hierarchical Clustering

***Pang, Emily, 17***

The Opposing Roles of Tumor Suppressive cC1qR and Oncoprotein gC1qR as Mechanisms for Inhibiting Cancer Pathogenesis

**Santa Cruz**

**Pacific Collegiate School**

***Chopra, Sahil, 17***

Identification of Genomic, Transcriptomic, Proteomic and Epigenomic Cancer Associations for Discovery of Novel Treatment Targets via Computational Modeling and Dynamic Visual Analysis

**South Pasadena**

**South Pasadena High School**

***Wang, Jason Ku, 17***

Identifying Biomarkers that Predict the Presence or Absence of Cancer in Men with Negative Prostate Biopsies

**Westlake Village**

**Westlake High School**

***Yin, Cynthia Lucinda, 17***

Self-Organization of Complex Spatiotemporal Structures with a Nanoscale Catalyst in the Belousov-Zhabotinsky Reaction

**COLORADO**

**Boulder**

**Fairview High School**

***Zhang, Lawrence, 17***

Suppression of Malonyl-CoA:ACP Transacylase as a Treatment for Squamous Cell Carcinomas

**Durango**

**Durango High School**

***Rossi, Rachel Louise, 18***

Endocrine Disruptor Remediation in Water: Exploration of Mycoremediation Capabilities of Fungi

**Monte Vista**

**Monte Vista High School**

***Rocha, Tayler Ann, 17***

A Novel Approach to Wetland Management in Arid Regions: Harnessing the Power of the Playa

**CONNECTICUT**

**Greens Farms**

**Greens Farms Academy**

***Garfalo, Frankie, 18***

Chemosensitization of High-grade Serous Ovarian Carcinoma via Calcium Signaling

**Greenwich**

**Greenwich High School**

***Anderson, Travis, 18***

Intrinsic Laptop Energy Capture via Keyboard Piezoelectric Conversion

***Buck, Friederike, 17***

Soluble Adenylyl Cyclase and the Intracellular Messenger Cyclic Adenosine Monophosphate (cAMP) Suppress Cancer Development by Enforcing Contact Inhibition

***Gusho, Zheni, 17***

Sustainable Enhancement of Plant Growth and Disease Reduction Using Biochar Soil Additives

***Merrill, Anne, 17***

Comparative Suppression of Soil-Borne Pathogens via Earthworm Bioturbation of Natural and Man-Made Biochars

**New Canaan**

**New Canaan High School**

***Abhiraman, Gita, 17***

Plant-like Transcription Factors in *Toxoplasma gondii*

**Ridgefield**

**Ridgefield High School**

***Armbrust, Natasha Kristin, 17***

Regulation and Browning Capabilities of FNDC4 *In Vivo*

**Wallingford**

**Choate Rosemary Hall**

***Hong, Lawrence, 18***

On the Single Facility Location Problem

**Windsor**

**The Loomis-Chaffee School**

***Jung, Soo Yeon, 18***

Spent Tealeaves as an Alternative for the Removal of Artificial Dye from Solutions

**FLORIDA**

**Fort Lauderdale**

**Pine Crest School**

***Bhagchandani, Preksha, 17***

Elucidating the Molecular Mechanisms Resulting from Acute Lead Exposure in *Saccharomyces cerevisiae*

***Herman, Laura Mariah, 17***

Frequency-Based Synesthetic Associations Between Letters and Colors

**Fort Pierce**

**Lincoln Park Academy**

***Bacchus, Robert Mohamed, 17***

Targeting "CancAARS": A Novel Therapeutic Target for Melanoma Tumorigenesis

**Melbourne**

**Viera High School**

***Loeb, Zachary, 17***

Preventing the Reproductive Failure of Aquatic Life from the Global Threat of Endocrine Disrupting Compounds Through Catalytic Waste Water Treatment (Year 4)

**Miami**

**Dr. Michael M. Krop High School**

***Odzer, Jamie, 17***

Impact of Predator Distribution and Productivity Levels on Abundance and Feeding Patterns of *Callinectes sapidus*: What Does Blue Crab Behavior Tell Us About Wetlands Restoration?

**Palm Harbor**

**Palm Harbor University High School**

***Moorthy, Aadith, 17***

A Novel Approach for the Encapsulation of Phase Change Materials for High Temperature Thermal Energy Storage Systems



**GEORGIA**

Evans Lakeside High School  
**Meixiong, Gerry, 17**  
 Cell-Cycle Regulated Membrane Association of NuMA: A Novel Pathway for Efficient Chromosome Segregation

**She, Edward, 17**  
 Discovery and Molecular Investigation of a Novel and Potent Drug Candidate Against Cancer Drug Resistance

Lawrenceville Gwinnett School of Mathematics, Science, and Technology  
**Jin, Willie, 18**  
 Developing Novel Protein Targets for *Bordetella pertussis* Antibiotics: Understanding Protein Interfaces and Domain-Domain Interactions

Macon Howard High School  
**Ilan, Teva, 18**  
 Response of Soil Invertebrates to Electromagnetic Stimuli

Roswell Roswell High School  
**Srinivasan, Anand, 17**  
 RNNScan: Eukaryotic Gene Prediction via Recurrent Neural Networks Utilizing Local-Feature Extraction

**HAWAII**

Mililani Mililani High School  
**Mocz, Viola, 17**  
 The Mass Ratio of Elementary Particles from Helicitoroidal Topology

**ILLINOIS**

Chicago The University of Chicago Laboratory High School  
**Mehta, Rahul Siddharth, 18**  
 A New Max-Flow Algorithm for Sparse Networks

**Munim, Mohammed, 17**  
 Directed Synthesis of Gold Nanostructures for Bioelectronic Applications

Hinsdale Hinsdale Central High School  
**Kanangat, Smriti, 17**  
 Detection of Soluble Human Histocompatibility Antigens (HLA) in Circulation-Potential Biomarkers for Early Detection of Non-Small Cell Lung Carcinoma (NSCLC)

Naperville Naperville North High School  
**Liu, Claire, 18**  
 The Effect of Electron Correlation on Excitonic Energy Transfer in a Synthetic Chromophore System

Normal University High School  
**Su, Alexander Charles, 17**  
 Probing the Quantum Vacuum with Electromagnetic Fields

**INDIANA**

Carmel Carmel High School  
**Homma, Yushi, 18**  
 Asymptotics of Two-Point Correlation Functions for the Zeros of Random Polynomials

***Liang, Charles, 17***  
*PT*-Symmetry Breaking in Periodic Potentials

Indianapolis **Park-Tudor School**  
***Cohn, Amy Jessica, 17***  
Detecting Reddening by Dust for Star Clusters in the Andromeda Galaxy

South Bend **John Adams High School**  
***Han, Raymond, 17***  
The Application of Hydrophobic Microporous Layers with Graphene-based Substrate in a Portable High Power Density Direct-Methanol Fuel Cell (DMFC)

**KENTUCKY**  
Lexington **Paul Laurence Dunbar High School**  
***Sarge, Valerie Youngmi, 16***  
Synthesis of Benzodifuran Derivatives for Solar Cells

**LOUISIANA**  
New Orleans **Benjamin Franklin High School**  
***Tang, Luke, 17***  
Finite Range Couplings in a Tensor Renormalization Group Approach to 2D Classical Lattice Models

Shreveport **Caddo Parish Magnet High School**  
***Leskova, Anna Igorevna, 17***  
Cellular Thiosulfate Metabolism and Proliferation Response in Regards to Angiogenesis Regulation in Ischemic Responses

**MARYLAND**  
Baltimore **Baltimore Polytechnic Institute**  
***Khare, Kelly, 17***  
The Effect of Drainage Channels on the Peeling of a Surface Submerged in Fluid  
  
***Winch, Lucas, 17***  
Origins of Large Igneous Provinces (LIPs)

Bethesda **Walt Whitman High School**  
***Deng, Lisa, 17***  
Transcriptome Analysis of Inhibitor of DNA Binding 3-Deficient Naïve CD4<sup>+</sup> T Cells When Differentiated to Regulatory T Cells or Th9 Phenotypes

Ellicott City **Centennial High School**  
***Nathan, Anusha, 17***  
How Completely Did Darwin Paint His Picture? A Study of Phenotypic Plasticity as It Relates to Reproduction in *Drosophila melanogaster*

Frederick **Governor Thomas Johnson High School**  
***Freed, Benjamin, 17***  
Identification of Novel Regulatory Mechanisms of the K-Ras Oncoprotein

Ijamsville **Urbana High School**  
***Xiao, Madelyne, 17***  
Deep Sequencing and Circos Analyses of Antibody Libraries Reveal Antigen-Driven Selection of Ig V<sub>H</sub> Genes During HIV-1 Infection

Owings Mills **Garrison Forest School**  
***Paseman, Katherine, 17***  
c # 35H: A New Model Relating Hemoglobin, Hematocrit, and Optical Density

Poolesville	<p><b><u>Poolesville High School</u></b>  <b><i>Sriram, Vinay, 17</i></b>  Quantitative Modeling of Processing Cost and Energy Consumption for Optimization Algorithms in Cryptographically Enhanced Secure Internet Routing Protocol</p>
Potomac	<p><b><u>Winston Churchill High School</u></b>  <b><i>Liu, Daniel, 17</i></b>  PEGylation of Tau-Specific Radioligands Improves PET Imaging Diagnosis for Alzheimer's Disease</p> <p><b><i>Yau, Jessica, 17</i></b>  Alternative Pathway of Mitophagy Activation in the Absence of Parkin</p>
Rockville	<p><b><u>Richard Montgomery High School</u></b>  <b><i>Ma, Emily Z., 17</i></b>  Investigating the Formation of Adult Intestinal Stem Cells During Vertebrate Development</p> <p><b><i>Xu, Suzanne, 17</i></b>  Inhibition of Polyamine Synthesis Impairs Axonal Mitochondrial Mobility: A Possible Role of Decrease in Polyamine Levels in Neurological Disorders and Cognitive Decline</p>
Silver Spring	<p><b><u>Montgomery Blair High School</u></b>  <b><i>Bourzutschky, Alexander N., 17</i></b>  New Analytical Solutions to the Time-Dependent Schrödinger Equation for the Quantum Two-Level System</p> <p><b><i>Datta, Shaun, 17</i></b>  Saturated Nuclear Matter in the Large <math>N_c</math> and Heavy Quark Limits of Quantum Chromodynamics</p> <p><b><i>Davey, Neil, 17</i></b>  Drop-based Microfluidics</p> <p><b><i>Ganelin, Daniela, 17</i></b>  Differences in Word Usage Patterns Between "Well-Recovered" Aphasic Patients and Control Subjects on a Picture Description Task</p> <p><b><i>He, Yi-Zhi, 17</i></b>  A Software Tool to Assist Genomic N-Glycosite Prediction in Cancer Cells</p> <p><b><i>Johri, Aanchal, 17</i></b>  Elasticity of Q<math>\beta</math> Virus Capsids as Malaria Vaccine Carriers Validated via Peak-Force Atomic Force Microscopy</p> <p><b><i>Shi, Jessica, 17</i></b>  The Speeds of Families of Intersection Graphs</p> <p><b><i>Shih, Hueyjong, 17</i></b>  The Effects of Oncogenic KRAS and c-Myc on the Transcriptomic Output of the Cell: A Novel Role for a Master Oncogene</p> <p><b><i>Studt, Gabriella, 17</i></b>  Construction of the Higher Bruhat Orders on the Weyl Group of Type B</p>
<b>MASSACHUSETTS</b>	
Acton	<p><b><u>Acton-Boxborough Regional High School</u></b>  <b><i>Gowravaram, Nihal Reddy, 18</i></b>  Enumeration of Subclasses of <math>(\mathbb{Z}+\mathbb{Z})</math>-free Partially Ordered Sets</p> <p><b><i>Saini, Ajay, 17</i></b></p>

Predictive Modeling of Opinion and Connectivity Dynamics in Social Networks

Andover

Phillips Academy  
*Chen, Rosalyn, 17*

Injury-induced Proliferation and Differentiation of Epicardial Derived Cells

Belmont

Belmont Hill School  
*Haigh, Alex, 17*

Investigating the Role of Chromatin in Regulating V(D)J Recombination: Designing a Model to Study the RAG Proteins' Preference for Nucleosome Position and Histone Modification

Boston

The Winsor School  
*Yamada, Jessica Massako, 18*

For Want of an Arginine, the Termination Was Lost: Characterizing the Structure and Function of the R169Q MTERF1 Variant

Concord

Concord Academy  
*Won, Junho, 18*

Lower Bounds for the Crossing Number of the Cartesian Product of a Vertex-transitive Graph with a Cycle

Concord-Carlisle Regional High School  
*Xia, Isaac, 18*

Lower Central Series Ideal Quotients over  $\mathbb{Z}$  and  $\mathbb{F}_p$

Falmouth

Falmouth Academy  
*Bocconcelli, Carlo, 17*

In Search of Genomic Dark Matter: A Novel Method for the Global Identification of Active Regulatory Elements

Lexington

Lexington High School  
*Kuszmaul, William Henry, 17*

A New Approach to Enumerating Statistics Modulo  $n$

*Seong, David, 18*

Novel Use of Mutant Huntingtin Haplotype 3'UTR Sequence to Discover miRNAs Targeting Mutant Huntingtin Gene Causing Huntington's Disease

Sheffield

Berkshire School  
*Chung, Hyun Suk, 18*

CryoEM Structure of MacK, a Novel Mycophage Isolated at Berkshire School

Westborough

Westborough High School  
*Homberg, Steven Alexander, 17*

Finding Enrichments of Functional Annotations for Disease-Associated Single-Nucleotide Polymorphisms

## MICHIGAN

Bloomfield Hills

International Academy  
*An, Guangning Phillip, 17*

Sildenafil Promotes Axonal Outgrowth in the Chondroitin Sulphate Proteoglycan Inhibitory Environment

Grand Rapids

Forest Hills Central High School  
*Damato, Emily Catherine, 17*

The Development of Phosphodiesterase 4D Inhibitors with 3D Printing and Molecular Visualization Software for the Treatment of Acrodysostosis

Novi

Novi High School

***Raina, Raj, 17***

Minimum Degrees of Minimal Ramsey Graphs

Port Huron

**Port Huron Northern High School**

***Mehta, Jay Harshad, 17***

A Novel In-Clinic Patient- and Cancer-Tailored Targeted Drug Delivery System

Portage

**Portage Central High School**

***Sertic, Genevieve, 17***

Mathematical Modeling of the Benefits and Drawbacks of Rooftop Agriculture

## MINNESOTA

Edina

**Edina High School**

***Lu, Kevin Zifeng, 17***

Charge Carrier Modulation by the Field Effect in Ultrathin Bismuth Thin Films

Minneapolis

**Breck School**

***Simpson, Claire Melinda, 18***

Writing and Applying a Monte Carlo Simulation Code to Examine Aerosol Vapor Pressure—  
An Important Factor in Climate Modeling

***Villafana, Elisa Beverly, 17***

Effects of the Pesticide Thiamethoxam on Vigor, Growth and Development of Soybean  
(*Glycine Max*) Crops

Plymouth

**Wayzata High School**

***Chen, Emily, 17***

FANCD2 Induced DNA Repair in Hereditary Fanconi Anemia: Unraveling the Mystery Behind a  
Cancer-Causing Blood Disease

***Narayan, Priyanka Rajasree, 18***

Improving the Oral Absorption of Chemotherapeutic Drugs Through the Use of  
Novel Nanoparticles

***Zhang, Sophia Lin, 18***

Effective Endothelial Cell Differentiation of Human Induced Pluripotent Stem Cells Using a  
Three-Dimensional Fibrin Scaffold

St. Paul

**St. Paul Academy and Summit School**

***Li, Lucy, 18***

Pretreatment of Switchgrass with White Rot Fungi in Context of Biofuel Production

## MISSOURI

Columbia

**David H. Hickman High School**

***Kumar, Ashwath, 18***

Effect of Bacterial Quorum Sensing Molecule N-3-oxo-Dodecanoyl-L-Homoserine Lactone on  
Human Pancreatic Carcinoma Cells

St. Louis

**Lindbergh High School**

***Hufker, Katherine Emily, 17***

Sibs of the Spectrum: Evaluating Support Groups for Those Who Have a Sibling with Autism

## NEW HAMPSHIRE

**Exeter**

**Phillips Exeter Academy**

***Fazel-Rezai, Vahid, 17***

Equivalence Classes of Permutations Modulo Three-Letter Length-Changing Pattern Replacements

**NEW JERSEY**

**Absecon**

**Holy Spirit High School**

***Moffa, Michelle Anne, 18***

A Point-of-Use Water Filter for Developing Countries - Year III: Improving Effectiveness, Practicality, and Sustainability of Arsenic-Removing Biosand Filters

**Basking Ridge**

**Ridge High School**

***Cai, Jeffrey, 17***

Orbits of a Fixed-Point Subgroup of the Symplectic Group on Partial Flag Varieties of Type A

**Chatham**

**Chatham High School**

***Shah, Parth, 17***

Underrepresentation of Cytidine Deaminase Hotspots Reveals Key Genes and Tropism for Herpesviruses

**Egg Harbor Township**

**Egg Harbor Township High School**

***Fulton, Laura Beth, 18***

Development of a Novel, Safe Method for *In Vitro* Re-Creation of the Tooth Enamel Layer

**Englishtown**

**Manalapan High School**

***Xu, Steven, 17***

The Optimal Atmospheric CO<sub>2</sub> Concentration for the Growth of Winter Wheat (*Triticum Aestivum*)

**Freehold**

**Freehold High School**

***Puzon, Liezl, 17***

A Kinect-Based, Low-Collision Obstacle Navigation Device for the Blind

**Hackensack**

**Academy for Medical Science Technology**

***Batarseh, Daniella, 18***

A Novel Method to Manipulate the Osteoblast Differentiation Process

***Heller, David, 17***

Photosynthetic Algae/Insulinoma Cell Fusion Creating Self-Sustaining Insulin Producer

***Pereira, Brianna, 17***

CXCR4/SDF-1 $\alpha$  Signaling as a Target of Microenvironmental Regulation of Metastasis in NSCLC

***Radakrishnan, Ankitha, 17***

Changing Cellular Identity: Direct Cell Reprogramming Using Chromatin Remodeling Complexes

***Song, Hee Jae, 18***

A Novel Approach to Traumatic Brain Injury: Antidepressant Induced Neuroprotection

**Academy for the Advancement of Science and Technology**

***Meier, Joshua Abraham, 18***

Control of Induced Pluripotent Stem Cell Aging by Modulation of Mitochondrial DNA Deletions

**Academy for Visual and Performing Arts**

***Gibli, Joseph, 17***

COX-2 Inhibition in Non-Small Cell Lung Carcinoma

Hightstown	<u>Peddie School</u> <b>Wang, Mien, 18</b> From a Geometric Angle: Minimum Triangulation in High Dimension
Kinnelon	<u>Kinnelon High School</u> <b>Vosatka, Karl, 18</b> The Role of NMDA, IP3 and Ryanodine Calcium Receptors in HIV-1 Tat-induced Neuronal Apoptosis
Martinsville	<u>The Pingry School</u> <b>Kapoor, Amol Jay, 17</b> The MicroRNA 310/13 Cluster Regulates Cellular Adhesion, Proliferation, and Differentiation in <i>Drosophila melanogaster</i>
Monmouth Junction	<u>South Brunswick High School</u> <b>Ragavender, Ritesh Narayan, 17</b> Odd Dunkl Operators and $q$ -nilHecke Algebras
<b>NEW YORK</b>	
Armonk	<u>Byram Hills High School</u> <b>Cawkwell, Samuel, 18</b> Hypoxia Alters Exosome Release in Lung Cancer Cells
	<b>Giardina, Jonathan, 18</b> Necroptosis: A Novel Mechanism of Cytotoxicity by Bacterial Toxins
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