

80<sup>TH</sup> ANNIVERSARY

***REGENERON***

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**REGENERON SCIENCE  
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2021 SCHOLARS**

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## 2021 SCHOLARS

The Regeneron Science Talent Search (Regeneron STS), a program of Society for Science, is the nation's most prestigious science and math competition for high school seniors. 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 Regeneron STS scholars and their schools are recognized. From that select pool of scholars, 40 student finalists are invited to participate in final judging, display their work to the public, meet with notable scientists and compete for awards, including the top award of \$250,000.

## ARIZONA

## Scottsdale

**BASIS Scottsdale*****Mehta, Viraj, 18***

GLIA-Deep: Glioblastoma Image Analysis Using Deep Learning Convolutional Neural Networks to Accurately Classify Gene Methylation and Predict Drug Effectiveness

## CALIFORNIA

## Arcadia

**Arcadia High School*****Liu, Stanley Cheung, 17***

A Microfluidic Device for Blood Plasma Separation and Fluorescence Detection of Biomarkers Using Acoustic Microstreaming

## Atherton

**Menlo School*****Tung, Katherine, 17***

The Sperner Property for 132-Avoiding Intervals in the Weak Order

## Cupertino

**Cupertino High School*****Agrawal, Vardhan, 18***

BP-Lytic: A Novel Apparatus to Continuously, Cufflessly, and Affordably Monitor Blood Pressure Trends

**Homestead High School*****Sanyal, Anushka, 17***

Intronic RNA Lariats Protect Against Neurodegenerative Disease Related Protein Aggregation

**Monta Vista High School*****Asawa, Parth, 17***

Mapping US Solar Insolation and Analyzing Cloud Predictability with a Novel Method Using NASA's DSCOVR &amp; SORCE Satellites

## Danville

**Monte Vista High School*****Li, Sean Jinxiang, 17***

On Group-Theoretic Extensions of Penney's Game

**San Ramon Valley High School*****Vinaithirthan, Bala Meyyappan, 18***

Prediction of Phenotypic Cancer Drug Response with an Image-Based Dual Convolutional Neural Network

## Fremont

**American High School*****Ramachandran, Shreya, 17***Water Recycling: The Effect of Soap Nut Grey Water on Soil and Plant Health, *E. coli* and Fecal Coliform Contamination, and the Soil Microbiome**Mission San Jose High School*****Narayanan, Charit Samyak, 17***

A Novel Cohort Analysis Approach to Determining the Case Fatality Rate of COVID-19 and Other Infectious Diseases

## Fullerton

**Troy High School*****Sreekumar, Nitin U., 18***

Variation in Gene Expression Reveals Genes Predictive of Overall Survival in the Triple-Negative Breast Cancer Subtype

Irvine	<b><u>University High School</u></b> <b><i>Feng, Daniel, 17</i></b> Discovering Antibiotic Molecules in <i>Ceanothus leucodermis</i> and Enhancing and Quantifying Their Efficacy with a Novel Simulation-Aided Method
	<b><u>University High School</u></b> <b><i>Mandelstam, Andrei, 17</i></b> The Structure of the Positive Monoid of Integer-Valued Polynomials Evaluated at $\alpha \in \overline{\mathbb{Q}}$
Los Angeles	<b><u>Brentwood School</u></b> <b><i>Zhou, Alec, 18</i></b> An Eddy Current Sensor for Low-Cost Smart Water Meter for Real-Time Water Management
Los Gatos	<b><u>Los Gatos High School</u></b> <b><i>Mihalache, Beatrice, 17</i></b> The Effects of Polyethylene Microbeads and Polyester Microfibers on the Firmicutes and Proteobacteria Phyla in the Human Gut Microbiome
Newport Coast	<b><u>Sage Hill School</u></b> <b><i>Park, Jian, 18</i></b> DT-DBSCAN: Density Based Clustering of Planar Datasets in Linear Expected Time Through Delaunay Triangulation
Palo Alto	<b><u>Henry M. Gunn High School</u></b> <b><i>Lam, Navya L., 18</i></b> Harnessing CRISPRi and HiPSCs to Down Regulate SFPQ Gene Expression Results in Massive Cell Death; Immense Implications for Animal Tested Drugs
Palos Verdes Estates	<b><u>Palos Verdes High School</u></b> <b><i>Kim, Beom Joon, 18</i></b> Flexible, Water-Resistant, and Biocompatible Medifoam-and URGO-Based Resistive Random-Access Memory for Skin-Wearable Healthcare Devices
Pleasanton	<b><u>Amador Valley High School</u></b> <b><i>Sunkad, Nitya, 17</i></b> Effects of Spaceflight on Gene Expression Patterns in Dermal Tissue
Rancho Palos Verdes	<b><u>Joseph Lister High School for Biomedical Sciences and Technology</u></b> <b><i>Johnston, Elisha Daniel, 17</i></b> A Novel Mechanistic Hypothesis Elucidating the Role of a Medical Procedure in Managing a Root Cause of Osteoarthritis by Regenerating Cartilage
San Diego	<b><u>San Diego Jewish Academy</u></b> <b><i>Gan, Jessie Low, 17</i></b> Predicting Metastasis with a Novel Biophysical Cell-Adhesion Force Technique
	<b><u>The Bishop's School</u></b> <b><i>Wang, Jeffrey G., 17</i></b> A Systematic Method to Identify Significant Changes in 3D Genome Compartmentalization Across Multiple Cell Lines
	<b><u>The Cambridge School</u></b> <b><i>Tianshi, Emily Lindsay, 17</i></b> Biomimicking Torrey Pine Needles: Atmospheric Moisture Harvesting Through Alternating Hydrophilic and Hydrophobic Micro-Patterns

**Westview High School**

***Gurram, Sanjana, 17***

Optimization of Plant Cellulose to Create a Cost-Effective and Environmentally Benign Oil Spill Sorbent

**San Francisco**

**Proof School**

***Maloney, Michael J., 18***

Mask Mandates and COVID-19: The Efficacy of Face Mask Mandates in Increasing Mask Usage, While Decreasing the Spread of and Deaths from COVID-19 in the United States

**Proof School**

***Zhang, Jessica, 17***

Classification of Tight Contact Structures on a Solid Torus

**San Jose**

**Archbishop Mitty High School**

***Balasingam, Akhilesh Varadan, 17***

A Kinetic Monte Carlo Simulator for Multi-Terminal RRAM Devices with Applications to Brain-Inspired Computing

**Archbishop Mitty High School**

***Patwa, Aalok Nital, 18***

Analysis of the Tumor-Immune Microenvironment Reveals Predictors of Recurrence and Overall Survival in Triple-Negative Breast Cancer

**BASIS Independent Silicon Valley**

***Sharma, Siddharth, 18***

Nature's Learning Algorithm? Experiments and Analysis of the Hebbian-LMS Algorithm

**Lynbrook High School**

***Hu, David, 18***

Probabilistic Zero Forcing on Grid, Regular, and Hypercube Graphs

**Lynbrook High School**

***Jha, Eshani, 17***

Thiol Functionalized and Manganese Dioxide Doped Biochar for the Removal of Toxic Organic and Inorganic Contaminants from Water

**Lynbrook High School**

***Tang, Claire, 17***

Automated Diagnostic Imaging for COVID-19: from the Unknown Detection to Clinical Prediction

**The Harker School**

***Alag, Shray, 17***

Analysis of COVID-19 Clinical Trials: a Data-Driven, Ontology-based, Longitudinal, and Natural Language Processing Approach

**The Harker School**

***Shah, Saloni, 17***

Identifying Resilience Mutations in an Alzheimer's Disease Whole-Genome Sequencing Cohort

**The Harker School**

***Tadimeti, Aditya, 17***

Machine Learning and Wildfire Burned Area: Examining Computational Techniques to Predict Fire Size for Practical Insights

**The Harker School**

***Xu, Sidra Yang, 17***

Application of Gene Embedding for Improved Somatic Mutation-Based Primary Cancer Typing and Biomarker Discovery

**Studio City**

**Harvard-Westlake School**

***Zhao, Aaron, 18***

Comparative Evaluation of Metal Chelators for the Reduction of Redox-Active Metal Concentration

**Walnut**

**Walnut High School**

***Li, Sabrina, 17***

Effect of Baycrete Texture and Tidal Elevation on the Recruitment of *Ostrea lurida* and *Amphibalanus amphitrite* in San Diego Bay, CA

**Walnut Creek**

**Las Lomas High School**

***Quan, Melanie, 18***

Developing a Sustainable Cycle of Compostable and Water-Soluble Plastics by Repurposing Waste Products of Algal Biofuel Production

## COLORADO

**Boulder**

**Fairview High School**

***Bharthulwar, Sid, 17***

Reconstructing Thoracic Computed Tomography Volumes from Single-Plane and Dual-Plane Chest Radiographs Using Encoder-Decoder Neural Networks

**Fort Collins**

**Fossil Ridge High School**

***Jin, Kylan, 18***

A Novel Bioelectrochemical Tool for Real-Time *In Situ* Monitoring of Soil Microbial Activity

**Lafayette**

**Peak to Peak Charter School**

***Woen, Andrew Matthew, 18***

ReDetect: A Novel Way to Reduce Recycling Contamination by Telling Users if an Object is Recyclable Through Either the Portable Device or Mobile Application

## CONNECTICUT

**Greenwich**

**Greenwich High School**

***Goldenberg, Hannah, 17***

Linking Continued Exposure to E-Cigarette Vapor Constituents with Chronic Obstructive Pulmonary Disease

**Greenwich High School**

***Patti, Alexander Clement, 18***

Plant Growth Enhancement & Fungal Disease Suppression via Copper, Zinc, and Manganese Nanoparticle Foliar Sprays

**Greenwich High School**

***Pronina, Sofia, 18***

Carbon Nanotube Lab-on-Chip as a Rapid, Inexpensive, Lyme Disease Detection System

**Greenwich High School**

***Sosa, Edgar, 20***

Metal Oxide Nanoparticle Suppression of Coffee Rust Using an *Alternaria*, Stomata-Sporulating Model Fungus

<b>Redding</b>	<u><b>Joel Barlow High School</b></u> <b>Popescu, Alexandra Ioana, 18</b> Conserved Cellular Crosstalk to the Microvascular Niche Identified via Single-Cell Analysis of the Lung and Liver
<b>Ridgefield</b>	<u><b>Ridgefield High School</b></u> <b>Choi, Kenneth Kawa, 18</b> Constructing General Hamiltonian Ground States on a Quantum Computer Using the Projected Cooling Sensor Algorithm
<b>Simsbury</b>	<u><b>Westminster School</b></u> <b>Wu, Jiefei, 18</b> Biases in First and Second Moments of the Fourier Coefficients in One- and Two-Parameter Families of Elliptic Curves
<b>Stamford</b>	<u><b>King School</b></u> <b>Hillenmeyer, Sammy Boyce, 17</b> The Electrochemical Oxidation of Methane in a Fuel Cell Utilizing Carbon Sequestration  <u><b>King School</b></u> <b>Winterlich, Joseph, 17</b> Antimicrobial Peptides and Antibiotics Produce Bactericidal and Bacteriostatic Effects on Wild-Type <i>E. coli</i>
<b>DELAWARE</b>	
<b>Wilmington</b>	<u><b>Charter School of Wilmington</b></u> <b>Xu, Justin, 17</b> Novel Nanoscale Analysis of the Electronic Structure Basis of Strength and Toughness in Fluoropolymers
<b>FLORIDA</b>	
<b>Boca Raton</b>	<u><b>Florida Atlantic University High School</b></u> <b>Willis, Devin, 18</b> SlideMap: A Flexure Based Approach to Automating Digital Pathology Cancer Diagnosis
<b>Fort Lauderdale</b>	<u><b>Pine Crest School</b></u> <b>El-Sharif, Maya Wael, 17</b> Understanding the Regulation of Food Consumption in <i>Drosophila melanogaster</i>
<b>Miami</b>	<u><b>Dr. Michael M. Krop Senior High School</b></u> <b>Finger, Tali, 18</b> A Genomic-Based Investigation of Repetitive Behaviors Across Four Neurodevelopmental Disorders Using a Machine Learning Approach  <u><b>Dr. Michael M. Krop Senior High School</b></u> <b>Odzer, Michael Noah, 18</b> Identifying and Overcoming Environmental Factors Affecting the use of Unmanned Aerial Systems (UAS) in Wildlife Studies of <i>Chelonia mydas</i>
<b>Ocala</b>	<u><b>Vanguard High School</b></u> <b>Shar, Andy, 15</b> Novel Fabrication and Implementation of Copper and Silver Plasmonic Nanostructure-Coated Foil as a Spectrally Selective Absorber in Highly Efficient Solar Steam Generation Under One Sun Illumination

<b>Oviedo</b>	<b><u>Oviedo High School</u></b> <b><i>Santra, Laboni, 17</i></b> Optimized 3D-Printed Microneedle Devices for the Delivery of New Therapeutics to Citrus Phloem Tissue
<b>Plantation</b>	<b><u>American Heritage School</u></b> <b><i>Mishra, Roshni, 18</i></b> Expression of Anti-Neurodegeneration Genes in Mutant <i>Caenorhabditis elegans</i> Using CRISPR-Cas9 Improves Behavior Associated with Alzheimer's Disease

## GEORGIA

<b>Atlanta</b>	<b><u>The Westminster Schools</u></b> <b><i>Kadadi, Yash, 18</i></b> SWIFT: A Novel Machine-Learning Platform for Space Weather Forecasting from HMI Vector Magnetograms
<b>Johns Creek</b>	<b><u>Northview High School</u></b> <b><i>Shi, William, 17</i></b> Refinements of Product Formulas for Volumes of Flow Polytopes
<b>Milton</b>	<b><u>Milton High School</u></b> <b><i>Nori, Divya, 17</i></b> Hero: Automated Detection System for Prescription Stimulant Overdose via AI-Based Emotion Inference, Metabolite Detection, and Biometric Measurement
	<b><u>Milton High School</u></b> <b><i>Ram, Vishaal, 18</i></b> Applications of an Age-Structured SIR Model
	<b><u>Milton High School</u></b> <b><i>Soneji, Priya, 17</i></b> Autonomously Tracking Organisms in Three Axes at Microscopic Resolution

## HAWAII

<b>Honolulu</b>	<b><u>Kalani High School</u></b> <b><i>Lubecke, Lana Carmen, 17</i></b> Life ReADeR: Remote Airborne Detection of Respiration
	<b><u>Kamehameha Schools Kapālama</u></b> <b><i>Moniz, Taylor Moani Akemi, 18</i></b> Ivermectin Induces Apoptosis, Cell Cycle Arrest, and Senescence in C4-2 Prostate Cancer Cells
<b>Kailua Kona</b>	<b><u>Kealakehe High School</u></b> <b><i>Bell, Alexander Keona, 17</i></b> Optimization of a Venturi Flow Mechanism for Gas-Transfer Applications

## ILLINOIS

<b>Chicago</b>	<b><u>University of Chicago Laboratory High School</u></b> <b><i>Pietraszek, Nicholas Wayne, 18</i></b> Application of Machine Learning to Classify Unmarked Cancer Cells from 3D Images
<b>Lincolnshire</b>	<b><u>Adlai E. Stevenson High School</u></b> <b><i>Patankar, Sayalee N., 17</i></b> Deep Learning-Based Computational Drug Discovery to Inhibit the RNA Dependent RNA Polymerase: Application to SARS and COVID-19



**Winnetka****New Trier Township High School*****Bardas, Alexandra Demetra, 17***

Identification of Novel Candidate Genes for Anthelmintic Drug Susceptibility to Alter Neglected Tropical Disease Treatment Strategies

**INDIANA****West Lafayette****William Henry Harrison High School*****Kim, Song, 18***

Computational Modeling of Intracellular Movement of Vesicular Stomatitis Virus Ribonucleoprotein Particles

**IOWA****Iowa City****West High School*****Taylor, Dasia T., 17***

A Novel Suture Additive: Use of Beet Extract to Assess for Surgical Wound Infection

**KANSAS****Olathe****Olathe North High School*****Kohli, Khushi, 17***

Dynamics of Brain Metastasis in Non-Small Cell Lung Cancer

**KENTUCKY****Bowling Green****The Carol Martin Gatton Academy of Mathematics and Science*****Zhang, Jason, 17***The Photocatalytic Single-Electron Oxidative Cyclopropanation of Ene-Ynamides with 2, 6-Lutidine *N*-Oxide: Synthesis of Bicyclic Amides**Lexington****Paul Laurence Dunbar High School*****Dhar, Saisha, 17***

The Role of Apoptosis Signal-Regulating Kinase 1 (ASK1) in Hyperoxia-Induced Lung Injury

**Louisville****duPont Manual High School*****Liang, Anne, 18***

Grape Polyphenols Inhibit Pro-Inflammatory Signaling and Dental Bacteria

**duPont Manual High School*****Render, Elaina, 18***

Exploring Probiotic Food Products as a Reservoir for Antimicrobial Resistance

**LOUISIANA****Shreveport****Caddo Parish Magnet High School*****Clary, Joseph Lee, 17***

Designing and 3D Printing a 3D Clinostat to Simulate Microgravity

**MAINE****Bangor****Bangor High School*****Vel, Vetri Senthil, 16***

Real-Time Fall Detection System for the Elderly Using Thermal Imaging and Deep Learning

## MARYLAND

### Rockville

#### Richard Montgomery High School

**Shen, Jerry, 18**

Analysis of the Asian Dust Trend in Recent Decades

### Salisbury

#### James M. Bennett High School

**Li, Marvin Fangzhou, 17**

Machine Learning Classifiers to Predict Outbreaks of Toxic *Karenia brevis* Blooms on the West Florida Shelf

### Silver Spring

#### Montgomery Blair High School

**Anand, Yash, 17**

Developing a Toy Model for Quantum Chaos Theory: Entanglement Entropy of Bipartite System Under Random Real Hamiltonians

#### Montgomery Blair High School

**Chen, Alan, 18**

Predicting High Energy Eigenstates by Coupling Discrete Supersymmetry and the Localization Landscape

#### Montgomery Blair High School

**Qian, Timothy Chenglei, 18**

Optimal Measurement of Field Properties with Quantum Sensor Networks

#### Montgomery Blair High School

**Tong, Christopher, 18**

Signatures of Second Generation Exoplanet Formation

## MASSACHUSETTS

### Acton

#### Acton-Boxborough Regional High School

**Friedman, Halley Rose, 17**

Zombie Flies: Examining Effects of *E. muscae* on Olfactory Function in *D. melanogaster*

#### Acton-Boxborough Regional High School

**Pulya, Ritvik Chandra, 17**

A Novel Deep Learning Model for Breast Cancer Risk Quantification Using Mammography and MRI Images

### Andover

#### Phillips Academy

**Chen, Sarah, 17**

*In Silico* Prediction of Retained Intron-Derived Neoantigens in Leukemia

#### Phillips Academy

**Zhou, Jeremy, 17**

Reconstructing Rooted Trees from Their Strict Order Quasisymmetric Functions

### Belmont

#### Belmont High School

**Yang, Jason, 17**

On Updating and Querying Submatrices

### Boston

#### Boston University Academy

**Liu, Friedrich, 18**

Phenotyping Neuropsychiatric Symptoms Profiles of Alzheimer's Disease Using Cluster Analysis on EEG Power

<b>Brookline</b>	<b><u>Brookline High School</u></b> <b><i>Li, Yangyang, 18</i></b> A Robust Classification Method Using Hybrid Word Embedding for Early Diagnosis of Alzheimer's Disease
<b>Lexington</b>	<b><u>Lexington High School</u></b> <b><i>Chen, Linda, 17</i></b> Reducing Round Complexity of Byzantine Broadcast  <b><u>Lexington High School</u></b> <b><i>Zhu, Alec Chen, 17</i></b> Investigation of Selenium Mediated Allylic and Propargylic Amination with Computational Chemistry
<b>Newton</b>	<b><u>Newton North High School</u></b> <b><i>Xiao, Helen Bingzhi Guo, 18</i></b> A Simple Approach for Evaluating Survey and Forecasting Data
<b>Shrewsbury</b>	<b><u>Saint John's High School</u></b> <b><i>Wadekar, Adway Suhrid, 17</i></b> A Psychosocial Approach to Understanding Substance Use Disorder Among Adolescents
<b>Somerville</b>	<b><u>Somerville High School</u></b> <b><i>Wen, Kevin, 17</i></b> Polystyrene Nanoplastics Spontaneously Enter Lipid Bilayers and the Blood-Brain Barrier
<b>Southborough</b>	<b><u>St. Mark's School</u></b> <b><i>Zhou, Beining, 18</i></b> High-Order Sensor Array Geometries for Improved Direction of Arrival Estimation in Signal Processing
<b>Westfield</b>	<b><u>Westfield High School</u></b> <b><i>Sundararajan, Suvin, 17</i></b> Functionalized Polylactide Filament for Additive Manufacturing

## MICHIGAN

<b>Bloomfield Hills</b>	<b><u>Cranbrook Kingswood Upper School</u></b> <b><i>Khan, Saa'im Ali, 17</i></b> Identification of Novel LEAD Compounds for Solute Transporter Protein Member 5 in Sensorineural Hearing Loss  <b><u>International Academy</u></b> <b><i>Yee, Vivian, 17</i></b> A Novel Epidemiological Approach to Exploring the Implications of Social Determinants of Health on COVID-19 Spread: A Call to Action for Health Equity
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## MINNESOTA

<b>Saint Paul</b>	<b><u>St. Paul Academy &amp; Summit School</u></b> <b><i>Chen, Anthony, 18</i></b> The Effects of Short Term Radiofrequency Electromagnetic Radiation on Diatom Photosynthetic Productivity
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## MISSISSIPPI

### Columbus

#### **The Mississippi School for Mathematics and Science**

***Lu, Michael Anran, 17***

Development of Predictive Tools for Anticancer Peptide Candidates Using Generative Machine Learning Models

## MISSOURI

### Chesterfield

#### **Marquette High School**

***Jagarlamudi, Rincon, 17***

Utilization of a Novel Method of RNA Interference in *Caenorhabditis elegans* to Conduct a Phenotypic Analysis of the *daf-2* and *daf-16* Longevity Genes

### Jackson

#### **Jackson Senior High School**

***Jones, Eli L., 18***

Towards the Total Synthesis of the Leishmanicidal Lindbergin E for the Development of an Enantioselective Phloroglucinol-Derived Polyketide Synthesis

### Kansas City

#### **Pembroke Hill School**

***Case, Katrina O'Connell, 17***

Importance of Neoantigen Affinity for Determining the Effectiveness of Immunotherapy in Lung Carcinomas

### Rolla

#### **Rolla Senior High School**

***Bai, Elena, 18***

Exploring Perceptual Associations Between Color and Music

### St. Joseph

#### **St. Joseph Central High School**

***Wiebelt-Smith, Bella, 18***

Investigation of Bacterial Gene Transcription from Promoters with Proximal i-motifs and G-quadruplexes

## NEVADA

### Reno

#### **The Davidson Academy of Nevada**

***Chien, Derek Lin, 18***

Curing COVID-19: Novel Design and Computational Evaluation of Potential SARS-CoV-2 Helicase Inhibitors

## NEW HAMPSHIRE

### Exeter

#### **Phillips Exeter Academy**

***Choi, Yunseo, 18***

On Two-Sided Matching in Infinite Markets

#### **Phillips Exeter Academy**

***Xiao, Zheheng, 18***

On Real Forms of Dubrovin-Ugaglia Poisson Brackets

#### **Phillips Exeter Academy**

***Zhu, Honglin, 18***

Characters for Projective Modules in the BGG Category  $\mathcal{O}$  for the Orthosymplectic Lie Superalgebra  $\mathfrak{osp}(3|4)$

## NEW JERSEY

## Basking Ridge

**Ridge High School*****Xu, Angelina, 18***

Is Seeing No Longer Believing? Detecting Deepfakes Using Discrete Fourier Transforms and Frequency Analysis

## Hackensack

**Bergen County Academies*****Choe, Erica, 18***The Effect of Human Hecpudin and *Pseudosciaena crocea* Hecpudin on the Prevention & Mitigation of *Staphylococcus epidermidis* Biofilm**Bergen County Academies*****Dabek, Patryk, 17***

Exploiting Metabolic Reprogramming in Liver Cancer: Mitochondrial Membrane Potential Response to Selective ATP Hydrolysis Inhibition

**Bergen County Academies*****Gomez, Michael, 17***

Underscoring the “Hypo-Hyper” Duality of Celecoxib in Melanocyte Pigmentation

**Bergen County Academies*****Gordon, Shayna Eve, 17***

FTY720 Enhances Remyelination in Sciatic Nerve Cells: A Targeted Approach to Treating Peripheral Nervous System Demyelinating Diseases

**Bergen County Academies*****Hashem, Emily Nadia, 17***Contextualizing IP3 Receptor-Dependent Astrocytic TGF- $\beta$  Signaling in Blood-Brain Barrier Permeability: A Novel Functional Role**Bergen County Academies*****Karam, Sarah, 17***

GRN Acts as a Novel Biomarker of Chemotherapy Resistance in Small Cell Lung Cancer

**Bergen County Academies*****Kim, Isabel Yoonsuh, 18***

Voltage-Dependent Anion Channel 1 (VDAC1) Expression in Retinal Cells Under Varying Glucose Conditions

**Bergen County Academies*****King, Thomas, 17***The Impact of UV-Blocking Chemicals on the Bleaching of *Acropora yongei***Bergen County Academies*****Lee, Jessica, 17***

Analysis of Data-Reduction Techniques Used in Dynamical Systems Modeling

**Bergen County Academies*****Ozkan, Lara, 17***

Identifying the Causal Mediators Between Diet, Obesity, and Cancer

**Bergen County Academies*****Shefter, Sasha, 17***

The Role of 5-fluorouracil in the Late Twentieth Century Decline of Cancer Mortality in the United States

**Bergen County Academies**

***Shaik, Raiyaan, 17***

The p53 Dependent and Independent Chemotherapeutic Potential of TQ in Breast Cancer: Targets *In-Vitro* and *In-Silico*

**Hillsborough**

**Hillsborough High School**

***Krishnan, Aravind Murali, 18***

A Novel Assay to Quantitatively Detect Bacterial Endotoxin by Harnessing PAMP-Triggered Immunity of *FRK1-LUC Arabidopsis thaliana*

**Lawrence Township**

**Lawrenceville School**

***Zhang, Michael, 17***

Development of Silver Nanoparticle Decorated Zinc Oxide Arrays for the Portable and Label-Free Detection of Opioids in Liquids

**Lincroft**

**High Technology High School**

***Tschand, Arya, 17***

Implementation of Novel Semi-Supervised Machine Learning Model into Autonomous Irrigation Network Optimized for Power Self-Sufficiency

**Plainsboro**

**West Windsor-Plainsboro High School North**

***Chen, Eddie, 17***

Epidemiological Models for COVID-19 Spread in US

**Princeton**

**Princeton International School of Math and Science**

***Chen, Quanlin, 18***

The Center of the  $\$q\$$ -Weyl Algebra Over Rings with Torsion

**Princeton International School of Math and Science**

***Huang, Lixin, 18***

Risk Taker or Driver: An Empirical Analysis of American Stock Markets During the COVID-19 Pandemic

**Scotch Plains**

**Union County Academy for Allied Health Sciences**

***An, Isabella, 17***

A Systematic Analysis of SLC9A9 SNP Sites and Their Association with Human Disease

**Skillman**

**Montgomery High School**

***Guha, Anshul, 17***

A New Bound on Odd Multicrossing Numbers of Knots and Links

**Tenaflly**

**Tenaflly High School**

***Dohi, Kosei, 18***

Variational Autoencoders for Jet Simulation

**Tenaflly High School**

***Wong, Michael James, 17***

The Human Tumor Microbiome Modulates Response to Checkpoint Blockade Immunotherapy by Influencing Immune Infiltrates in the Tumor Microenvironment

**Tenaflly High School**

***Yakar, Noam, 17***

Design & Construction of a Cost-Effective Full Arm Prosthesis with Computer Vision

**NEW MEXICO**

**Carlsbad**

**Jefferson Montessori Academy**

***Helmer, Ryan Scott, 17***

Engineering a Desiccant-Driven ( $\text{CaCl}_2$ ) Self-Contained Solar Distillation System to Collect Drinking Water from the Atmosphere

**Los Alamos****Los Alamos High School*****Ebey, Karin Ruth, 17***

Climate Change on Crocodilians: Modeling the Effects of Variations in Rainfall on Crocodilians and Their Ecosystem

**NEW YORK****Ardsley****Ardsley High School*****Bradford III, Malik Aaron, 17***

Exploring Novel Regulators of Endoplasmic Reticulum (ER) Stress Through Cell Signaling and Unsupervised Machine Learning Methods

**Ardsley High School*****Chun, Elizabeth, 17***Combating Familial Alzheimer's Disease: A Study of Resveratrol's Effects on a Presenilin Model of *Drosophila melanogaster***Ardsley High School*****Tomé, Marie-Hélène, 17***

On the Use of Statistical Measures and Density Maps Generated from CT Scans for the Detection, Classification, and Monitoring of COVID-19 Cases

**Armonk****Byram Hills High School*****Canter, Olivia Grace, 17***Birds of a Feather Age Together: Telomere Dynamics and Social Behavior Predict Lifespan in Female Japanese Quail (*Coturnix japonica*)**Byram Hills High School*****Dittrich, Mia Nicole, 18***

Epigenetic Editing of Cdk5 Leads to Sexually Dimorphic Stress Responses

**Byram Hills High School*****Goldstein, Bailey Isaac, 18***

Investigating Differences in the Relaxation of Non-Photochemical Quenching and its Implications for Crop Photosynthetic Efficiency

**Byram Hills High School*****Hafez, Ali, 17***

Using Artificial Neural Networks to Accurately Simulate Carbon Nanotube Field-Effect Transistors

**Byram Hills High School*****Ilan, Jared, 17***

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