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# Meena Niveda Ravishankar#, 16, Freshman,
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Behavioral and Social Sciences

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Institucion Educativa Privada de Señoritas Luz Andina Reyna de
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Juan Carlos Munoz Bojorquez, 18, Senior,
Centro de Bachillerato Tecnologico Industrial y de Servicios
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BEHA041T  The Effect of Traumatic Brain Injury and Metformin on Drosophila Learning
Hannah Rose Bilton, 18, Junior, Emma Elizabeth Bilton, 18, Junior, Yorktown High School, Yorktown Heights, New York

BEHA042  The Black Plague and the Conception of Death
Noga Yekutieli, 18, Senior, Israel Arts and Science Academy, Jerusalem, Israel

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# Ben Weiss, 17, Sophomore, Kalaheo High School, Kailua, Hawaii

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JJ Singh Kapur, 18, Junior, Valley High School, West Des Moines, Iowa

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Chloe Ann Levin, 18, Senior, Roslyn High School, Roslyn Heights, New York

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Makenna Mary Gabel, 17, Junior, Karen Nicole Scharlau, 18, Junior, Cochrane-Fountain City High School, Fountain City, Wisconsin

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Georgi Agapi Fotiou, 18, Senior, Townsend Harris, Flushing, New York

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Ryan Foo, 18, Senior, The Bronx High School of Science, Bronx, New York

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Sarah Nicole Mason, 19, Senior, Southwest Livingston County R-I High School, Ludlow, Missouri

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Zhitong Wang, 18, Senior, Jericho Senior High School, Jericho, New York

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Josie Dylan Douglas-Brown, 16, Sophomore, Lakeside High School, Atlanta, Georgia

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Harkirat Bhullar, 16, Sophomore, Evan Hardy Collegiate Institute, Saskatoon, Saskatchewan, Canada

BEHA055  And the Winner Is...: Developing a Computer Program to Investigate Neural Competition with Multimodal Stimuli
Caleb Jireh Martonfi, 15, Freshman, Tuscumbia High School, Tuscumbia, Missouri

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Latifah Maratun Sholikhah, 17, Senior, State Senior High School 1 Teras, Boyolali, East Java, Indonesia

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Luis Angel Ramos Hernandez, 14, Freshman, Luis De La Luz Sanchez, 17, Freshman, Carlos Monsivais, Puebla, Mexico
Universidad Interamericana, Puebla, Cholula, Mexico

BEHA058T  A Novel Way to Determine Sociometrics in the Real World
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#  Erin Smith, 18, Junior, Shawnee Mission West High School, Overland Park, Kansas

BEHA061  Using a Virtual Environment to Indirectly Measure Racial Bias
Daniel Fadi Busaba, 18, Senior, Spackenkill High School, Poughkeepsie, New York

BEHA062T  "Compassion Fade" and the Limitations of Student Subjects in Social Science Research
Alexander Karl Sun, 18, Junior, Emma Sun, 15, Freshman, Hillcrest High School, Midvale, Utah
The Waterford School, Sandy, Utah

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Vera Escaja-Heiss, 16, Sophomore, South Burlington High School, South Burlington, Vermont

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Dawson Alexander Verley, 18, Senior, West Valley High School, Fairbanks, Alaska

BEHA065  RoboGlove: A Design for Engagement and Hedonic Motivation with Visual-Spatial for Deaf and Hearing Impaired Children, Phase II
Hiba Muhyi, 18, Senior, Arrowhead Park Early College High School, Las Cruces, New Mexico
Biochemistry

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# Sai Aditya Sriram, 19, Senior, Vanguard High School, Ocala, Florida

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Ty Price, 17, Junior, Benjamin E. Mays High School, Atlanta, Georgia

BCHM003 Enzyme Dynamics of Biofilm-Breaking Dispersin B
Edward Sangyoon Kim, 18, Senior, Midway High School, Waco, Texas

BCHM004 Investigating the Effects of 2,3-Dihydroxybenzoic Acid Extraction from Salvinia molesta as Means for Treatment in Harmful Microorganisms
Blake Harrison Bathman, 16, Sophomore, Williams High School, Plano, Texas

BCHM005 The Role of RAD51 Mutation in Cancer Development
Karina Movsesian, 18, Sophomore, Prvni Ceske Gymnazium v Karlovcy Varech, Karlovy Vary, Czech Republic

BCHM006 Pathogenic Yeast Candida parapsilosis and Its Carbonic Anhydrase
Jan Blaha, 18, Sophomore, Gymnazium a Stredni Odborna Skola Prewolc, Prewolc, Pardubicky Kraj, Czech Republic

BCHM007T Microbiological Quality in Popular Foods
Maria Fernanda Suarez Hernandez, 17, Junior, Gymnazium a Stredni Odborna Skola Prewolc, Prewolc, Pardubicky Kraj, Czech Republic

BCHM008 Insights into the Interaction of N-APP with Death Receptor 6 in Inducing Neuronal Apoptosis
# Yingxuan (Jason) Tan, 18, Senior, College Station High School, College Station, Texas

BCHM009 Is Tiny Mighty? Phase II
Payton Danielle Scrivner, 17, Junior, Alma High School, Alma, Arkansas

BCHM010 Utilization of Epigallocatechin Gallate and Serine/Asparagine Compounds as a Natural Therapeutic for Glycosylation-Inhibited Breakdown of the Zika Virus Ectodomain
Sangita Vasikaran, 16, Sophomore, Jasper High School, Plano, Texas

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Brynna Grier McFarland, 18, Junior, Durant High School, Plant City, Florida

BCHM012 Aptamer Based Disruption of the CD47-SIRPα Interface for Anticancer Applications
# Pushkar Shinde, 17, Junior, Oregon Episcopal School, Portland, Oregon

BCHM013 Synthesis of a Fusarochromanone Analog and Its Efficacy in Treating Triple Negative Breast Cancer
Sunjay Letchuman, 18, Junior, Caddo Parish Magnet High School, Shreveport, Louisiana

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# Fatima Laraib, 19, Senior, Oxford High School, Oxford, Mississippi

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# Maries Ann Ramos Silvestre, 17, Sophomore, Juan R. Liwag Memorial High School, Gapan City, Nueva Ecija, Philippines

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David Bruns, 17, Senior, Fisher's of Men Academy, Rosamond, Illinois

# Buffalo vs. Beef: Analyzing Lipid Components in Search of Potential Health Benefits
Elsie Monique DuBray, 17, Junior, Timber Lake High School, Timber Lake, South Dakota

# A Novel Method to Prevent Digestive Disorders: The Creation of an Enzymatic Catalysis Enhancer for Bromelain from Ananas comosus (Pineapple) for the Digestive Function of Casein, Ovalbumin, Glycine max (Soy) and Pismum sativum (Pea) Proteins
Christopher Ariel Martinez Tiru, 18, Senior, Specialized Science and Math Secondary School Thomas Armstrong Toro, Ponce, Puerto Rico

# Bioengineering Islet Cells Using 3D-Bio Printing Technology for the Treatment of Type-1 Diabetes
Vishaal N. Balamurugan, 17, Junior, North Oldham High School, Goshen, Kentucky

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Farhath Sulthana, 18, Senior, Joplin High School, Joplin, Missouri

# LRBA: A Possible Key Player in Cancer Cell Autophagy
Kristina Marie Kohler, 18, Senior, American Fork High School, American Fork, Utah

# Physical-Chemical Analysis of Hymenaea courbaril Flour for the Development of Functional Food in Combating Anemia and Child Malnutrition
Luis Claudio Lucena Duarte, 17, Junior, Centro de Ensino Nascimento de Morais, Imperatriz, Maranhao, Brazil

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# Andrea Augustine, 18, Senior, Eagle's Landing High School, McDonough, Georgia

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Evan Paul Yamaguchi, 18, Senior, Governor Thomas Johnson High School, Frederick, Maryland

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Elise Nicole White, 17, Junior, Binghamton High School, Binghamton, New York

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Stuti Dalal, 16, Sophomore, Shawnee Mission East, Prairie Village, Kansas

# Biodetoxification of N-nitrosamines by Symbiotaphrina kochii and Quantification of N-nitrosamines via Gas Chromatography Mass Chromatography
Katelynn Ryenne Salomon, 17, Sophomore, Palmer Ridge High School, Monument, Colorado

# Utilization of CRISPR/Cas9 to Knock Down Inflammatory and Angiogenic MicroRNAs in Endothelial Cells
Julienne Chaquor, 17, Sophomore, High Technology High School, Lincroft, New Jersey
BCHM029T A Novel Iso-Enzyme Based Dot Blot Strip Test for Rapid Detection of Multiple Insecticide Residues
Divya Kranthi#, 17, Junior,
Suhani Sachin Jain#, 17, Junior,
Ambedkar College, Nagpur, India
Taywade College, Nagpur, India

BCHM030 Increasing the Efficiency of a Nasal Epinephrine Delivery System
Alexandra Anne Zelenski, 17, Senior, Burlington Community High School, Burlington, Iowa

BCHM031T Developing a Nanoscale DLD Array Using Immunosignature-Derived Aptamers to Effectively Separate and Analyze Tumor Exosomes
Sachin Jai Shankar, 17, Junior,
Somil Jain, 18, Junior,
Hamilton High School, Chandler, Arizona

BCHM032 Treating Hypertension: Using Natural Compounds to Inhibit Angiotensin Converting Enzyme
Brindha Priya Rathinasabapathi, 16, Freshman, Eastside High School, Gainesville, Florida

BCHM033 Characterization and Testing of Compounds Produced by Aspergillus turcosus that Target Cancer-Associated Pathways
Niel Mondava, 17, Junior, Hellgate High School, Missoula, Montana

BCHM034 Lingering Heavy Metal and Metalliods in the Allium cepa Root Tip and Bulb from the Animas and San Juan Riverbeds, after the 2015 Gold King Mine Spill
Sunny Nez, 18, Senior, Navajo Preparatory School, Farmington, New Mexico

BCHM035 Development of a Simple and Efficient Method for Site-Specific Mutagenesis
Allen Yang Huang, 17, Senior, Oak Grove High School, Hattiesburg, Mississippi

BCHM036T Niacin and Beta-Curcumene from Ziziphus spina-christi Are the Most Promising Approaches to Treating Alpha-1 Antitrypsin Deficiency
Abdulah Ahmed AlSolaiman#, 18, Senior,
Saleh Al-Muhaizaa, 18, Senior,
AlShamal Secondary School for Boys, AlShamal, Qatar

BCHM037T Biocompatible Cell Encapsulation by Polyphenol Originated from Plant
Seok Yeong Jung, 18, Senior,
Dae Hun Um, 18, Senior,
Chungnam Science High School, Gongju Si, Chungcheongnamdo, South Korea

The above text is the natural representation of the document as if you were reading it naturally.
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<td>BMED002</td>
<td>Enhancing Breast Cancer Treatment Efficiency Using Circadian Rhythm</td>
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<td>Julia Beth Hoffman, 17, Junior, Satellite High School, Satellite Beach, Florida</td>
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<td>Luciana Victoria Jacquelin, 19, Senior, Emanuel Andres Cortez, 19, Senior, Instituto Provincial de Educacion Tecnica #267 Antonio Graziano, Bell Ville, Cordoba, Argentina</td>
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<td>Effect of Physical Activity upon Mitochondrial Trafficking and Degradation in a Rat Model of Parkinson’s Disease</td>
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<td>Carolina Eva Padilha, 18, Senior, Colegio Dante Alighieri, Sao Paulo, SP, Brazil</td>
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<td>Potential Neuronal Toxicity Associated with Cellular Exposure to Electronic Cigarette Fluids</td>
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<td>Myllena Cristyna Braz da Silva, 18, Junior, Gabriel de Moura Martins, 19, Junior, Escola de Ensino Medio Joaquim de Figueiredo Correia, Iracema, Ceara, Brazil</td>
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<td>George Pkhabadze, 18, Senior, Maria Eradze, 18, Senior, Georgian-American School “Progress”, Kutaisi, Imereti, Georgia</td>
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<td>Niko Nikoladze School, Kutaisi, Imereti, Georgia</td>
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<td>Emily Yang, 18, Senior, Kalani High School, Honolulu, Hawaii</td>
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<td>Amber Cui, 15, Freshman, Cookeville High School, Cookeville, Tennessee</td>
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<td>Aarushi Patil, 16, Sophomore, Cox Mill High School, Concord, North Carolina</td>
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<td>Vitamin E Delta-Tocotrienol Targets Cancer Stem Cell Transcription Factors and Inhibits Human Pancreatic Cancer Metastasis</td>
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<td>Sayyada Kazim, 18, Senior, Tampa Bay Technical High School, Tampa, Florida</td>
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<td>Ally Grace Puckett, 19, Senior, Poyen High School, Poyen, Arkansas</td>
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<td>Sakshi Garg, 15, Freshman, Little Rock Central High School, Little Rock, Arkansas</td>
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<td>Qingzeng Gao, 17, Junior, Kiara Luyando Harding, 18, Senior, Parkview High School, Liburn, Georgia</td>
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<td>Jose Roberto Ramirez, 19, Senior, Bianca Lauren Castro, 18, Senior, Welsaco East High School, Welsaco, Texas</td>
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<td>UTILITY Mathematics and Science Academy, Edinburg, Texas</td>
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<td>Yang Liu, 18, Senior, Gisell Chantilly Loredo, 19, Senior, Northside Health Careers High School, San Antonio, Texas</td>
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<td>Health Careers High School, San Antonio, Texas</td>
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<td>Morgan Lee Fisher, 18, Senior, Carly Michele Porter, 18, Senior, Southwest Virginia Governor’s School, Pulaski, Virginia</td>
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<td>Nabeel Jamil Quershy, 17, Junior, University School of Milwaukee, Milwaukee, Wisconsin</td>
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<td>Sumona Udayan Banerjee, 19, Senior, Niles North High School, Skokie, Illinois</td>
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<td>Kevin Hu, 17, Junior, Massachusetts Academy of Math and Science, Worcester, Massachusetts</td>
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<td>Destany LittleSky Pete, 18, Junior, Owyhee High School, Owyhee, Nevada</td>
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<td>Jeremiah David Penick, 17, Junior, Brookville High School, Brookville, Ohio</td>
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Aniv Ray, 16, Freshman, Columbus Academy, Gahanna, Ohio

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Angel Huang, 19, Senior, Taipei American School, Taipei, Chinese Taiwan

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Daniel Danxu Zhang, 18, Junior, Westview High School, San Diego, California

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Gary Jandi Brixi, 16, Sophomore, Winston Churchill High School, Potomac, Maryland

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Clairisse Eunhae Whang, 17, Junior, Academy for Medical Science Technology, Hackensack, New Jersey

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David James Friedman, 18, Senior, Jack Tygard Weitzner, 19, Senior, Sleepy Hollow High School, Sleepy Hollow, New York

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Sarah Anne Hoffman, 17, Junior, Ossining High School, Ossining, New York

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Megha Nitin Joshi, 16, Sophomore, South Salem High School, Salem, Oregon

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Gabriel Ronatty Tavares Santos, 18, Senior, ETEC Guaracy Silveira, Sao Paulo, SP, Brazil

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Zainab Bader Alnakkas, 17, Junior, Bayan High School for Girls, Bayan, Kuwait

BMED044 Antibiotic Properties of Moringa oleifera to Combat Superbugs
Srijith Nair, 18, Senior, American Heritage School of Boca Delray, Delray Beach, Florida

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Ray Jia, 17, Junior, Alexander W. Dreyfoos School of the Arts, West Palm Beach, Florida

BMED046 “Catch a Whiff”
Autumn Rose Smith, 16, Sophomore, Coral Academy of Science Las Vegas, Henderson, Nevada

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Anjali Maheshwari, 18, Senior, Half Hollow Hills High School West, Dix Hills, New York

BMED048 Discovery of Highly-Correlated Circadian Oscillations in Oral MicroRNA and Microbiome Levels Using Next Generation Sequencing of Human Saliva: Implications for Human Health and Disease

BMED049 Rising Rates of Antibiotic Resistance among in Infants with Urinary Tract Infections
Priyanka Bonifaz, 19, Senior, Barrington High School, Barrington, Rhode Island

BMED050 Skin Deep: The Effect of Skin Temperature on Touch Perception
Christopher Jon De Groot, 19, Senior, Unity Christian High School, Orange City, Iowa

BMED051 The Relationship between Artificial Sugars and Increased Lipid Levels
Alexander J. Rodriguez, 18, Senior, Mitchell High School, Mitchell, South Dakota

BMED052T Artemisia Anna
Noah Lee Heezen, 17, Sophomore, Emma Elizabeth Heezen, 18, Senior, Plankinton High School, Plankinton, South Dakota

BMED053 The Effect of Antibacterial Toothpaste on the Ecology of Oral Flora
Matthew Davis Staten, 16, Sophomore, Bonneville High School, Washington Terrace, Utah

BMED054 Reversing High Glucose Levels through a Novel Approach: C. elegans as a Model for Treating Diabetes
Abraq Nadir Nassar, 18, Senior, Sunnyside Senior High School, Sunnyside, Washington

BMED055 Ototoxic Drug Levels in Cochlear Tissues: Validating Machine Segmentation of Drug Uptake in Individual Cells Types of the Cochlea in Confocal Images
Tsering Shola, 16, Sophomore, Camas High School, Camas, Washington

BMED056T Osteochondral Tidemark Region Synthesis: Application of Siglec-15 Overexpression and Novel Seeded Hydrogel
Irene Antony, 17, Junior, Farah Tiffany Rexha, 17, Junior, Half Hollow Hills High School West, Dix Hills, New York

Irene Antony, 17, Junior, Jericho High School, Jericho, New York
Select one project to read in detail:

**BMED057** Role of Wnt Self-Renewal Pathway in Regulating Tumor Initiating Cells in Breast Cancer
Omar Bakr Alammari, 17, Senior, Imam Al-Alishi High School, Riyadh, Riyadh, Saudi Arabia

**BMED058** Tacedinaline-Induced Expression of LL37: A Novel Approach to Treating Tuberculosis Infection
Kira Griffith, 17, Senior, Good Hope Country Day School, Kingshill, St. Croix, United States Virgin Islands

**BMED059** Oncolytic Activity of Engineered Adenovirus Ad-TERT in Glioblastoma Multiforme
Jooyoung Lee, 18, Senior, West Lafayette Junior/Senior High School, West Lafayette, Indiana

**BMED060** Identification of Remains
Kennith James Goddard, 20, Senior, Fairview High School, Fairview, Oklahoma

**BMED061** The Effect of Pollutant Bisphenol A on Cancer Cell Proliferation
Zhiyue Wang, 18, Senior, West Lafayette Junior-Senior High School, West Lafayette, Indiana

**BMED062** Hospitalization in Women with Turner Syndrome
Isani Singh, 18, Junior, Cherry Creek High School, Greenwood Village, Colorado

**BMED063** The Effect of Wnt/Beta-Catenin Signaling Inhibition on Oral Squamous Cell Carcinoma
Adam Benjamin Snowden, 19, Senior, Ponte Vedra High School, Ponte Vedra, Florida

**BMED064** Impact the Force: Effects of Insoles on Impact Force for Gymnasts
William Broomhead, 16, Sophomore, Kenton County Academy of Innovation and Technology, Fort Mitchell, Kentucky

**BMED065** What Sun Protection Products Block Ultraviolet Radiation Best?
Carlisle McCullough, 16, Sophomore, Savannah Arts Academy, Savannah, Georgia

**BMED066** Study on the Radio-Protection of Curcumin-Encapsulated Nanoliposomes on Human Lymphocytes
Xuan Quynh Thi Nguyen, 17, Junior, Tien Thuy Mai, 17, Junior, Thang Long High School For The Gifted, Da Lat, Lam Dong, Vietnam

**BMED067** Omega-3 ALPHA-Linolenic Fatty Acid in Chia Seeds (Aalvia hispanica L.) and Its Influence on Human Performances
Ines Bahlawane, 17, Junior, Lavinia Marie Kadar, 17, Junior, Ecole Europeenne Luxembourg II, Bertrange, Luxembourg, Luxembourg

**BMED068** A Scalable, Non-Invasive, and Digital Tool to Quickly Diagnose the Zika Virus by Applying Correlation Analysis, Edge Detection Methods, and K-Means Clustering to Fundus Images
Arsh Banerjee, 15, Freshman, Bayonne High School, Bayonne, New Jersey

**BMED069** Anti-Skin Cancer Lotion
Sadia Qadir, 18, Sophomore, Punjab Daanish School for Girls, Hasilpur, Punjab, Pakistan

**BMED070** The Antimicrobial Efficacy of Stainless Steel, Copper and Brass for the Reduction of Nosocomial Illness
Margaret Anne Williams, 18, Senior, Ancaster High School, Ancaster, Ontario, Canada

**BMED071** Analysis of Electrodermal Activity to Quantify Stress Levels in Autism
Kayley Noelle Ting, 17, Junior, The Academy for Gifted Children - P.A.C.E., Richmond Hill, Ontario, Canada

**BMED072** eX Marks the Spot: A Novel Method in Diagnosing PCa via Exosome Analysis
Labib-Daiyan Syed, 17, Junior, Centennial Regional High School, Green Field Park, Quebec, Canada

**BMED073** A Selective Inhibition of Metastatic Cancer Cell Migration
Akshat Singh, 16, Sophomore, Century High School, Rochester, Minnesota

**BMED074** Development of Diet-Induced Insulin Resistance in Drosophila melanogaster and a Characterization and Comparison of the Anti-Diabetic Effects of Resveratrol and Pterostilbene, Part II
Arko Somujwal Dhar, 18, Junior, St. Andrew's Episcopal School, Ridgeland, Mississippi

**BMED075** Hepatic Stellate Cell-Targeting Nanoparticles for Hepatocellular Carcinoma Chemoprevention
Mohamed Ehab El-Abtah, 18, Senior, Syosset High School, Syosset, New York

**BMED076** Rare Amino Acids Accelerate Cancer Growth
Nathaniel Chung, 16, Freshman, Berrien County Math and Science Center, Berrien Springs, Michigan

**BMED077** A Patch Clamp Study of TRPM7 Ion Channels: East Indian Sandalwood Oil (EISO) as a Possible Therapeutic Target for Cancer, Year II
Nia Myfanwy Clements, 17, Junior, Keystone School, San Antonio, Texas

**BMED078** Cell-Based Delivery of Gene-Silencing Products via Gap Junction Channels
Erika Emily Nemeth, 18, Senior, Smithtown High School East, St. James, New York

**BMED079** Potential Therapeutic Effect of Novel Multivitamins and Minerals Combination for Alzheimer’s: In vitro and in vivo Studies
Ahmed Aly Sobhy, 18, Senior, Victoria College, Alexandria, Egypt

**BMED080** Omega-3 ALPHA-Linolenic Fatty Acid in Chia Seeds (Aalvia hispanica L.) and Its Influence on Human Performances
Ines Bahlawane, 17, Junior, Lavinia Marie Kadar, 17, Junior, Ecole Europeenne Luxembourg II, Bertrange, Luxembourg, Luxembourg

**BMED081** A Scalable, Non-Invasive, and Digital Tool to Quickly Diagnose the Zika Virus by Applying Correlation Analysis, Edge Detection Methods, and K-Means Clustering to Fundus Images
Arsh Banerjee, 15, Freshman, Bayonne High School, Bayonne, New Jersey

**BMED082** Anti-Skin Cancer Lotion
Sadia Qadir, 18, Sophomore, Punjab Daanish School for Girls, Hasilpur, Punjab, Pakistan

**BMED083** The Antimicrobial Efficacy of Stainless Steel, Copper and Brass for the Reduction of Nosocomial Illness
Margaret Anne Williams, 18, Senior, Ancaster High School, Ancaster, Ontario, Canada

**BMED084** Analysis of Electrodermal Activity to Quantify Stress Levels in Autism
Kayley Noelle Ting, 17, Junior, The Academy for Gifted Children - P.A.C.E., Richmond Hill, Ontario, Canada
Biomedical Engineering

**ENBM001** The Preparation of PLGA Microspheres with Calcium Alginate Surface Modification
Keyi Zheng, 16, Sophomore, Hangzhou No.14 High School, Hangzhou, Zhejiang, China

**ENBM002T** Sleep Improvement Study with Wearable LED Goggles Based on Citropic Effect
Yuanheng Zhou, 16, Sophomore, YuLiang Wang, 17, Sophomore, High School Affiliated to Fudan University, Shanghai, China

**ENBM003** Identifying Bacteria with “Fingerprints” Based on Laser Diffraction Patterns
Katarina Barbara Chapman, 18, Senior, Gymnasium Hochrad, Hamburg, Germany

**ENBM004** Novel Point-of-Care, Non-Invasive Mild Traumatic Brain Injury (mTBI) or Concussion Diagnostic Tool
Pariyosh Suri, 17, Sophomore, Jasper High School, Plano, Texas

**ENBM005** Body Balance Ability Monitor Based on Acceleration Spectrum Analysis
Zewei Shi, 18, Junior, Beijing No. 4 High School, Beijing, China

**ENBM006T** Combo Infusion
Yuval Feldman, 20, Senior, Amalia Ben Asher, 19, Senior, Tal Cohen, 19, Senior, Ort Psagot, Karmial, Galilee, Israel

**ENBM007T** Microsensors Monitoring Devices Regarding the Rehabilitation Process Carried Out After Orthopaedic Surgeries of the Lower Limb
# Miruna Alexandra Ojoga#, 17, Junior, # Ana-Maria Tudorache#, 18, Junior, International Computer High School of Bucharest, Bucharest, Romania

**ENBM008** Neuro-Computer Interface as a Means of Increasing Efficiency of Mental Activity
Olga Daniilovna Golovan, 17, Sophomore, Municipal Gymnasium of the City Fryazino, Fryazino, Moscow Region, Russian Federation

**ENBM009** Mechanized Collection of Organic Spider Silk
Aubrey Anne Berger, 18, Junior, Eaglecrest High School, Centennial, Colorado

**ENBM010** Modeling and Engineering an Electricity Free Nebulizer
Nicole Veloro Tayag, 17, Junior, Veterans High School, Kathleen, Georgia

**ENBM011** 3D Printed Myoelectric Prosthesis without TMR Surgery
Max Seidel, 16, Sophomore, Riverwood International Charter School, Atlanta, Georgia

**ENBM012** Designing Oral Implants to Dissipate Occlusal Load
Behram Neville Dossabhow, 18, Senior, Caddo Parish Magnet High School, Shreveport, Louisiana

**ENBM013** Modeling Neural Disorder via Involuntary Response Simulator
Bergen Loren Sanderford, 19, Senior, Isidore Newman School, New Orleans, Louisiana

**ENBM014** Inexpensive Glucose Monitoring Device for Diabetics Using Capillary Action of Crosslinked Sensing Fluid, Year II
Serena Liang Jing, 19, Senior, St. Paul Central High School, St. Paul, Minnesota

**ENBM015** Bioengineering the Lung: Directed Differentiation of Human Pluripotent Stem Cells into Definitive Endoderm on a Lung Extracellular Matrix
Meghana Iyer, 18, Senior, Edina High School, Edina, Minnesota

**ENBM016** Predicting Mechanical Damage from Glioblastoma Tumor Growth
Shobha Dasari, 17, Sophomore, Academy of Science and Technology, The Woodlands, Texas

**ENBM017** Utilizing Cardiac and Pulmonary Function with Piezoelectricity to Power a Cardiac Pacemaker, Year III
### Isuru Ashan Somawardana, 18, Senior, Keystone School, San Antonio, Texas

**ENBM018** Chitosan Gelatin Microspheres: Using Fluorescein as an Indicator for the Delivery of Drugs into CEM, HeLa, and HEK 293 Cells
# Deserie Miguel Patagpatan, 18, Senior, Waipahu High School, Waipahu, Hawaii

**ENBM020T** Development of 3-D Printed Electronic Stethoscope and Open-Source Android-Based Platform with Automated Diagnosis of Cardiac Conditions
Abraham Riedel-Mishaan, 17, Senior, Ryan Edward Folz, 18, Senior, Praharshasai Paladugu##, 18, Senior, duPont Manual High School, Louisville, Kentucky

**ENBM021** A Novel High-Efficiency System for Infant Warming through Secondary Heating Mechanisms
## Swathi Ravi Srinivasan, 18, Senior, Beachwood High School, Beachwood, Ohio

**ENBM023** Development of a Novel 3D Printed 2-Stage Hollow Fiber Filter to Reduce Pain on Injection of a Propofol Emulsion
Conor Collins, 19, Senior, Monroe Woodbury High School, Central Valley, New York

**ENBM024** Inexpensive and Accurate Test Kit for Zika: Point-of-Care Diagnostics in 10 Minutes with Paper-Based Serological Flow Device
Hsi-Min Chan, 16, Sophomore, Raffles Girls School (Secondary), Singapore, Singapore

**ENBM025T** SmartRate: An Innovation in Automated Early Warning, Detection, and Prevention of Cardiac Death
Sameer Sundrani, 17, Junior, Nikhil Sundrani, 16, Sophomore, University High School, Fresno, California

**ENBM026T** Accurate, Low-Cost Diagnosis and Monitoring of Parkinson's Disease by Detecting Dysphonic Features through a Machine-Learning Algorithm
Parth Saxena, 15, Freshman, Rishik Kundhur Reddy, 15, Freshman, Shiladitya Dutta, 15, Freshman, Amador Valley High School, Pleasanton, California

**ENBM027** 3D Printable Transtibial Prosthetic
Everett Adien Jeffrey Kroll, 17, Sophomore, Stillwater Area High School, Stillwater, Minnesota

**ENBM028** Mosquito-Inspired Insertion Guide Prevents Flexible Intracortical Microelectrodes from Buckling during Implantation
Suraj Sai Srinivasan, 17, Junior, Strongsville High School, Strongsville, Ohio

**ENBM029** Formulation of a Bovine Gelatin Crosslinked Scaffold for Potential Human Tissue Applications: Cost-Effective, Patient Specific Alternative Treatment of Acetabular Labral Tears of the Hip
# Sophie Elizabeth Edelstein, 16, Sophomore, Wilbur Cross High School, New Haven, Connecticut

**ENBM030** Year Two: Use of Intestinal Scaffolding as a Pumping Assist Solution to Heart Failure
Rithvik Seela, 17, Junior, Lake Highland Preparatory School, Orlando, Florida
ENBM031 Structure of Lys B28 Pro B29 Insulin
Xingnan Frank Lin, 18, Junior, Hilton Head Preparatory School, Hilton Head Island, South Carolina

ENBM032T SmartLeg – Smart Transfemoral Prosthesis II
Leonardo Azzi Martins, 17, Senior, Luciano Sampaio da Silva, 19, Senior, Arthur de Freitas e Precht, 18, Senior, Instituto Federal de Educacao, Ciencia e Tecnologia - IFSUL Campus Charqueadas, Charqueadas, RS, Brazil

ENBM033 Diagnosing Tumours Using fNIR Imaging System
Khadeel Saud Alwaishel, 19, Senior, Kuwait National English School, Hawally, Kuwait

ENBM034 An Electric Spark Scalpel
Valeria Olegovna Lebedeva, 17, Sophomore, Gymnasium #5, Korolyov, Moscow Region, Russian Federation

ENBM035 High-Dimensional Single-Cell Cytometry Analysis for Understanding Cancer Stemness
Madeleine Yang, 16, Sophomore, Detroit Country Day School, Beverly Hills, Michigan

ENBM036 Detecting the Elusive Lyme Disease: Creating a Novel Lateral Flow Test for Detection of Borrelia burgdorferi in Ticks
Luke Daniel Little, 17, Junior, Timber Ridge Scholars Academy, Pacific, Missouri

ENBM037 Engineering Surface Chemistries to Improve Tissue-Material Integration in Medical Implants
Vinijs Vale, 17, Junior, Phillips Exeter Academy, Exeter, New Hampshire

ENBM038T The Influence of Metalized Graphene Oxide/Reduced Graphene Oxide and Sulfonated Polystyrene on Dental Pulp Stem Cell Differentiation and Protein Adsorption
Rachel Sara Sacks, 18, Senior, Gila Rachel Schein, 18, Senior, Hebrew Academy of the Five Towns and Rockaway, Cedarhurst, New York

ENBM039 Development of a Low Cost Multi-Analyte Microfluidic Device
Srikrishnan Pillai Raju, 16, Sophomore, Lakeside High School, Evans, Georgia

ENBM040T Design for an Alternate Wireless Medical Auscultation Device
Hamza Asif Jamal, 18, Senior, John Prosper, 19, Senior, Central High School, Aberdeen, South Dakota

ENBM041 Analysis of Retinal Fundus Images to Detect Macular Degeneration Using Machine Learning Methods
Alexander Cheng, 16, Sophomore, Hillcrest High School, Midvale, Utah

ENBM042 Isolating Motion Patterns in Compromised Human Gait as Proxy for Amputees Wearing Prosthetics
Michael James Remley, 17, Junior, Northern Utah Academy for Math Engineering and Science, Layton, Utah

ENBM043T X-Enhance: A New Technology of Color Enhancement for the Visually Impaired
Sebastian Hernandez-Castro, 18, Senior, Angelik Laboy-Torres##, 18, Senior, Escuela Secundaria Especializada en Ciencias, Matematicas y Tecnologia, Caguas, Puerto Rico

ENBM044 MyHealth: A Novel Wearable Solution for Early Detection and Monitoring of Parkinson's Disease and a Transformation from Subjective to Quantifiable Testing
Surabhi Gopal Mundada, 18, Senior, Olympia High School, Olympia, Washington

ENBM045 Synthesized Limpet Snail Teeth: A Novel Inexpensive Nanocomposite for Stronger Bio-Compatible Prosthetics
Soham P. Dessai, 18, Senior, Academy of Science, Sterling, Virginia

ENBM046 Investigating Tuned Magneto-Rheological Reservoirs, Compression Systems, and Shear Thickening Fluids to Improve Mean Peak Acceleration as Measured by High-G Accelerometers in Hockey Headgear
Claire Elizabeth Wagner, 19, Senior, Saginaw Arts and Sciences Academy, Saginaw, Michigan

ENBM047 A Novel 3-D Engineered Solution for Congenital Microtia of the Ear
Vidyा Mullangi, 17, Junior, Burlington Community High School, Burlington, Iowa

ENBM048 Prosthetic Replacement Technology Mark 6 (PRT-6)
Aristomenes Tambakis, 17, Sophomore, QSI Chengdu, Chengdu, Sichuan, China

ENBM049 Toward Precision Medicine: Designing Injectable, Conductive Graphene-Doped Hydrogels and Robust Computational Models for Post-MI Cardiac Tissue Engineering and Drug Discovery
Arvind Paramas Pridhir, 19, Senior, Bellarmine College Preparatory, San Jose, California

ENBM050 Reach into the Future II
Joseph Eusebio Cienti, 18, Senior, South Sumter High School, Bushnell, Florida

ENBM051T Nanotopographical Control of Dental Pulp Stem Cell Fate Using Phase Segregated PLA/PS Thin Films
Alice Guanyi Wu, 18, Senior, Katherine Chen Cao, 18, Senior, William Hu, 18, Senior, Half Hollow Hill High School West, Dix Hills, New York Homestead High School, Mequon, Wisconsin Saratoga High School, Saratoga, California

ENBM052 Novel Iron-Regulating Hydrogel for the Treatment of Diseases with Iron Dyshomeostasis
Marc S. Henein, 18, Senior, College Jean-de-Brebeuf, Montreal, Quebec, Canada

ENBM053T Improved Detection of Cardiac Troponin I with Reduced Antibodies
Matthew Lin, 17, Junior, Chia Chi Chang, 17, Junior, Shanghai American School Pudong, Shanghai, China

ENBM054T The Smart Bed to Protect Children from the High Temperature Khalifa Khalid Al-Marri, 16, Sophomore, Ahmed Jamal Elwa, 17, Junior, Ahmad Bin Mohammad Secondary School, Doha, Qatar

ENBM055 A Fully-Integrated and Self-Contained Lab-On-A-Chip Device for Sample Preparation, RNA Amplification, and Detection for Disease Diagnostics
Benjamin Cheung Liu, 16, Sophomore, Arcadia High School, Arcadia, California

ENBM056 A Path to Improving Gene Therapies for Liver-Related Diseases and Cancers through Selectable CRISPR-Cas9 Vectors
Daniel Tang, 18, Senior, West Linn High School, West Linn, Oregon

ENBM057T Real Time Monitoring of Mechanical Heart Valves
Dekel Roth, 18, Senior, Ariel Adar, 18, Senior, Ort Grinberg Kiryat Ti'on, Kiryat Ti'on, Israel
ENBM058 Diagnosing the Puzzle of Autism: A Wearable Micro-Movement Sensing Cap for Early Pediatric Screening

# Samuel Ferguson, 18, Senior, Christian Unified High School, El Cajon, California

ENBM059 Hermes Braindeck: A Brain-Computer Interface for Communication with Patients Initially Classified as Comatose or Vegetative
## Luiz Fernando da Silva Borges, 19, Senior, Instituto Federal de Educacao, Ciencia e Tecnologia de Mato Grosso do Sul - Campus Aquidauana, Aquidauana, Mississippi, Brazil

ENBM060 The Future of Prosthesis: The Design and Production of a Neural Prosthetic Comprised of Ionic Polymer-Metal Composites
# Sydney Victoria McDonald, 18, Senior, Bangor High School, Bangor, Maine

ENBM062 The Morris Orthotic: A Smart Orthotic for Diabetic Patients
Margaret Elizabeth Richey, 17, Junior, Western Albemarle High School, Crozet, Virginia

ENBM063 Membrane-Based Nanostructured Biosensor to Detect Hemolytic Bacteria
Camila Moran-Hidalgo, 15, Freshman, Westdale Secondary School, Hamilton, Ontario, Canada

ENBM064 Manipulating Matter on the Nanoscale: Incorporated Branched Junction Inside a DNA Tensegrity Triangle
Mutahara Nurit Bhuiyan, 17, Junior, Jericho Senior High School, Jericho, New York

ENBM065 Engineering and Evaluation of 3D Printed Polymer Scaffolds for Bone Tissue Regeneration
Nipun Udaar Jayatissa, 16, Sophomore, Maumee Valley Country Day School, Toledo, Ohio

ENBM066 Engineering a Device to Improve Vision via Photoactivation
Isabelle Louise Chambers, 15, Freshman, Woodhaven Academy, Fargo, North Dakota

ENBM067 Identifying Limiting Nutrient on Stem Cell Spheroid Viability for Human Cardiac Tissue Regeneration
Jenny Junru Yao, 17, Junior, Academic Magnet High School, North Charleston, South Carolina

ENBM068 Refining a Novel Device to Decrease the Risk of Vesicovaginal and Rectovaginal Fistulae during Labor
# Lori Liu Zhang, 17, Junior, High Technology High School, Lincroft, New Jersey

ENBM069 A Novel Isothermal Microfluidic Device to Detect Salivary MicroRNAs in Breast Cancer
Lucas Jeffrey Penny, 18, Senior, Grimsby Secondary School, Grimsby, Ontario, Canada

ENBM070 Efficient Genome Editing of Mammalian Cells via Novel sgRNA Architectures and Cas9 Endonuclease
Rania Abdullah Alghamdi, 18, Senior, Dharan Ahliyya Schools, Dharan, Eastren Province, Saudi Arabia

ENBM071 Flexible Low-Cost Sensory Patch for Chronic Wheezing Detection
Abdullah Mohammed Almansour, 18, Junior, Dar Alfikr Schools, Makkaah, Saudi Arabia

ENBM072 Biophysical Validation of Electroporation as a Unique Method of Improving Oral Hygiene and Reducing Systemic Morbidity: Development of a Novel Electroporating Toothbrush (ePrush)
Hemanth Ojas Asirvatham, 15, Freshman, Century High School, Rochester, Minnesota

ENBM073 Developing a Cost Effective 3D Printed Hand with Speech Recognition
# Alan Wei Hwang, 18, Senior, Hershey High School, Hershey, Pennsylvania

ENBM074 A Real-Time Vein Imaging System Using Image Processing Algorithms on Images Obtained from a Standard Smartphone Camera
FNU Chaitanya, 18, Senior, FNU Geeve, 18, Senior, Little Rock Indian School, Brahmavara, Karnataka, India

ENBM075 Nanopatterned Polystyrene Polymer with Bactericidal and Bacteriostatic Properties against Salmonella enterica ATCC 43975 and Bacillus cereus ATCC 14579
Nishant Lakmikant Vekaria, 16, Sophomore, Mansi Navin Hirani, 15, Sophomore, Shree Cutchi Leva Patel Samaj School, Nairobi, Nairobi, Kenya

ENBM076 Smart Sock: The Research of Tensoreisitive Sensors' Operating and Usage in Innovative Technologies
Daniela Gods-Romanovska, 20, Senior, Zane Greta Grants, 19, Senior, Rigas's French Lyceum, Riga, Vidzemes Priekspilseta, Latvia

ENBM077 Alzheimer's Treatment: Solubilized Curcumin via Trans-Buccal Patch
Kathryn Elizabeth Savage, 16, Sophomore, Sarasota High School, Sarasota, Florida

ENBM078 Neo-Sole Accelerometer-Based Remote Communications Fall Detection Device
Jake Evan Brooks, 16, Freshman, Saurab Dhaval Shah, 16, Sophomore, Cherry Hill High School East, Cherry Hill, New Jersey

ENBM079 Can of-DS and rVAR2 Methods Detect Early Stage Cancer?
Frederikke Moll Engesgaard, 20, Senior, Norresundby Gymnasium & HF, Norresundby, Nordjylland, Denmark

ENBM080 Investigation of a Novel Saccade-Based Diagnostic for Rapid Concussion Detection
Helen Gordan, 19, Senior, Menlo-Atherton High School, Atherton, California

ENBM081 A Technology Assisted Ketone Detecting Patch for the Noninvasive Detection of Type 1 Diabetes
# Anna Quinlan, 16, Sophomore, Menlo-Atherton High School, Atherton, California

ENBM082 Cancer Application Using Magnetosomes
Elena Fungyuan Yuan#, 18, Junior, Cristian Ionut Costin#, 17, Junior, International Computer High School of Bucharest, Bucharest, Romania

ENBM084 Dilantin Insole to Reduce Damage Inflicted by Peripheral Neuropathy
Emily Reid Tenzer, 17, Sophomore, Roanoke Valley Governor's School, Roanoke, Virginia

ENBM085 Novel Nanoscale Approach to Combat Disease: Electrically Stimulated Drug Release from Biodegradable PCL Nanofilms
Rohan Mehrotra, 17, Junior, Lynbrook High School, San Jose, California
Cellular and Molecular Biology

CELL001 Galectin-4 and the Functions of N- and C- Terminal Domains in Innate Immunity
Marissa Rose McDonald, 18, Junior, Union Grove High School, McDonough, Georgia

CELL002 Temporal Dissection of Microtubule-Based Motor CENP-E in Mitosis
Wuzhekal Zeng, 17, Junior, Hefei No. Eight Senior High School, Hefei, Anhui, China

CELL003 Effect of Thymol on Telomerase Systems: A Potential “Catch-All” Cure for Cancer Therapy
#
Eric Yiyang Wang, 18, Senior, Chattahoochee High School, Johns Creek, Georgia

CELL004 Optimization of Zinc Oxide Nanoparticles for Vaccine Delivery
#
Hari Sowrirajan, 17, Junior, Cherry Creek High School, Greenwood Village, Colorado

CELL005 Can Oxidative Stress Increase Transcriptional Mutagenesis and Aggregate Apha-Synuclein Protein?
Jemma Elizabeth Clary, 17, Junior, Caddo Parish Magnet High School, Shreveport, Louisiana

CELL006 Controlling Noxa Protein Expression by a Novel Approach to Study Its Function in Leukemic Cells, Phase II
Geetanjali Rajamani, 18, Senior, Highland Park Senior High School, Saint Paul, Minnesota

CELL007 Exosomes as Vaccine Candidates for Flavivirus Including Zika Virus
Floyd Jensen Rubonal, 18, Senior, Waipahu High School, Waipahu, Hawaii

CELL008 Using Genome Sequencing to Develop a Probiotic within the Turkey Gastrointestinal Tract
Joshua Matthew Proehl, 17, Junior, New London-Spicer High School, New London, Minnesota

CELL009 Exploring the Relationship between the PITX3 Gene and Pituitary as a Site for Neural Regeneration through Blastocyst Complementation of Knockout Brains for the Treatment of Neural Degenerative Diseases
Gauri Chitra Binoy, 18, Senior, Wayzata High School, Plymouth, Minnesota

CELL010 The Mutagenesis of the PD-L1 Inhibitory Ligand to Identify the Binding Site of the Novel PD-L1/B7-1 Pathway
Alyssa Nicole Klee, 17, Junior, Somers High School, Lincolndale, New York

CELL012 The Effects of Glucose on the Behavior and Nervous System of C. elegans
Abhishek Shah, 17, Senior, John H. Guyer High School, Denton, Texas

CELL013 STITCHER 2.0: Primer Design for Overlapping PCR Applications
Isabel Urieregka Herburger, 18, Senior, School Without Walls High School, Washington, District of Columbia

CELL014 Role of Autophagy on HIV Tat-Induced Intracellular Calcium Release in Murine Astrocytes
Amanda Rocío Maytin, 18, Senior, Medical Academy for Science and Technology at Homestead, Homestead, Florida

CELL015 Development of an Antigen-Detection Diagnostic Assay for Lyme Disease
Sophia Tang, 19, Senior, Boston Latin School, Boston, Massachusetts

CELL016 Autism and Genetics: Understanding the Role of AUTS2 in the Pathology of Autism Spectrum Disorder
Katherine Anne Miles, 18, Senior, Sleepy Hollow High School, Sleepy Hollow, New York

CELL017 Drosophila melanogaster's Mutant Reaction to UV Radiation with a Link to the p53 Gene
Katelin Marie Baird, 18, Senior, James Clemens High School, Madison, Alabama

CELL018 Role of Circular RNAs in Drosophila Innate Immunity
Julia Situ, 16, Sophomore, Canyon Crest Academy, San Diego, California

CELL019 Predicting Paths to Prostate Cancer: The Role of Inorganic Arsenic in Estrogen Receptor Mediated Signaling Pathways
Anusha Ebrahim, 19, Senior, Whitney M. Young Magnet High School, Chicago, Illinois

CELL020 Tactile Stimulation of the Tongue Elicits the Activation of TrkC Neurons in the Trigeminal Ganglion
Madison Andrea Sneve, 18, Junior, duPont Manual High School, Louisville, Kentucky

CELL021 Epigenetic and Biotransformation Effects of Hookah Smoke Extract on Human Oral Keratinocytes
Anusha Zaman, 16, Sophomore, Baton Rouge Magnet High School, Abton Rouge, Louisiana

CELL022 The Role of PAG1 and the SFKs in Neuroblastoma Tumor Formation and Invasion
#
Shelby Auchincloss Kinch, 17, Junior, Heligate High School, Missoula, Montana

CELL023 Identification of TBX3 as a Novel Regulator of Lung Angiogenesis
Michael Lai, 18, Senior, Jericho Senior High School, Jericho, New York

CELL024 Circumventing Traditional Bottlenecks in Gliona Genetic Therapy: Ultra-pH Sensitive Nanodelivery Vehicles
Marc Huo, 17, Junior, Jericho High School, Jericho, New York

CELL025 Assessing the Efficacy of Pentachloropseudilin as an Inhibitor of Slow Adaptation in Hair Cells
Chinmai A. Deo, 17, Junior, Ossining High School, Ossining, New York

CELL026 The Identification of Candidate NBA1 Interacting Proteins
Jeffrey Zhang Ma, 17, Junior, Edgemont High School, Scarsdale, New York

CELL027 Development and Characterization of a Novel Zinc-Finger Construct for Targeted Epigenetic Modification
#
Jessica Jasing Sun, 17, Senior, Parkway Central High School, Chesterfield, Missouri

CELL028 Determining RNA Interference in Mouse Embryonic Stem Cells and Their Differentiated Cells Using a Novel dsRNA-Based Antiviral Assay
##
Jason Guo, 18, Senior, Oak Grove High School, Hattiesburg, Mississippi

CELL029 Understanding the Proteins Involved in Regenerative Angiogenesis
Riya Palikonda, 18, Senior, The Governor’s School for Science and Technology, Hampton, Virginia

CELL030 Moving Towards the Cure: Investigating the Effect of cAMP-Dependent Molecular Mechanisms on the Regulation of MAPT Gene Expression and the Formation of Neurofibrillary Tangles to Identify Drug Targets for Alzheimer's Disease
###
Jay Chandar, 18, Senior, Canterbury School, Fort Myers, Florida

CELL031 Characterization of Platelet Endocytosis and Its Role in Immunity
Thirushan Wignakumar, 17, Senior, Paul Laurence Dunbar High School, Lexington, Kentucky
 Division or Inhibition? The Effect of Antioxidants on Cell Division and Differentiation
Gayathri Plakkot, 17, Junior, Huntingtown High School, Huntingtown, Maryland

A Novel Approach to Understanding Cancer: The Effects of Antitumor Agents in P53 Gene Expression on the Early Development of Zebrafish Embryos
Ashlynn Anne Gallagher, 18, Junior, W.F. West High School, Chehalis, Washington

The Synergistic Effect of Imatinib and Allicin: A Potential Therapeutic for BCR-ABL1-positive Leukemia
# Jamie Lim, 17, Junior, Murphy High School, Mobile, Alabama

Dimerization Domain of SSRP1 as a Dominant Negative FACT Inhibitor
Thierry Juang, 17, Junior, City Honors School, Buffalo, New York

A Novel Systemic Approach to Cardiometabolic Disease with Dual Therapeutics
# Marissa Sumathipala, 17, Junior, Broad Run High School, Ashburn, Virginia

Proliferation of Natural Killer Cells and the Anti-Inflammatory Cytokine Interleukin-4 in a Model of Infantile Spasms
Lior Raz-Farley, 18, Senior, Michelle Zhang, 18, Senior, Ossining High School, Ossining, New York

Hur Spatial Localization Is Affected by p38 MAPK Phosphorylation upon T-Cell Activation
Rocio del Mar Aviles Mercado, 18, Senior, Pablo Colon Berdecia, Barranquitas, Puerto Rico

Determining the Presence of Genetically Modified Organisms in Our Daily Foods
Paulina Minguela Torres, 16, Sophomore, Liceo Aguadillano, Barranquitas, Puerto Rico

Impact of Substance Use on Salivary Cytokine Levels in Healthy Female Individuals
Miranda Li, 17, Junior, Crescenta Valley High School, La Crescenta, California

Alpha-Synuclein Oligomers and Mitochondrial Membrane Permeabilization: A Potential Cytotoxic Mechanism in Parkinson's Disease
Bowen Jing, 18, Junior, West Lafayette Junior-Senior High School, West Lafayette, Indiana

The Effect of Mechanical Compression on Cancer Cell Proliferation
Katharine Tang Shao, 17, Junior, Detroit Country Day School, Beverly Hills, Michigan

Modeling and Experimental Characterization of IgE Receptor Signaling, Year Two
# Alexander Latchesarov Ionkov#, 18, Junior,
# Priyanka V. Velappan#, 18, Junior,
Los Alamos High School, Los Alamos, New Mexico

Elucidating the Roles of the REST C-Terminus and CoREST1 in Zebrafish Neural Development and Behavior
Karen Jiang, 18, Senior, Horace Mann School, Bronx, New York

Site-Specific Integration of Large DNA Fragments: Evaluating and Redesigning Genome Editing Systems
# Kshitij Sachan#, 17, Junior,
# Yesh Satyajit Doctor#, 17, Junior,
Plano East Senior High School, Plano, Texas

Neurotrophin Receptor Isoform Expression Analysis in Breast Invasive Carcinoma: Potential Considerations for Targeted Therapy and Precision Medicine
Vaishnavi Phadnis, 17, Junior, Nikola Tesla STEM High School, Redmond, Washington

The Effects of Western Diet on Sarco/Endoplasmic Reticulum Ca2+-ATPase Expression and Calcium Dysregulation in the Brain
Sarah Shirley, 16, Sophomore, Little Rock Central High School, Little Rock, Arkansas

Lecithin-Retinol Acyl Transferase in Squamous Cell Carcinoma: The Relationship between Oncology and Wound Repair
Emily Ann Peterson, 18, Senior, Smithtown High School East, St. James, New York

An Investigation into Caffeine as a Migraine Treatment and Its Effects on the Severity of Spreading Depolarizations
# Rusty Warren Ludvigsen, 17, Sophomore, The Early College Academy, Albuquerque, New Mexico

Retain CHD7, an Epigenetic Regulator, in the Nucleus to Combat Breast Cancer Metastasis
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Nadley Aisuan, 17, Junior, Rialto High School, Rialto, California

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Arjun Raghav Somayazulu, 17, Junior, Westview High School, Portland, Oregon

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Zaid Haque, 17, Junior, Saginaw Arts and Sciences Academy, Saginaw, Michigan

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# Sara Mohammed Alkabbi, 17, Junior, Qatar Banking Studies and Progenitors
BA High School for Girls, Doha, Qatar
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Ivan Emmanuel Cordova Rivera, 18, Junior,
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Xian Jing Koay, 17, Junior,
Zhan Yi Chng, 17, Junior,
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Alexandra Samoylova, 18, Junior,
Maria Makarova, 18, Junior,
Moscow Chemical Lyceum of Moscow South-Eastern Lyceum and Grammar School Complex, Moscow, Moscow, Russian Federation

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Brian Ling Ho, 19, Senior, Plano West Senior High School, Plano, Texas

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Vijay M. Shah, 19, Senior, Niles West High School, Skokie, Illinois

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Yi-Chen Chen, 18, Junior,
Taipei First Girls High School, Taipei City, Taiwan, Chinese Taipei

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Al-Hasaad Al-Tarbawi School, Amman, Jordan

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Alex Hamilton Scharein, 15, Freshman, Rural Special High School, Fox, Arkansas

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Jake Bringetto, 15, Freshman, Clovis West, Fresno, California

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# Shrikant Chand#, 17, Junior,
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# Detroit Country Day School, Beverly Hills, Michigan

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Suganth Kannan, 18, Senior, American Heritage School, Plantation, Florida

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# Andrea Lynn Noronha, 17, Senior, Redlands High School, Redlands, California

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# Xander Owen Jones, 16, Sophomore, Navajo Preparatory School, Farmington, New Mexico
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Earth and Environmental Sciences

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Kenneth Marshall West, 17, Sophomore, Melbourne High School, Melbourne, Florida

EAEV006 Investigating Flood Warning Systems
Ray Mutsahuni, 13, Freshman, Irene Christian College, Harare, Zimbabwe

EAEV007 Detection and Removal of Dinotefuran from the Environment: A Multi-Year HPLC-MS Analysis
Raley Schweinfurth, 18, Junior, Oregon Episcopal School, Portland, Oregon

EAEV008 Determination of Size and Concentration of Water Droplets in Experiments with Wilson Chamber
Evgenij Sergeevich Goncharov, 19, Junior, Municipal Budget Educational Institution “Lyceum No. 3”, Sarov, Nizhegorodskaya Region, Russian Federation

EAEV009 Difference in Antibiotic Resistance on Biofilms vs. Whole Water Samples in an Aquatic Environment
Gabrielle Amri Barreto, 15, Freshman, Skyview Academy, Highlands Ranch, Colorado

EAEV010 Groundwater Quality of the Aquifers Underlying the Mississippi Embayment and the Gulf Coastal Plain
Krishna K. Patel, 18, Senior, Arkansas School for Mathematics, Sciences, and the Arts, Hot Springs, Arkansas

EAEV011T The Synthesis of High Oil Affinity Ester Macro Molecule with Renewable Resources
Pok Him Michael Leung, 17, Junior, King Lun Chan, 17, Junior, Yu Hin Ching, 17, Junior, Po Leung Kuk Ngn Po Ling College, To Kwa Wan, Kowloon, China, Hong Kong Special Administrative Region

EAEV012 Use of Waste Carbon Dioxide as a Renewable Reagent to Catalytically Synthesize Commercially Useful Cyclic Carbonates
Meghana Chowdary Bollimpalli, 16, Sophomore, Little Rock Central High School, Little Rock, Arkansas

EAEV013T Black Carbon Detection: A Regional Snow Survey
Nathaniel David Miner, 16, Sophomore, Drake Lee Ludgate, 16, Sophomore, Brush High School, Brush, Colorado

EAEV014 The Effects of Bacillus Bacteria on the Invasive Species Lemna minor (Duckweed)
Claire Elizabeth Wentzlaff, 18, Junior, Burnsville High School, Burnsville, Minnesota

EAEV015 Testing the Waters: Development of A Novel Chitosan-Based Water Filter for Industrial and Third World Applications
Khushi Thakkar, 15, Freshman, T. C. Jasper High School, Plano, Texas

EAEV016 Impact of Ocean Acidification on Relative Fitness and Interspecies Interactions of Picophytoplankton
Margaret Amelia Knight, 18, Senior, Alabama School of Fine Arts, Birmingham, Alabama

EAEV017T Mass-Transfer Theory versus Pan Evaporation
Jacob Carson Wells, 18, Senior, Emily Morgan Hough, 18, Senior, Casey James Ryan, 19, Senior, South Sumter High School, Bushnell, Florida

EAEV018 Arsenic Contamination through Tsunami Wave Movement in Hawaii: Investigating the Concentration of Heavy Metals in the Soil from the 1960 Hilo, Hawaii Tsunami
Jared J.K. Goodwin, 16, Sophomore, Hilo High School, Hilo, Hawaii

EAEV019 Are These Plants GMO?
Luis Nicolaus Pires, 16, Sophomore, Excel High School, Boston, Massachusetts

EAEV020 The Effect of Wi-Fi on Plant Health
Kristen Elizabeth Stawasz, 17, Junior, Westfield High School, Westfield, Massachusetts

EAEV021 Taking the Pulse of Tar Creek: A Lab and Field Study of Macroinvertebrates in Tar Creek Coupled with a Heavy Metal Water Analysis
Macey Middleton, 18, Senior, Grove High School, Grove, Oklahoma

EAEV022 Moringa oleifera: Purify Your Water Supply
Maya Cameron Navar, 16, Junior, Radford School, El Paso, Texas

EAEV023 The Effect of Light on Fireflies
Savannah Madison Long, 18, Senior, Mountain Vista Governor’s School, Middletown, Virginia

EAEV024T A Geochemical Investigation of Volcaniclastic Rocks from Northern Taiwan: A Provenance Study
Pin-Lan Liu, 18, Senior, Hsu-Feng Ou, 19, Senior, The Affiliated Senior High School of National Taiwan Normal University, Taipei City, Taiwan, Chinese Taipei

EAEV025T Crumb Rubber for Artificial Turf: The Effect on Water Systems by Heavy Metal Leaching
Chase T. Cleveland##, 19, Senior, Connor N. Cleveland#, 17, Junior, Fort Walton Beach High School, Fort Walton Beach, Florida

EAEV026 The Study of Hemiurgus sanguineus Population Density and Genetic Variation
Margaret Stein, 18, Senior, Archbishop Williams High School, Braintree, Massachusetts

EAEV027 Determination of Soil VOC Content due to Coal Dust Deposition along Major Railroad Transportation Routes
Sierra Nicole Spears, 17, Junior, Lingle-Fort Laramie High School, Lingle, Wyoming

EAEV028 Investigating the Effects of Nanosilver in Pond Water Quality
Laura Zampani, 18, Junior, American School of Campinas, Campinas, Sao Paulo, Brazil

EAEV029 Characterization of the Pyroelectric and Piezoelectric Effect Exhibited by Alpha-Crystalline Silicon Dioxide: Potential Application as a Micro-Thermovoltaic Transducer
Jenna Marie Salvat, 17, Sophomore, Coronado High School, Colorado Springs, Colorado
EAEV030 Increasing the Sustainability of a Heterotrophic Algae Biomass Production System: A Six Year Study of Chlorella vulgaris
Alexandra Katrina Gabrielski, 19, Senior, Viera High School, Viera, Florida

EAEV031 To Drink or Not to Drink: The Lysis of Escherichia coli by Ultraviolet Light through a MakeShift Filtration System, Part Two
Abigail Lynn Rademaker#, 19, Senior, Taylor Michelle Lawrence#, 18, Senior, Delavan High School, Delavan, Illinois

EAEV032 Using 3D Modeling to Save our Reefs: Accuracy of Reef Assessment Techniques Using Structure from Motion
Clara Megan Benadon, 16, Sophomore, Alle Mary Battista, 16, Sophomore, Poolesville High School, Poolesville, Maryland
Our Lady of Good Counsel High School, Olney, Maryland

EAEV033 Impact of Road Salt Usage on Atmospheric Concentrations of Cl & Na PM 2.5
Rashad Keith Prendergast, 18, Senior, Cass Technical High School, Detroit, Michigan

EAEV034 Impacts of Altered Precipitation Regimes on the Distribution of Dryland Soil Nitrogen
Jarek Vincent Kwieciinski, 17, Senior, Albuquerque Institute for Math and Science, Albuquerque, New Mexico

EAEV035 Using Dropsonde Descending Speed to Determine Vertical Air Velocity in a Hurricane
Megan Taiyue Tang, 17, Junior, York School, Monterey, California

EAEV036 Phototactic Analysis of the Effects of the Chemorepellent Nitrate on Taxis-Based Vertical Column Orientation in Phytoplanktonic Flagellates
Rohan Bhushan, 17, Junior, Monterey High School, Monterey, California

EAEV037 Evaluating the Effectiveness of Lichen as Bioindicators
Isaac Taylor Quinn Klementis, 18, Junior, Gresham High School, Gresham, Oregon

EAEV038 A Comparative Study of Different Plant and Limestone Combinations, and Their Ability to Naturally Mitigate the Harmful Effects of Ocean Acidification on Coastal Coral Reef Health
Lucas Alexander Tomita, 17, Sophomore, Hilton Head Preparatory School, Hilton Head Island, South Carolina

EAEV039 Modeling the Effects of Land Use Change on Flooding in Pacific Northwest Streams to Promote Green Practices
Adam C. Nayak, 17, Junior, Cleveland High School, Portland, Oregon

EAEV040 A Longitudinal Study of Fluctuating Radiation Levels in Prince William Sound, Alaska: A Conclusion to a Four Year Study
Jedediah Emmet Dean, 19, Senior, Colony High School, Palmer, Alaska

EAEV041 Degradation of Nonpathogenic Iridovirus May Improve Food Nutrition in Insects
Shreya Kambam Reddy, 16, Sophomore, Lincoln Park Academy, Fort Pierce, Florida

EAEV042 Stormwater Treatment Area Performance Prediction Using Artificial Neural Networks
William Gao, 17, Junior, Suncoast Community High School, Riviera Beach, Florida

EAEV043 DSSCs and Their Potential for Clean Energy
Joseph Andrew Davide, 18, Junior, Kosciusko Senior High School, Kosciusko, Mississippi

EAEV044 A Study of Westward Recurring Tropical Cyclone Tracks in the Atlantic
Abbigayle Emily Cuomo, 18, Senior, Commack High School, Commack, New York

EAEV045 A Novel Method for Accurately Modeling Past Atmospheric Conditions Using Ice Core Data from Law Dome and WAIS Divide: An Approach to Monitor Future Climate Sustainability
Gilbert Granger Spencer, 17, Junior, Half Hollow Hills High School West, Dix Hills, New York

EAEV046 Impacts of 1,2-Propanediol Effluent Discharge on Reproductive Rates and Dispersion Patterns of Anabaena inaequulis and Chlamydomonas reinhardtii
Nicolas Maxwell Berg, 18, Senior, Bishop Hendricken High School, Warwick, Rhode Island

EAEV047 Evaluating the Viability of Reducing Plastic Waste with Tenebrio molitor
Katie Brooke Hughes, 18, Senior, Bonneville High School, Washington Terrace, Utah

EAEV048 The Correlation between Presence of Radon Gas in Residences and Diagnosis of Type 1 Diabetes
Julia Kathryn Sherman, 18, Senior, West High School, Salt Lake City, Utah

EAEV049 Investigating the Presence of Microplastics in the Gastrointestinal Tract of Mountain Whitefish in the Spokane River
Isaac William Caruso, 18, Senior, Lewis & Clark High School, Spokane, Washington

EAEV050 Estimating CO$_2$ and CH$_4$ Emissions from Washington DC Using Low Cost Sensors and Small Drone Technology
Siona Prasad, 16, Sophomore, Thomas Jefferson High School for Science and Technology, Alexandria, Virginia

EAEV051 From Global Warming to Stronger Economy
Maysa Yasser Farag, 18, Senior, Maha EL-Sayed Arafat, 18, Senior, Maadi STEM School For Girls, El-Maadi, Cairo, Egypt

EAEV052 A Study of the Mineralogy and Texture of the Hot Springs Sandstone
Tristan Bailey Tompkins, 18, Senior, The Arkansas School for Mathematics, Sciences, and the Arts, Hot Springs National Park, Arkansas

EAEV053 A Novel, Cost-Effective Water Filtration and Desalination Technique Based on Biodegradable Superabsorbent Polymers
Joseph Galasso, 17, Junior, Galasso Homeschool, Tucson, Arizona

EAEV054 An Innovative Solution for Water Filtration in Third World Countries
Rohan Patel, 16, Sophomore, Mayo High School, Rochester, Minnesota

EAEV055 Monitoring Drought Conditions in the Sequoia National Forest in California by Using Satellite Imagery
Anthony David Weng, 17, Junior, Terre Haute South Vigo High School, Terre Haute, Indiana

EAEV056 Determination of Lead in Ostrea lurida at Jobos Bay
Nicole Alejandra Colon, 18, Senior, Specialized School of Sciences and Mathematics, Guayama, Puerto Rico

EAEV057 Mineralogical Characterization of Puerto Rico's Beach Sand and Its Relationship to Puerto Rico's Volcanic Origin
Delian Colon, 18, Sophomore, Radians School, Cayey, Puerto Rico
EAEV058 Detection of Built-Up Areas from ERS-2, Envisat and Sentinel-1 Synthetic Aperture Radar Data
Eva-Maria Tonson, 20, Senior, Hugo Treffner Gymnasium, Tartu, Tartumaa, Estonia

EAEV059T Comparison of Hazardness Caused by Different Levels of pH on Phytoplankton
Sieun Park, 16, Freshman, Isabella Machado Freitas Vilela Gouveia, 17, Freshman, Escola Americana de Campinas, Campinas, Sao Paulo, Brazil

EAEV060 Water Potability Device (W.P.D.)
Eros Pegolo, 19, Senior, I.S.I.S. Malignani Udine, Udine, Italy

EAEV061 The Ultimate Fate of Perfluoroamines in the Atmosphere
Peave Mutwiri, 18, Senior, University High School, Tucson, Arizona

EAEV062T Indium Prospecting Using Neural Nets
Joshua L. Tucker, 18, Senior, Spencer James Toll#, 19, Senior, Vero Beach High School, Vero Beach, Florida

EAEV063 Can Ants Help Save the Bees? Developing a Better Model for Screening Pesticide Effects on Honeybee Social Behavior
James Donovan Sappington, 16, Sophomore, South River High School, Edgewater, Maryland

EAEV064T Water Filtration Using Silver Nanoparticle Impregnated Filter-Paper
Mackenzie Wiegand, 16, Sophomore, Madison Clio Wiegand, 16, Sophomore, Taylor Layne Jones, 16, Sophomore, Simms High School, Simms, Montana

EAEV065T Estimation of the Humidity in the Upper Troposphere Using Contrails Formed by Airplanes
Mizuki Koshiba, 18, Senior, Hinata Koizumi, 17, Senior, Shio Furueda, 18, Senior, Aomori Prefectural Aomori Minami Senior High School, Aomori, Japan

EAEV066 Goo Be Gonel Cleaning Up Oil Spills with Magnets and Nanotechnology
Vanessa Stephanie Siggers, 16, Freshman, Murphy High School, Mobile, Alabama

EAEV067 Factors Affecting the Discharge of Micro-Plastic Fibers from Household Laundry
Noel Katherine Lange, 16, Sophomore, Auburn High School, Auburn, Alabama

EAEV068 Mathematically Cutting to the Bone: Solving Analytical Problems in ESR Dating the Paleolithic Site at Isimila, Tanzania
Neeraj Sakhriani, 18, Senior, Bronx High School of Science, Bronx, New York

EAEV069 A Novel Methodology for Co-Clustering Identification and Analysis for Endemic Plants with Applications to Conservation and Agricultural Planning
Gregory Shogo Gueorguiev, 18, Senior, Bronx High School of Science, Bronx, New York

EAEV070T Micro and Nano Engineering for Wastewater: Toxic Cr(VI) Remediation Using Biochar and Nanoparticle from Wastewater
Pattiyage Shehan Kavishka, 19, Senior, Alujilage Sankalpa Perera, 19, Senior, S.D.e.S. Jayasinghe Central Collage, Dehiwala, Western, Sri Lanka

EAEV071T Biodegradable Plastic from Gelidium pusillum
Hassan Rizwan, 17, Senior, Mansoor Ahmed, 15, Freshman, Pak Turk International School and Colleges, Karachi, Sindh, Pakistan

EAEV072 The Extraction of Oil from Chlorophyta algae in Different Water Environments
Raul Ignacio Vila-Olazabal, 17, Junior, Colegio San Ignacio de Loyola, San Juan, Puerto Rico

EAEV073 Soil Quality in Developed and Agricultural Areas: How Does Neighborhood Development Degrade Homeowners’ Soil?
Jin Cho, 17, Junior, Paul Laurence Dunbar High School, Lexington, Kentucky

EAEV074 Nanosilver: Biohazard or Breakthrough
Bryan Martinez, 16, Freshman, Trenton High School, Trenton, North Dakota

EAEV075 America's Farming Future: The Impact of Climate Change on Crop Yields
Lillian Kay Petersen, 15, Freshman, Los Alamos High School, Los Alamos, New Mexico

EAEV076 Population Dynamics in D. magna When Exposed to Minute Concentrations of Silica Gels
Carl Arthur Whitesel, 18, Senior, Arizona College Preparatory-Erie, Chandler, Arizona

EAEV077 Natural Attenuation of Titanium Dioxide (TiO₂) Nanoparticles Photo-Catalysis, Phase II: Marine Systems
Rayna Shianne Ellison, 18, Junior, Latta High School, Ada, Oklahoma

EAEV078 Bamboo Forest as a Natural Levee of Pyroclastic Flows in Merapi Volcano
Azizah Dewi Suryaningsih, 18, Senior, State Senior High School 1 Yogyakarta, Yogyakarta, DI Yogyakarta, Indonesia

EAEV079T Scientific Wisdom behind Yogyakarta Palace's Sustainable Resilience to Natural Hazards
Najmuna Ratni Lakshita, 18, Senior, Sakina Yaumil Fitri, 19, Senior, SMA Negeri 1 Yogyakarta, Yogyakarta, DI Yogyakarta, Indonesia

EAEV080 The Effects of Boat Traffic on Water Quality as Measured by Levels of Turbidity, Colored Dissolved Organic Matter, and Chlorophyll A
Melissa June Marchese, 18, Senior, Canterbury School, Fort Myers, Florida

EAEV081 Effect of Stream Nutrients on Benthic Algal Overgrowth in Vatia Bay
Gabrielle Tepora Langkilde, 18, Senior, Carver High School, Pago Pago, American Samoa

EAEV082 The Effects of Nanosilver on Planaria
Isabella Marie Sanchez, 15, Freshman, Manatee High School, Bradenton, Florida

EAEV083 PET Degradation by Ideonella sakaiensis: A Hypothetical Model
Angelica Mercedes Sinclair, 15, Senior, Manatee High School, Bradenton, Florida

EAEV084 The Effects of Low Levels of Radiation on Physarum polycephalum
Levi Stephen Hrabos, 17, Sophomore, Northwestern High School, Kokomo, Indiana

EAEV085 Developing a Numerical Box Model to Compute Algae Concentration, Year Two
Sichen Shawn Chao, 18, Senior, Oxford High School, Oxford, Mississipi

Anushka M. Nair, 17, Sophomore, Lake Oswego High School, Lake Oswego, Oregon
EAEV087  Cleaning It Up! Self Filtration Container
   Riley James Watson, 18, Junior,
   Mark Austin Palmertree, 19, Senior,
   Kosciusko Senior High School, Kosciusko, Mississippi

EAEV088  An Innovative Crowdsourcing Approach to Monitoring Freshwater Bodies
   Sahithi Rohini Pingali, 17, Junior, Inventure Academy, Bengaluru,
   Karnataka, India

EAEV089  In Hot Water—Consequences for Global Fresh Water Quality:
   A Quantitative Study on the Effects of Rising Freshwater Temperatures on Water Chemistry and Microorganism Biomass and Productivity
   Eleanor Lawton-Wade, 17, Junior, Presbyterian Ladies College Sydney, Sydney, NSW, Australia

EAEV090  Air Purifier Using Water for Fine Particle Reduction in School
   Hyeryeong Kim, 15, Freshman,
   Nayoung Kim, 15, Freshman,
   Buil Girls' Middle School, Incheon, Incheon Metropolitan City, South Korea

EAEV091  Human Impacts on Coral Reefs
   Shasta B. White, 17, Junior,
   Sonata Yazmee Beasley, 17, Senior,
   Kapaa High School, Kapaa, Hawaii
Embedded Systems

EBED001 Silicon Diode Spectrometer
José Gaiduske, 19, Senior, DELTA - Strední Skola Informatiky a Ekonomie, Zakladni Skola a Materska Skola, S.R.O., Pardubicke, Pardubicky Kraj, Czech Republic

EBED002T AcquaNetwork: Measurement and Analysis System For Residential Water Consumption
Jean Diego Silva Fontena, 20, Senior, Rafael Hoffmann Zibetti, 19, Senior, Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha, Novo Hamburgo, Rio Grande do Sul, Brazil

EBED003T A.T.S.P. (Autonomic Thermal Soaring Platform)
Florian André Vahl, 18, Senior, Etienne Philippe Neumann, 18, Senior, Friedrich Maximilian Schiller, 18, Senior, Johannes-Brahms-Schule, Pinneberg, Schleswig-Holstein, Germany

EBED004 A Novel Anti-Interference & None Misjudgment Digital Optical Sensor
Chentian Li, 17, Sophomore, No. 1 High School Zuhuai City, Zuhuai, Guangdong, China

EBED005 Photosensitive Panoramic Photography Device
Hin Wang Lin, 19, Senior, Yuen Long Merchants Association Secondary School, Hong Kong, China, Hong Kong Special Administrative Region

EBED006 Safe with Me Now: A Novel System to Prevent Vehicular Hyperthermia in Children
Jessica Mengxin Yu, 16, Sophomore, West Linn High School, West Linn, Oregon

EBED007 Development of an Assistive and Rehabilitative Hand Orthosis and Its Complementary Control Systems
Muhammad Nuhan Ahnaf, 18, Senior, Plano East Senior High School, Plano, Texas

EBED008 A Smart Bionic Leg Brace: An Electromechanically Actuated Active-Assist Wearable Orthotic Device for Comprehensive Restoration of Gait Characteristics across Everyday Mobility Scenarios
Syamantak Payra, 16, Junior, Clear Brook High School, Friendswood, Texas

EBED009 Developing a More Efficient Quantum Protocol Using Vehicle Signals and Photon Polarization
Evan McKenna Meade, 18, Junior, Keystone School, San Antonio, Texas

EBED010T Homemade Cycling Power Meter
Benjamin Marsan, 17, Sophomore, Katelynn Giuli Marsan#, 19, Senior, Dripping Springs High School, Dripping Springs, Texas

EBED011 Smart Seniors Care
Raad Amer Kloob, 15, Freshman, Al-Omaryah Schools, Amman, Jordan, Jordan

EBED012 Automatically Reproducing Live Performances of Violins via Novel Sound-Post Controlled Electrification
Aito Tanaka, 18, Senior, Hiroshima University High School, Fukuyma, Fukuyma-city, Hiroshima-pref, Japan

EBED013 Battery System Optimization and Development of a Novel Rapid-Response Bioelectronics Device
Rahul Lall, 18, Senior, Auburn High School, Auburn, Alabama

EBED014 A Vibrating Watch for the Visually Impaired
Michelle Loven, 17, Junior, The Massachusetts Academy of Math and Science, Worcester, Massachusetts

EBED015 EYERONIC2
Marc Miguel Cline Mirabal, 16, Freshman, Grants High School, Grants, New Mexico

EBED016T Hi-Viz Bike
Declan Lang Predavec, 14, Freshman, Callum Lang Predavec, 16, Junior, Mosman High School, Sydney, NSW, Australia

EBED017 The Heat Free Car: Vehicular Heatstroke Prevention System (Second-Generation Prototype)
Scott Andrew Soifer, 17, Junior, North Shore Hebrew Academy High School, Great Neck, New York

EBED018 Epi-Phone Auto-Locator
Maya Arie Van Houten, 16, Sophomore, Covenant Christian Academy, Huntsville, Alabama

EBED019T Economical Optimal Optical Obstacle Proximity Detector
Russell Collin Ro, 17, Junior, Adam Walker, 17, Junior, Advanced Technologies Academy, Las Vegas, Nevada

EBED020 SafeSeat
Andrew Barbaro, 18, Junior, Carroll High School, Dayton, Ohio

EBED021 JustStep: Voice Message System for Tactile Ground Surface Indicator (TGSI)
Lorena Santos Vilas Boas, 19, Senior, Instituto Federal da Bahia (IFBA) - Campus Salvador, Salvador, BA, Brazil

EBED022 Highly Sensitive E. coli Bacteria Detection through the Integration of Gold Nanodisk Plasmon Resonance and Antibody-Antigen Binding
Sophie Joy Guo, 17, Junior, James Clemens High School, Madison, Alabama

EBED023 ResQ: A Low Cost, Wearable, Automatic Fall Detection Device for Senior Citizens
Arya Vikrantth Goutam, 17, Sophomore, The Nueva School, San Mateo, California

EBED024 Increasing Wifi Signal Strength Using a Phased Array Helical Antenna System
Alisa Yukina Hathaway, 17, Junior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

EBED025 Use of a Novel Arduino System as a Sensor for Detecting and Controlling Mosquito Populations
Alberto Gustavo Rodriguez-Masso, 17, Junior, Colegio Rosa-Bell, Guaynabo, Puerto Rico

EBED026 Smart Garden
Frida Sofia Andrade Sierra, 18, Senior, Colegio de Estudios Cientificos y Tecnologicos del Estado de Queretaro, Corregidora, Queretaro, Mexico

EBED027 Smart Road Signs: The Bluetooth LE-Based Safety System for Pedestrians
Seung Heon Song, 18, Sophomore, Gould Academy, Burke, Virginia

EBED028 High Resolution Weather Tracking: A Micronet
Brenden Chandler Duffy, 17, Junior, Lake Braddock Secondary School, Burke, Virginia

EBED029T Clap Detecting System Using a Raspberry Pi
Dania Maraliz Villafuerte-Gonzalez, 16, Sophomore, Sofia El Badaoui-Rivero, 17, Sophomore, Colegio Mater Salvatoris, San Juan, Puerto Rico

EBED030 Visualizing Sound Decibels
Daniela Del Mar Villafuerte, 18, Senior, Academia San Jose High School, Guaynabo, USA, Puerto Rico
EBED031 LaserWAN - Laser Broadband Internet Connections
Valerio Pagliarino, 17, Junior, I.S. Nicola Pellati, Nizza
Monferrato, Asti, Italy

EBED032 Real-Time Sound Localization Using a Microphone Array
Joseph Aldo Sartini, 19, Senior, Arkansas School for Mathematics, Sciences, and the Arts, Hot Springs, Arkansas

EBED033 Monitoring of Arsenic in Groundwater Sources using an Innovative IoT Sensor
Anjali Chadha, 15, Sophomore, duPont Manual High School, Louisville, Kentucky

EBED034 Smart Digital Psychrometer for Forecasting Local Weather
Made Radikia Prasanta, 17, Junior, Bagus Putu Satria Suarima Putra, 17, Junior, SMA Negeri Bali Mandara, Buleleng, Bali, Indonesia

EBED035 Bringing ‘Sight’ with ‘Touch’: Making wearable Walking Assist Device for Blind
Geonyeok Lee, 18, Senior, Seungmok Han, 18, Senior, Yuhwan Shin, 18, Senior, Gyeongsangnam Science High School, Jinju-si, Gyeongsangnam-do, South Korea

EBED036 Balance Temperature, Conveniently: Designing an Affordable and Easy-to-Implement Wireless Zoning System
Benjamin Jiang, 17, Junior, duPont Manual Magnet High School, Louisville, Kentucky

EBED037 Mind Hand: A Comprehensive Solution Supports Two-Way Communication for the Deaf Mute
Thao Chi Hien Nguyen, 17, Junior, Tran Ngan Thi Tran, 17, Junior, Tran Phu Gifted High School, Hai Phong, Viet Nam

EBED038 Translating Glove for the Deaf-Mute Compatible with Smartphones
Minh Duc Hoang Chu, 17, Junior, Tan Thien Pham, 17, Junior, Le Hong Phong High School for the Gifted, Ho Chi Minh City, Viet Nam

EBED039 Bracelet Aid for Blind People
Mujtaba Sajjad Kamani, 17, Junior, Aga Khan Higher Secondary School, Karachi, Sindh, Pakistan

EBED040 3D POV Display
Evan Eugene Shrader, 18, Junior, Terre Haute North Vigo High School, Terre Haute, Indiana

EBED041 Using Inertial Navigation Systems (INS) and the Kalman Filter in order to Create a Reliable Navigation Aid for the Blind
Isabelle Paris Chong, 18, Senior, Byram Hills High School, Armonk, New York

EBED042 Assembly of a Novel CO₂ Based Heat Zone Design to Optimize Absorption during Optic Fiber Processing
Eric He, 17, Junior, High Technology High School, Lincroft, New Jersey

EBED043 Gas Detector Alarm System
Peter-Newman Giffa Messan, 17, Junior, Ghana Christian International High School, Accra, Greater Accra, Ghana

EBED044 Development of Microresonator-Based Logic Gates Using Signal Conditioning Circuits
Faisal Abdullah Shafiei, 18, Senior, Abdulrahman Fakieh School, Makkah, Makkah, Saudi Arabia

EBED045 Paper Circuit Printer and Its Applications
Chia-Yu Yeh, 19, Senior, Chung Shan Industrial & Commercial School, Kaohsiung City, Taiwan, Chinese Taipei

EBED046 ThumbFi: Control All Your Devices with Your Fingertips
Sarthak Sethi, 18, Senior, Mohd Faiz Lnu, 18, Senior, Maxfort School Dwarka, New Delhi, India

EBED047 Eco-Phone: A Future Safe Phone with Visible Light and Infrared Communication
Mohammed Sharief, 18, Senior, St. Aloysius Pre-University College, Mangalore, Karnataka, India

EBED048 A Low-Cost, Clutter-Cancelling Life Detection System for First Response after Natural Disasters
Sachin Ganesh Konan, 17, Junior, Hamilton High School, Chandler, Arizona

EBED049 Design, Analysis, and Implementation of a Portable, Low-Cost, and Bluetooth ECG Device
Osman Celikok, 17, Junior, Pleasant View School, Memphis, Tennessee

EBED050 Less Water—More Food?: Real-Time Three-Dimensional Imaging of Soil Moisture Distribution for Intelligent Irrigation
Vasily Antonovich Tremsin, 18, Junior, Campolindo High School, Moraga, California

EBED051 Piezoelectric Based Pressure Sensing Matrix Array
Shahab Fazal, 18, Senior, Loreto College, Manchester, Lancashire, United Kingdom

EBED052 EZsleep: A Low-Cost Wearable Device for Early Diagnosis of Obstructive Sleep Apnea –Validated by a Machine Learning Technique
Mustafa Muhyi, 16, Sophomore, Arrowhead Park Early College High School, Las Cruces, New Mexico
Energy: Chemical

EGCH001 Potatoes Are the Ultimate Solution to our Electricity Problems in Zimbabwe
Pelagia Maria Majoni, 18, Senior, Queen Elizabeth Girls High School, Harare, Zimbabwe

EGCH002 Ultra-Thin Asymmetric Supercapacitor: Utilizing Nano-Porous Nickel and Graphene-Copper for a High Energy Density
Alexander Graziani Mancevski, 17, Junior, Liberal Arts and Science Academy High School, Austin, Texas

EGCH003 A Durable, Portable and Biodegradable Microbial Fuel Cell that Utilizes a Native Plant Based AC Electrode and Optimized Sizing
Rohan Mahesh Wagh, 15, Freshman, Sunset High School, Portland, Oregon

EGCH004 The Straw Carbon Material as the Cathode Material for Lithium-Sulfur Batteries
Liyan Chang, 17, Junior, Shanghai Jianping High School, Shanghai, Shanghai, China

EGCH005 A Cocktail of Natural Dyes as Photosensitizers for Dye-Sensitized Solar Cell
Kai Yui Ho, 17, Junior, Pak Kau College, Hong Kong, China, Hong Kong Special Administrative Region

EGCH006T Hybrid Photovoltaic Cells Based on Biologic and Polymeric Materials
Ioana Andreae Stelea, 17, Sophomore, Miruna Elena Vlad, 18, Junior, International Computer High School of Bucharest, Bucharest, Romania

EGCH007 Economical Oxygen Reduction Electrocatalysts: Alternatives to Platinum for Proton Exchange Membrane Fuel Cells
Anusha Bhattacharyya, 16, Sophomore, Little Rock Central High School, Little Rock, Arkansas

EGCH008 Artificial Photosynthesis: Novel Visible Light Response and Formic Acid Generation from Carbon Dioxide Using Tantalum Oxide/Tantalum Plate
Huiyi Wu, 18, Junior, Ichikawa Gakuen Ichikawa High School, Ichikawa-city, Chiba-pref., Japan

EGCH009 Optimization of Storage Capacity Using Activated Carbon Fibers from Sustainable Agricultural Sources for Hydrogen
Sriram Satyavolu, 17, Junior, Kentucky Country Day School, Louisville, Kentucky

EGCH010 Analysis of Algal Lipid Content to Optimize Biofuel Production
Katherine Beadle, 19, Junior, Bishop Feehan High School, Attleboro, Massachusetts

EGCH011 Hydrogenation as a Method for Upgrading Lignin-Based Bio-Oil to High Value Chemicals
Gabriella T. J. Blatt, 18, Senior, Big Sandy High School, Big Sandy, Montana

EGCH012T Eco-Flex Lite Capacitor
King Fun Chow, 16, Sophomore, Tsun Ting Sin, 16, Sophomore, Guanqun Zhou, 16, Sophomore, The Chinese Foundation Secondary School, Hong Kong, China, Hong Kong Special Administrative Region

EGCH013 Heating Our Way to the Future!
Bryn Taylor Groff, 19, Senior, Sheldon High School, Sheldon, Iowa

EGCH014 Thermoelectric Dry Energy
Yousef Zaid Alnawafeh, 16, Sophomore, Wadi Musa Primary School, Wadi Musa, Jordan

EGCH015T Hydrogen Fuel Cell: Titania Nanotubes as Photoanode
Farah Nurshahirah Binti Mohd Solehin, 16, Sophomore, Zaiyani Binti Bahari, 17, Junior, Mara Junior Science College Kubang Pasu, Jitra, Kedah, Malaysia

EGCH016T Effects of Contaminants on Acid Gas Pyrolysis
Hunter Noriesta Whalpes, 18, Senior, Duy Anh Nguyen, 18, Senior, Eleanor Roosevelt High School, Greenbelt, Maryland

EGCH017 A Smart Light-Tracker Using Machine Learning and Dye-Sensitized Solar Cells
Malini Mukherji, 18, Junior, Notre Dame Preparatory, Pontiac, Michigan

EGCH018 A Paper-Based Microbial Fuel Cell for Glucose Monitoring in Saliva
Kendra Zhang, 17, Junior, Jericho High School, Jericho, New York

EGCH019 Pack More and Charge Faster: To Improve the Capacity Retention and the Rate Performance of Lithium Batteries
Sophia P. Zhou, 15, Sophomore, Dutch Fork High School, Irmo, South Carolina

EGCH020 Analysis of Photocatalytic Performance in TiO2-Dye Sensitized Solar Cells Doped with Nanostructure Diatoms
Isaac Ryan Rost, 19, Senior, Baker High School, Baker, Montana

EGCH021 Synthesizing Bio-Diesel from Different Vegetable Oils via Transesterification
Jose Alejandro Ruiz-Ruiz, 15, Freshman, Escuela Secundaria Especializada en Ciencias, Matematicas y Tecnologia, Caguas, Puerto Rico

EGCH022T Utilization of Epigallocatechin gallate (EGCg) as a Shawnella putrefaciens ATP Synthase Inhibitor to Maximize Microbial Fuel Cell Performance
Dahyun Park, 19, Senior, Jordan Brett Sanford, 18, Senior, Syosset High School, Syosset, New York

EGCH023 The Fuel of the Future
Daniel Austin Orr, 16, Sophomore, Northwestern High School, Mellette, South Dakota

EGCH024T Better Biodiesels: Converting Autumn Olive Oil into Winterized Fuel
Mariafernanda Tirado, 17, Sophomore, Kelli Luann Buckalo, 17, Sophomore, McMinn County High School, Athens, Tennessee

EGCH025T The Future of Potable Water: Air Cathode Microbial Desalination Cells
Rishabh Kuldeep Jain, 17, Junior, Alexandria Irene Schmid, 17, Junior, George C. Marshall High School, Falls Church, Virginia

EGCH026T Utilization of Water Hyacinth in Energy Production
Mahmoud Reda Darwish, 17, Junior, Istanbul GamalElDein Abousama, 17, Junior, STEM School of Alexandria, Burj El-Arab, Alexandria, Egypt

EGCH027 Voltage Production by Geobacter sulfurreducens as a New Source of Renewable Energy
Jose Luis Rodriguez, 18, Senior, Specialized Science and Math Thomas Armstrong Toro School, Ponce, Puerto Rico, Puerto Rico

EGCH028T Electrochemical Application in a Battery with the Use of Fuel Cells
Justin Enrique Melendez Campos, 18, Senior, Joshua Soto, 18, Senior, Voc. Metropolitana Miguel Such, San Juan, Puerto Rico

EGCH029 BIO-CELL: A Novel MicroCHP pMMO Enzymatic Biofuel Cell for the Generation of Clean and Reliable Electrical Energy
Thomas Raimundo Ribeiro, 17, Junior, Laval Senior Academy, Laval, Quebec, Canada
EGCH030 Nanoscale Engineering: Activated Pecan Shell for EDLC Application
Sarah Jin Zou, 18, Junior, Texas Academy of Mathematics and Science, Denton, Texas

EGCH031 Development of Novel Additive-Enhanced Dye for Environmentally Friendly, Sustainable, and Efficient Dye Sensitized Solar Cells
# David Andrew Kravets, 18, Senior, Chesapeake Science Point, Hanover, Maryland

EGCH032T Perovskite Tracking Solar Cell (PTSC)
Mohamed Khaled Othman, 17, Junior, Hossam Mostafa Ibrahim, 17, Junior, 6 of October STEM Egypt School, Giza, 6 of October, Egypt

EGCH033 Development of a Novel Catalyst for the More Efficient Conversion of CO2 in H2O to Sustainably Produce Hydrocarbons as an Alternative Form of Energy
Aditi Kumar, 17, Junior, Timberline High School, Lacey, Washington

EGCH034 Designing a Thermostable Cellobiohydrolase: A Novel Approach to Sustainable Ethanol Production
Sagarika Samavedi, 16, Sophomore, Interlake High School, Bellevue, Washington

EGCH035 Wavelength Dependence of Light-Activated Transformation of Carbon Dioxide at Copper Oxide Electrodes
## John Cramsey, 19, Senior, Southeastern Junior/Senior High School, Augusta, Illinois

EGCH036T The Feasibility of Using Bamboo as a Source of Ethanol for Fuel
Ben Peter Charnay, 18, Senior, Aaron Charnay, 18, Senior, Sycamore High School, Cincinnati, Ohio

EGCH037T Natural Dye of Red Dragon Fruit (Hylocereus costaricensis) Peel Extract for Dye Sensitized Solar Cells (DSSC) Application
Miranti Ayu Kamaratih, 19, Senior, Octiafani Isna Ariani, 19, Senior, Al Hikmah Senior High School, Surabaya, East java, Indonesia

EGCH038 A Novel Approach for the Preparation of High Efficiency Water Splitting Photocatalysts
Dana Abdulwahab Alkhalidi, 18, Senior, KFUPM Schools, Dhahran, Eastern Province, Saudi Arabia

EGCH039 Optimization of Inverted Planar Methylammonium Lead Halide Perovskite Solar Cells
Noor Nezar Alkhonaizi, 18, Senior, Dhahran Ahliyya Schools, Jeddah, Eastern Province, Saudi Arabia

EGCH040 Promising Fuel in Advanced Engines: Ignition Delay Measurements and Modeling of Straight Run Naphtha
Abdulaziz Abdulrahman Alsalem, 18, Senior, Dhahran Ahliyya Schools, Dhahran, Eastern Province, Saudi Arabia

EGCH041T Versatile Examination of the Biochar Products from Biol Mass Materials Subjected to Proliz Process
Oguzhan Bas, 18, Senior, Emre Pahal, 18, Senior, Yilmaz Kayalar Fen Liesesi, Erbaa/Tokat, Turkey

EGCH042T The New Solid State Mechanochemical Synthesis of Advanced Ni, Ni-Co and Ni-Al Hydroxides for Hybrid Supercapacitor Application
Illia Samsonov, 16, Sophomore, Ksenia Kovalenko, 16, Sophomore, Chemical Ecological Lyceum, Dnipropetrovsk Region, Ukraine

EGCH043 Carbon Coatings on a Copper Antimonide Anode for Enhanced Performance and Lifetime in Rechargeable Metal-Ion Batteries
Jay Chandra, 17, Junior, Fossil Ridge High School, Fort Collins, Colorado

EGCH044T An Analysis on the Upscaling of Biodiesel Production from Food Waste
### Tyler Michael Staten###, 19, Senior, Riley Paul Midgley##, 19, Senior, Bonneville High School, Ogden, Utah

EGCH045 Green Nano Supercapacitors
Lawrence John van Staden, 18, Senior, St. Dominics Newcastle, Newcastle, KwaZulu-Natal, South Africa

EGCH046 Quantifying the Evolution of Gas from Li-Ion Battery Materials
Ryan Robert Armstrong, 19, Senior, Oak Ridge High School, Oak Ridge, Tennessee

EGCH047 Symbiotically Grown Algal-Fungal Cultures for Economically Feasible and Sustainable Biofuel Production
## McKenna Kristin Loop, 18, Senior, Arizona College Preparatory-Erie, Chandler, Arizona

EGCH048T Enhancement of the Behavior of a Species of NiHcd HER Electrode Using a Stable Ni(OH)2-NiOOH Phase Transformation Redox Mediator in a Developed-Two-Step Alkaline Electrolysis Process Under Variable Current Densities
Aparimeya Taneja, 17, Senior, Jaskaran Singh Sethi, 17, Senior, St. Columba's School, New Delhi, India

EGCH049 Graphene Based Solar Panel
Salama Rashed Alkhateri, 16, Junior, Al Khaleej National School, Dubai, United Arab Emirates
Energy: Physical

EGPH001 Thermoelectric Generator Powered Tracking Concentrated Photovoltaic System
Camille Alden Miles, 18, Junior, Niceville High School, Niceville, Florida

EGPH002 Power Moves: Harvesting Kinetic Energy to Generate Electricity
Megan Grace Uszynski, 16, Freshman, McIntosh High School, Peachtree City, Georgia

EGPH003 Independent
Vanessa Ann Quintero, 17, Sophomore, Lopez Early College High School, Brownsville, Texas

EGPH004 Novel Fabrication of Thin Film Luminescent Solar Concentrators
Bryan Hoo Hao Chun, 19, Senior, Oregon Episcopal School, Portland, Oregon

EGPH005T Innovative Technology of Increasing Solar Cells' Efficiency
Vakhtang Kontridze, 18, Senior, Giorgi Nioradze, 18, Senior, AIA-GESS, Tbilisi, Qvemo Qartli, Georgia

EGPH006 LED: Is it Really a More Efficient Future?
Xiang Tang, 16, Sophomore, Caddo Parish Magnet High School, Shreveport, Louisiana

EGPH007 Optimizing Micro-Geometric Bladeless Wind Turbines, Year Five
Sarah May Palmer, 19, Senior, Friendswood High School, Friendswood, Texas

EGPH008T Solar Panel Deploable Light Reflector Innovating Construction
# Beqa Mikadze#, 18, Senior, # Giorgi Margian#, 19, Senior, AIA-GESS, Tbilisi, Qvemo Qartli, Georgia
Akhal Litseumi, Tbilisi, Georgia

EGPH009 Increased Tidal Barrage Energy Output through Pumping
# Peter Joseph Menart, 17, Junior, Carroll High School, Dayton, Ohio

EGPH010 “Printenna”: A 3D Printed Biquad Yagi Antenna for Transmission of Space Solar Power
# Samuel Brian Lossef, 16, Sophomore, School Without Walls High School, Washington, District of Columbia

EGPH011 WWAG: Walk, Warm, and Generate
Omar Mohammad Nassar, 16, Sophomore, Islamic Educational College, Amman, Jordan

EGPH012T A Unique Solar System that Captures the Heat Energy of the Sun in an Efficient Way
Rakan Raed Nasereeddin, 17, Junior, Tamer Shibbley Al-Haddadin, 17, Junior, Modern Montessori School, Amman, Jordan

EGPH013 Development of a Non-Tracking Solar Thermal Concentrator Using the Simultaneous Multi-Surface Design Method
Anthony Y. Zhou, 16, Sophomore, Mission San Jose High School, Fremont, California

EGPH014 Renewable Hydrogen and Fuel Cells: The Future of Energy
Claire Victor, 18, Senior, Centaurus High School, Lafayette, Colorado

EGPH015 A Study on Sustainable, Environmentally-Friendly, Alternative Insulators
Benjamin James Eisinger, 17, Sophomore, Hilton Head Preparatory School, Hilton Head Island, South Carolina

EGPH016 The Clever GIRL (Global Intelligent Rip Locator)
Maddison King, 18, Senior, Meriden School, Strathfield, NSW, Australia

EGPH017 Catching the Sun with Transparent Solar Cells: Application of Natural Dye-Sensitized Solar Cells as BIPVs
Sabahat Fatima, 18, Senior, Al Rahmah School, Windsor Mill, Maryland

EGPH018 The Development of a Renewable Energy Phone Case
Jack Harrison Kolosvary, 18, Junior, Columbia River High School, Vancouver, Washington

EGPH019 Wind Energy: The Power of Pulleys
Tanner John Kempf, 17, Sophomore, Ashley Public School, Ashley, North Dakota

EGPH020T Solar-Powered Optics: Insight into a Renewable Energy Resource
Giovanni Riyanto Budi, 18, Senior, Andrea Lamas-Nino, 18, Senior, Isaac Bear Early College High School, Wilmington, North Carolina

EGPH021 Localizing Heat with Carbon Foam for Efficient Solar Desalination
# Oliver Leitner, 17, Junior, The Davidson Academy of Nevada, Reno, Nevada

EGPH022 Smart Self-Sustaining Lighting System
# Karlos Lenniel Nicolas Miranda Garces, 18, Senior, Adela Rolon Fuentes, Toa Alta, Puerto Rico

EGPH023T Transforming Alternate Current (AC) to Direct Current (DC) via Kinetic Energy
Ensol David Tomassini Morales, 18, Senior, Kevin Manuel Matias, 19, Senior, Padre Anibal Reyes Bellen, Hatillo, Puerto Rico

EGPH024T Programmable System for the Extraction of Hydroelectric Energy
# Norman Ariel Toro Vega#, 18, Senior, Emanuel Felipe Burgos Robles, 18, Senior, Dr. Carlos Gonzalez High School, Aguada, Guaniquilla, Puerto Rico

EGPH025T Utilization of Rosa roosa Nanostructures for Optimization of Solar Cell Light Management
Benjamin Gu Li, 16, Sophomore, Anthony Jiang, 16, Sophomore, Jasper High School, Plano, Texas

EGPH026 Go with the Flow: Increasing the Efficiency of the Tesla Turbine to Reduce the Cost of Cleaner Energy Generation from Natural Gas
# Daniel C. Bobbitt, 18, Junior, Niceville High School, Niceville, Florida

EGPH027 From a Single Moment of Force to Sustainable Energy: Achieving Optimal Frequency for Piezoelectricity
Arielle Ese Aina, 16, Sophomore, Garth Webb Secondary School, Oakville, Oakville, Canada

EGPH028 A Roar for Energy: The Piezoelectric Effect
Haseeb Ahmed Khawaja, 18, Senior, Aga Khan Higher Secondary School, Karachi, Sindh, Pakistan

EGPH029 Solar Bimetallic Actuator
Claudio Nicolae Nitan, 18, Sophomore, Mihai Eminescu National College of Suceava, Suceava, Romania

EGPH030T Design of Automatic Retractable Dome Structure Using Petal Arrangement Patterns
Young-Soo Na, 17, Junior, Minkyu Kim, 17, Junior, Hyunwoo Lee, 17, Junior, Incheon Academy of Science and Arts, Incheon Metropolitan City, Incheon, South Korea
EGPH031 Developing a Novel Aeroelastic Flutter Based Piezoelectric Energy Harvester (AERO)
Maanasa Mendu, 15, Freshman, William Mason High School, Mason, Ohio

EGPH032 “Virtually Perfect” Photovoltaic Cells: A Novel and Adaptive Approach to Modeling Quantum Dot Templates Optimized for Varied Light Conditions
Sathya Edamadaka, 16, Sophomore, High Technology High School, Lincroft, New Jersey

EGPH034 Driving on Sunshine
Kieran Hensleigh Walter-Sundaram, 16, Freshman, Good Hope Country Day School, Kingshill, United States Virgin Islands

EGPH035 Developing an Optimal Novel Unconventional Wind Turbine
Farid Muddassir Shahid, 16, Freshman, Parkland High School, Allentown, Pennsylvania

EGPH036 Thin Panel, Cylinder-Arrayed, Solar Water Heater
Nizhoni Tallas, 18, Senior, Navajo Preparatory School, Farmington, New Mexico

EGPH037 The Converter of Three-Dimensional Oscillations into Electrical Energy
Valeriia Tyshchenko, 17, Sophomore, Kherson Physical and Technical Lyceum of Kherson City Council Affiliated to National University of Dnipropetrovsk, Kherson, Ukraine

EGPH038 Waste Heat Recovery to Reduce Engine Emissions
Eric John Spilman, 18, Senior, Mandan High School, Mandan, North Dakota

EGPH039 Recycling Energy and Reducing Solid Waste: A Novel Battery-Charging Device with Optical Concentrator Reflector Design that Optimizes Indoor Energy Harvesting
Annie Ostojic, 15, Freshman, Munster High School, Munster, Indiana

EGPH040 Multi Axial Motion Unifying Gear Arrangement to Capture Wave and Other Random Run Away Energy
Sairandri Sathyanarayanan, 17, Senior, Sacheth Sathyanarayanan, 16, Junior, National Public School, Chennai, Tamil Nadu, India

EGPH041 Investigation of the Performance of Home-Made Flywheel Energy Storage Systems
Katinka Nell Wilkinson, 16, Sophomore, Herschel Girls High School, Cape Town, Western Cape, South Africa
Engineering Mechanics

ENMC001 Integrated Self-Powered Bicycle Wheel Light
Thomas J. Dorminy, 19, Senior, Sola Fide Home School, McDonough, Georgia

ENMC002 Design and Production of an Innovative, Interactive Augmented Reality Projector
Tobias Gerbracht, 20, Senior, Carl-Fuhlrott-Gymnasium, Wuppertal, Nordrhein-Westfalen, Germany

ENMC003 A Wing Is Enough: An Improved Flying Wing Based on a Bell-Shaped Lift Distribution
Ivo Zell, 19, Senior, Internatsschule Schloss Hansenberg, Geisenheim-Johannesberg, Hessen, Germany

ENMC004T Fast & Self-Stabilized Image Platform
YanYi Wang, 16, Freshman, YuFei Li, 15, Freshman, Beijing No.4 High School, Beijing, China
The High School Affiliated to Renmin University of China, Beijing, China

ENMC005 Gaze: A Low Cost, Digital Optical Device Supporting Education in Developing Countries
Gareth Reid, 19, Senior, Grosvenor Grammar School, Belfast, Northern Ireland, United Kingdom

ENMC006 Design and Fabrication of Solar Water Pumping System with Smart Irrigation Technique
Shahzaib Ejaz, 19, Senior, PakTurk International Schools and Colleges, Lahore, Punjab, Pakistan

ENMC007T Construction of an Electric Reel to Collect a Strand of Electric Shepherd
Lucia Fuentes, 20, Senior, Sabrina Lujan Cornu, 19, Senior, Agrarian School of Rosario, Rosario, Colonia, Uruguay

ENMC008T Improving Forklift Maneuverability
Reiner Conrad Scherman, 17, Junior, Christiana Bernard Myburg, 17, Junior, Hoerskool Waterkloof, Pretoria, Gauteng, South Africa

ENMC009 Avionic System Supremacy
Carlos Alberto Mendez, 18, Junior, United High School, Laredo, Texas

ENMC010 Improved Brushless DC Motor
Michael Serge Pozmantir, 16, Freshman, Imagine International Academy of North Texas, McKinney, Texas

ENMC011 A Brief Study in the Effects of the Bernoulli Principle when Applied to an Underwater, Inverted Foil
Donald Edward Martin, 17, Sophomore, Academics Etc., Lake Charles, Louisiana

ENMC012T High Efficiency Rocket Nozzles

ENMC013T A Novel Aircraft De-icing System: Smart Piezoelectric Skin
Hamid Salimov, 17, Junior, Timur Kalyayev, 17, Junior, Baku European Lyceum, Baku, Absheron, Azerbaijan

ENMC014 Prevention Device for Non-Controllable Oil and Gas Blow Out
Gudrat Muradli, 16, Sophomore, Istek Lyceum, Baku, Azerbaijan

ENMC015T Electric Jet Engine
Taylor Ann Benning, 19, Senior, Adam Skora, 19, Senior, Buena High School, Sierra Vista, Arizona

ENMC016 Designing and Implementing an Algorithm to Accurately Control the Attitude of Free-Floating Satellites Using Extensible Manipulators
Ashwin Nivas Datta, 19, Senior, Glencoe High School, Hillsboro, Oregon

ENMC017 Cryogenic Thermosuit for Manned Mission to Titan
Wittiker Benjamin Schlauch, 18, Senior, Clear Brook High School, Friendswood, Texas

ENMC018 Plasma Actuator, “Not A Drag,” Year II
Robert Ezekiel Kollman, 19, Senior, Shallowater High School T-STEM Academy, Shallowater, Texas

ENMC019 Single and Simple Groove Addition Improves Propeller Efficiency
Kotaro Tabuchi, 18, Senior, Nanzan Boys’ Senior High School, Nagoya-city, Aichi-pref., Japan

ENMC020 Composites: Transforming T-Beams
Danika Louw, 18, Senior, Holy Spirit Catholic High School, Tuscaloosa, Alabama

ENMC021T Cost-Effective Remotely Operated Vehicles (ROVs) for Ecological Analysis
Alex Yamada, 18, Senior,
Eric Scott Schiltzuk, 17, Junior,
Pearl City High School, Pearl City, Hawaii

ENMC022 Reduction of Cranial Impact from High-Speed Lacrosse Shots Utilizing Multi-Durometer, External Helmet Padding: A “Deflection” Design
Maximilian James Chmura, 16, Sophomore, St. Vincent – St. Mary High School, Akron, Ohio

ENMC023 Synth-ETic: The World’s First “Hood-Wind” Musical Instrument
Justin Hughes Mitchell, 15, Freshman, St. Kevin’s College Toorak, Toorak, Victoria, Australia

ENMC024T Aircraft Nut Tension Monitoring Washer
Grace Gao, 17, Junior, Guanqun Zhou, 16, Sophomore, Pui Shan Lee, 17, Junior, Ka KI Ng, 15, Freshman, SKH Li Ping Secondary School, Hong Kong, China, Hong Kong Special Administrative Region

ENMC025 External Combustion Open-Cycle Engine
Ion Cerempei, 18, Senior, Theoretical High School “George Calinescu,” Chisinau, Republic of Moldova

ENMC026 Can Machines Learn to Design Better than Humans?
Robert Connor van Zyl, 17, Sophomore, McIntosh High School, Peachtree City, Georgia

ENMC027 Development of a Hybrid Direct Ink Write 3D Printer: A Novel Approach to 3D Printing Multi-Material Functional Devices and Flexible Electronics
Joshua Murphy Jacob, 18, Junior, Saint Xavier High School, Albany, Kentucky

ENMC028T Solar Energy Out on a Limb: A Novel Photovoltaic Energy
Hahnbee Lee, 17, Junior, Jarrett J. Lash, 17, Junior, The Governor’s School @ Innovation Park, Manassas, Virginia

ENMC029 An Altitude Control System for Long Duration, High Altitude Balloon Flights
Natalie Celeste White, 15, Freshman, University High School, Fresno, California

ENMC030 The Next Airbender: A Novel Approach to Airfoil Efficiency and the Optimization of the Lift-to-Drag Ratio
Rachel Seevers, 16, Sophomore, Paul Laurene Dunbar High School, Lexington, Kentucky
ENMC031 The Effects of Pre-Heating the Intake of an Engine on the Output of Emissions
Kaycee Rae Smith, 17, Junior, Spring Creek High School, Spring Creek, Nevada

ENMC032 The Development of an Unmanned Aerial Vehicle for Use in Silo Inspection
Samantha Boyea, 17, Junior, Greenwich Junior-Senior High School, Greenwich, New York

ENMC033 Effectiveness of Negative Stiffness Devices at Resisting Seismic Force in Buildings
Derek Christopher DeMel, 18, Senior, Athens High School, The Plains, Ohio

ENMC034T Analysis of Airborne Wind Energy Systems in a Wind Tunnel to Enhance Electricity Generation Efficiently
Theo Calvin Guerin, 18, Senior, Charles Johannes Fenske, 18, Junior, Falmouth Academy, Falmouth, Massachusetts

ENMC035T Modular Numerical Controlled Prototype
Laurenz Caspar Fussenegger, 18, Senior, Elias Vogel, 18, Senior, Hohere Technische Bundeslehr- und Versuchsanstalt Rankweil, Rankweil, Vorarlberg, Austria

ENMC036T FuelRFID
Hala M. N. Ishtaiah, 16, Sophomore, Lana A. Y. Haqsh, 15, Sophomore, Talae’ Al-Amal Secondary Schools, Nablus, West Bank, Palestine

ENMC037 Protecting Civilians and Public Service Personnel through an Early Identification and Warning System for Airborne Chemicals: SEIAC
Hannah Dorothy Herbst, 17, Sophomore, Florida Atlantic University High School, Boca Raton, Florida

ENMC038 Mission To Mars: Designing a Spacecraft Impact Protection and Detection System with Radiation Shielding
Grayson Hunstinger, 18, Junior, Lakeland Grace Academy/New Life Christian, Lakeland, Florida

ENMC039 LifeSpin: Comprehensive Water Purification and Transportation via Induced Turbulent Flow in Conjunction with Faraday’s Law of Induction
Shane Tomaino, 17, Junior, Rye Country Day School, Rye, New York

ENMC040 Building a Better Burner Improving Forge Efficiency
Brendan Joseph Crotty, 15, Freshman, Home School, Muskogee, Oklahoma

ENMC041 Development of a Low-Cost Articulated Arm 3D Printer
Zachary Scott Allen, 17, Junior, Northridge High School, Layton, Utah

ENMC042 Blown Away: Improving Propeller Efficiency with Natural Flow Propeller Shrouds
Andrew Bennett, 17, Junior, Bountiful High School, Bountiful, Utah

ENMC043 The Effect of the Removal of Mass on the Calculated Efficiency of Structural Beams
Heather Dawn Wotton, 18, Junior, Mountain Vista Governor’s School, Warrenton, Virginia

ENMC044 An Investigation of Optimal Rural Building Designs for All Earthquake Zones of Turkey
Lucas Robert Mayhew, 17, Sophomore, Mills E. Godwin High School, Henrico, Virginia

ENMC045 Real-Time 3D Printing Error Detection and Correction
William Makinen, 17, Junior, West Potomac High School, Alexandria, Virginia

ENMC046T Algae Energy
Seifeldin Abdelmoneim Mohamed, 19, Senior, Dina Ahmed Abdelaal, 18, Senior, Suez Advanced Industrial School, Suez, Egypt

ENMC047 The Effects of Pitch on Propeller Thrust
Anna Claire LeJeune, 16, Sophomore, Saint Joseph’s Academy, Baton Rouge, Louisiana

ENMC048 Investigating Flow in Rotating Cylindrical Tubes
Hannah Elisabeth Lynn Farmer, 16, Freshman, Stillwater Area High School, Oak Park Heights, Minnesota

ENMC049 Morphing Wing for Trucks: Greater Stability in Cornering
Felix Junior Morales, 18, Senior, Colegio Congregacion Mita, San Juan, Puerto Rico, Puerto Rico

ENMC050 Energy Saving SwimFin: Developing the Optimal Fin for Faster and Efficient Swimming
Yuki Hayakawa, 17, Sophomore, Kyoto Municipal Tonan High School, Kyoto, Kyoto, Japan

ENMC051 Feedback Control of Driverless Buses
Taiga Yanagida, 17, Sophomore, Tamagawa Academy, Machida, Tokyo, Japan

ENMC052 A Wooden CNC from Scratch: The True Established Mechanisms by Three Elements – Technology, Electronics and Software Are Out There!
Tadasu Nishimiy, 16, Sophomore, Kokura High School, Kitakyushu, Fukuoka, Japan

ENMC053 Hydraulic Operated Vice
Walakulage Sanjaya Udayantha Abeywickrama, 18, Senior, Dharmasoka College, Ambalangoda, Galle, Sri Lanka

ENMC054 Systematic Wall Constructing Tool
Gangodawila Kankanamalage Navodya Wishwajith Gangodawila, 16, Junior, Mayurapada Central College, Narammala, North Western Province, Sri Lanka

ENMC055 Angling Energy for Vitamin D3 Synthesis Efficiency
Abigail Ann Arnashus, 15, Freshman, Von Steuben Metropolitan Science Center, Chicago, Illinois

ENMC056 Silent Sounds
Andra Moira Catherine Smith, 15, Freshman, Trinity Christian School, Williston, North Dakota

ENMC057T Making 3D Printer Using Junk: Everyone Can Make!
Juhwan Lim, 17, Junior, Jigang Lee, 17, Junior, Geunyaong Park, 18, Senior, Daegun High School, Daegu, South Korea

ENMC058 Designing a Scalable 3D Printer with a Novel Elevation System
Liam Fitzpatrick Johnson, 19, Senior, Arkansas School for Mathematics, Sciences, and the Arts, Hot Springs, Arkansas

ENMC059 Enhancing Accessible Pedestrian Signals: Using Tactile Maps
Mary Grace Murray, 17, Sophomore, Olentangy High School, Lewis Center, Ohio

ENMC061T Solenoid Engine
Mikhail Burlachenko, 17, Sophomore, Andrei Perkov, 17, Sophomore, State Budgetary Educational Institution of Moscow “Gymnasium No 1786”, Moscow, Russian Federation

ENMC062 Neolithic Engineering in the 21st Century: An Innovative Design Using the Ball-and-socket Model to Mitigate Seismic Effects on Contemporary Pacific Structural Designs
Youngyoon Seo, 17, Junior, Saint John’s School, Upper Tumon, Guam
ENMC063T No More Heat Awaiting in the Car
Virginia Marie Martin, 16, Sophomore, Esteban Josue Martinez, 16, Sophomore, Col. Beato Carlos Manuel Rodriguez, Bayamon, Puerto Rico

ENMC064 Iced Up Lowdown: Examining the Degrading Effects of Ice on Laminar Flow and Performance of Airfoils
Elizabeth Grace Kent, 16, Sophomore, Kent Academy, Edmond, Oklahoma

ENMC065 Utilization of the Spidron System for Generating Force Absorbing Structures
Skyler Hughes, 18, Junior, Albuquerque Institute for Math and Science, Albuquerque, New Mexico

ENMC066 A Novel Approach to Prevent Damage from Earthquakes and Tsunamis with the Utilization of a Proportional Surface Hexagonal Structure and Modified Underground Two-Part Hexagonal Damping Rubber Bearing Base Isolator
Daniel Noon, 15, Freshman, Brophy College Preparatory, Phoenix, Arizona

ENMC067 You’re Out! An Electronic Baseball Umpire
Elias Andersen, 17, Junior, Pretty River Academy, Collingwood, Ontario, Canada

ENMC068T The Analyzer for Testing the Roughness Quality of Surfaces
Chin Ieong Kong, 18, Senior, Wen Jing Liang, 20, Junior, The Workers’ Children High School, Macau, China, Macao Special Administrative Region

ENMC069 Engineering a Laser Technique to 3D Print Robust Hydrogels for Extracellular Matrices
Joshua Dong, 18, Senior, North Carolina School of Science and Mathematics, Durham, North Carolina

ENMC070T Calculation and Visualization of Bicycle Traffic Flows
Gustav Lidberg, 19, Senior, Martin Tjern, 19, Senior, Lugnetgymnasiet, Falun, Dalarna, Sweden

ENMC071 Using 3D Printing for the Fabrication of Gas Dynamic Virtual Nozzles
Daniel Fay, 18, Senior, Mesquite High School, Gilbert, Arizona

ENMC072 Stepping into the Future
Ryan Macayan Ramsey, 18, Senior, Rialto High School, Rialto, California

ENMC073 Nuclear Thermal Rockets: Mars and Beyond
Sophia Li, 19, Junior, Los Alamos High School, Los Alamos, New Mexico

ENMC074 The Effect of Dimple Configuration on Golf Ball Distance
Hunter Twitchell, 17, Junior, Success Academy DSU, St. George, Utah

ENMC075 Design of a Telepresence System to Operate at Mars Surface in a Pre-Colonial Context
Joel Romero Hernandez, 17, Junior, Institut F.X. Lluch i Rafecas, Vilanova i la Geltru, Barcelona, Spain

ENMC076 Thermoelectric-Evaporative Cloud Chamber
Finlay James Joseph Cuffe, 19, Senior, Sutton Grammar School, Sutton, Surrey, United Kingdom

ENMC077T Developing a Bicycle Attached Device for Manipulating Riders Attention for Increased Safety
Anders Osterby, 19, Junior, Vincent Olesen, 18, Junior, Odense Tekniske Gymnasium, Odense, Fyn, Denmark

ENMC078 Power Up with HOH
Hayden James Heilig, 18, Senior, Moore High School, Moore, Montana

ENMC079T Transparent Side
Mousa Ghassan Rajab AlJawaheri, 17, Junior, Mohammed Zaki Hamid Jabir AlJubori, 18, Junior, Baghdad Ishik Boys College, Baghdad, Almansour, Iraq

ENMC080T Green Belt
Sharena Mohamed Alremeithi, 17, Senior, International Community School, Abu Dhabi, United Arab Emirates
Environmental Engineering

ENEV001T Evaluation of Particulate Matter (PM10) Concentration: A Case Study in Camboriu, Brazil
Beatriz Faga, 17, Senior, Daniel Caldas de Oliveira, 18, Senior, Instituto Federal Catarinense - Campus Camboriu, Camboriu, Santa Catarina, Brazil

ENEV002 Carbon Capture and Storage via Silver Nanoparticle Catalyzed Hydration of Carbon Dioxide
Agustina Stefani, 18, Senior, Greenwich High School, Greenwich, Connecticut

ENEV003 Development of a Less Expensive Method for Radon Measurements
Jose Alfredo Ocegueida Sanchez, 20, Senior, Centro de Ensenanza Tecnica Industrial, Tonala, Jalisco, Mexico

ENEV004 Zapping the Pollutants! Electro-Oxidation for Pollution Control
Rohan Sanjeev Jakhete, 14, Freshman, South Fork High School, Stuart, Florida

ENEV005 Do Herbicides and Fertilizers Found in Surface Runoff Affect the Oyster (Cossostrea virginica) and Clam (Mercenaria mercenaria)?
Kyle Wilson Bramblett, 15, Freshman, Titusville High School, Titusville, Florida

ENEV006 Phytodesalination of Saline Soil Using Native Hawaiian Halophytes
Mika Alexandra Ishii, 16, Freshman, Kalani High School, Honolulu, Hawaii

ENEV007T “A Nice Fracking Solution,” Phase III: The Implementation of a Testing Protocol to Test De-icing Qualities of Fracking Salt Pellets When Compared to Road Salt (NaCl) and to Test Plausibility of Implementation of Fracking Salt Pellets as a Possible Northern Road De-Icer
Levi Allen Peterson, 18, Senior, Jacob Tyler Schmidt, 18, Senior, Cloquet Senior High School, Cloquet, Minnesota

ENEV008 Evaluating the Effectiveness of a Hydrogel/Fertilizer Matrix to Improve Seed Germination
# Dante Arther Sylvester, 18, Senior, Greybull High School, Greybull, Wyoming

ENEV009T Goldenrod: Alternative Raw Material for Pharmacology and Energetics
Aliaksandra Kakhavets, 17, Sophomore, Zhodino Gymnasium No. 1, Zhodino, Minsk Region, Belarus

ENEV010 Predicting Space Debris’ Trajectory through the Atmosphere
Esben Juel Porat, 20, Senior, Arhus Statsgymnasium, Aarhus, Jyllland, Denmark

ENEV011 Alternatives of Bioremediation in the Management Waste of CETMAR 08
Miriam Sugey Romero Osuna, 18, Senior, Centro de Estudios Tecnologicos del Mar 08, Mazatlan, Sinaloa, Mexico

ENEV012 Effective Remediation of Air Pollution and Sustainable Electricity Production using an Algal Bio Photo-Voltaic Fuel Cell (BPFC), Phase III
# Sai Sameer Pusapaty, 18, Senior, Liberal Arts and Science Academy, Austin, Texas

ENEV013 Signal Buoy
Hans Anniste, 18, Junior, Poltsamaa Co-Educational Gymnasium, Poltsamaa, Jogeavamaa, Estonia

ENEV014 Phosphorus Recovery from Storm Water Runoff with Seawater-Mixed Pervious Concrete for Reutilization as a Mineral Fertilizer
# Vincent Daamvin Hwang, 18, Senior, Southwestern Educational Society, Mayaguez, Puerto Rico

ENEV015T RecycoTrash: Barcodes vs. CV
Jesus Rene Capo, 16, Sophomore, David Alexander Perez, 16, Sophomore, Christopher Columbus High School, Miami, Florida

ENEV016 Engineering an Environmentally Friendly Drilling Fluid
Jill Elizabeth Bohnet, 16, Sophomore, The Woodlands College Park High School, The Woodlands, Texas

ENEV017T Shocking! A Study of Electrocoagulation in Treatment of River Water
Garrett Eric Curtis Guerrero, 15, Freshman, Matthew Jeffrey Trees, 15, Freshman, Guerrero Home School, San Angelo, Texas

ENEV018T A Magnetic Brush that Cleans Solar (PV) Cells from Dust and Sand without the Use of Water and Electricity
Omar Ahmad Ahmad, 17, Junior, Zaid Riyad Alalatyat, 17, Junior, Modern Montessori School, Amman, Jordan

ENEV019T Using Physics in Withdrawing and Purifying Air without Human Intervention
Bisher Nijm Aldabbagh, 16, Junior, Saleh Alkiswani, 17, Junior, Al-Hassaal Al-Tarabi, Amman, Jordan

ENEV020 Recycling of Cement Kilns Dust (CKD) to Improve the Mechanical Properties of the Base Course Layer in Highways
Ban Ayoup Ghrair, 15, Freshman, Al-Hussein Preparatory School for Girls - UNRWA, Amman, Amman, Jordan

ENEV021T Investigation of the Pyrolysis and Chemical Activation of Expanded Polystyrene Foam to Form Activated Carbon
Julia Nicole Bray, 16, Freshman, Ashton Cameron Cofer, 15, Freshman, Gahanna Lincoln High School, Gahanna, Ohio

ENA022 Post-consumer PET as Stock for Additive Manufacturing
Ban Ayoup Ghrair, 15, Freshman, Al-Hussein Preparatory School for Girls - UNRWA, Amman, Amman, Jordan

ENEV023 Removal of Radioactive Strontium from Contaminated Water Using Novel Cost-Effective Biosorbents
Kaelum Robb Rodriguez Hasler, 18, Senior, Blacksburg High School, Blacksburg, Virginia

ENEV024T Versatile Usage of Spent Coffee as an Eco-friendly Water Purifier
Dominic Wei Ting Yap, 17, Junior, Shawn Hai Leong Lim, 17, Junior, Bryan Wei Leong Lim, 17, Junior, Hwa Chong Institution, Singapore, Singapore

ENEV025 Removal of Heavy Metal Ions from Industrial Wastewater Using Algal Polysaccharide Alginate
Mathew Colso Bevilacqua, 19, Senior, Escola Americana de Campinas, Campinas, Sao Paulo, Brazil

ENEV026T Chemically Modified Jordanian Zeolitic Tuff for Removal of Heavy Toxic Metals from Industrial Water
Hala Basheer Almajali, 17, Junior, Tala Maen Mesmar, 17, Junior, Jubilee School, Amman, Jordan
ENEV027  The Development of an Algorithm through the Assessment of Nutrients in a Recycled Food Supplement for Canines to Reduce Waste Production
Alexis Lauren Jones, 18, Junior, Auburn High School, Auburn, Alabama

ENEV028  Engineered Environmental Containment: Using *Leucaena leucocephala* to Reduce Nitrate Levels in Aquatic Environments
Aaron Alexander Wills, 18, Junior, Central Lee High School, Donnellson, Iowa

ENEV029  The Construction of a Price Reduced 3D Printed Turbidity Meter
Samuel Anthony Maher, 17, Junior, Arthur Hill High School, Saginaw, Michigan

ENEV030  Environmental Impact of Artificial Sweeteners Acesulfame, Sucralose, and Aspartame in Nature
QiHang Wang, 18, Junior, Oxford High School, Oxford, Mississippi

ENEV031  Development of a Household Direct-Steam-Generation Solar-Powered Water Recovery System, Year II
Anna Christine Benedict, 18, Senior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

ENEV032  Crowd-Sourced Detection and Mapping of Nitrate Water Pollutants via a Mobile Web-Based Image Analysis System
Luca Jose Barcelo, 17, Junior, Greenwich High School, Greenwich, Connecticut

ENEV033  Development of a CNT/ZnO/TiO2 Membrane for Visible-Light Induced Photocatalytic Filtration of Water-Borne Organic and Bacterial Pollutants
Michelle Jun Xiong, 17, Junior, Greenwich High School, Greenwich, Connecticut

ENEV034  Novel Low-Temperature Carbon Capture Using Aqueous Ammonia and Organic Solvents
Ethan Novek, 18, Senior, Greenwich High School, Greenwich, Connecticut

ENEV035  Addressing Global Water Scarcity: Novel Dewatering Techniques for Hydrophilic Saponified Starch-Grained Polyacrylamide Hydrogel Based Desalination Using UV Light, Ca(OH)2, and Dry Ice to Improve Reusability of Super-Absorbent Polymers
Chaitanya Dasharath Karamchedu, 18, Senior, Jesuit High School, Portland, Oregon

ENEV036  Development of a Novel Biodegradable Plastic Film with *Passiflora edulis*’s Byproduct
Juliana Davoglio Estradioto, 17, Junior, Instituto Federal de Educacao, Ciencia e Tecnologia do Rio Grande do Sul – Campus Osorio, Osorio, RS, Brazil

ENEV037  Functionalizing Biochar with Layered Double Hydroxides for Removal of Phosphates and Nitrate from Aqueous Solutions
Stefan Wan, 18, Senior, Alexander W. Dreyfoos School of the Arts, West Palm Beach, Florida

ENEV038  The Potential of Selected Agricultural Wastes as Sound Absorber and Thermal Insulator Based on Their Surface Morphology
Ricky Dave Torres Mercado, 18, Junior, Nabaslot National High School, Pinamalayan, Oriental Mindoro, Philippines

ENEV039  Harmful Algae Bloom Prevention Using *Stropharia* Mycofiltration
Harshal Rajesh Agrawal, 16, Sophomore, Dr. Ronald E. McNair Academic High School, Jersey City, New Jersey

Tanisha Martheswaran, 17, Junior, Waterford School, Sandy, Utah

ENEV041  Low-Cost Gravity Driven Filtration System Designed Using Iron Oxide Nanoparticle-Loaded PU Foam for Arsenic Removal from Polluted Water in Developing Countries
Arundhati Pillai, 18, Senior, University School of Milwaukee, Milwaukee, Wisconsin

ENEV042  The Ideal Electricity System
Hossam Hassan Hassan, 17, Junior, S.T.E.M. Luxor School, Luxor, Egypt

ENEV043  Integrated Recycling System
Ahmad Yasser EL Gazzar, 18, Senior, Abdelrahman Khaled Abdo, 18, Senior, STEM High School for Boys, 6 of October, Giza, Egypt

ENEV044  Efficient Removal of Pb2+, Cd2+, and UO2+ from Water through Sustainable Nano Cellulose Coagulants Synthesized through One Step Modification of Raw Biomass
Aurnov Chattopadhyay, 19, Senior, University High School, Irvine, California

ENEV045  The Effects of *Brassica juncea* vs. *Eichhornia crassipes* on the Reduction of Cr(VI) to Cr(III) through Phytoremediation
Sara E. Zangi, 16, Sophomore, East Chapel Hill High School, Chapel Hill, North Carolina

ENEV046  Modeling Realistic Factors for the Improvement of SODIS-AOP
Helen Haiyue Peng, 17, Sophomore, Starkville High School, Starkville, Mississippi

ENEV047  The Development of a Mechanized Approach to Rapidly and SENSITIVELY Detect and Purify Water Contaminated with *Shigella*, *E. coli*, *Salmonella*, and *Cholera* through the Use of Carbon-Based Biosensors in Conjunction with Arduino-Controlled Micropipettes
Rachel Chang, 17, Junior, Ryan Matthew Thorpe, 17, Junior, Manhasset High School, Manhasset, New York

ENEV048  Slick and Clean: An Investigation into How Magnetite Can Be Used with Organic Sorbents in Oil Spill Clean-Up
Rebekah Kang, 17, Junior, Presbyterian Ladies’ College, Sydney, Sydney, New South Wales, Australia

ENEV049  For Pure Life
Ibrahim Mohamed Helmy Ali, 17, Junior, Mohamed Gamal Nafe, 18, Junior, Dr. Yusuf Ismail Secondary, Nag Hammadi, Qena, Egypt
Red Sea STEM, Hurgada, Egypt

ENEV050  Utilization of Triglycerides from spent Coffee Grounds to Create Methyl Esters through Transesterification
Regina Elizabeth Lee, 18, Senior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

ENEV051  Innovative Vapor Condenser Inspired by Bromeliad Plant
Sureeporn Triphetprapa, 17, Junior, Kanjana Komkla, 18, Junior, Thidarat Phianchat, 18, Junior, Suratpittaya School, Suratthani, Thailand

ENEV052  Powerless Desalination: The Development of a Novel PEGylated Membrane to Exploit Ambient Thermal Energy Gradients of the Ocean
Hyrum Thomas Diesen, 19, Senior, Pleasant Grove High School, Pleasant Grove, Utah

ENEV053  Sustainable and Appropriate Technology System (SATS)
Mijoo Ryu, 17, Sophomore, Sun Woo Yoo, 17, Sophomore, Chaeyon Lim, 17, Junior, Banpo High School, Seoul, South Korea

ENEV054  Development of a Household Direct-Steam-Generation Solar-Powered Water Recovery System, Year II
Anna Christine Benedict, 18, Senior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

ENEV055  Addressing Global Water Scarcity: Novel Dewatering Techniques for Hydrophilic Saponified Starch-Grained Polyacrylamide Hydrogel Based Desalination Using UV Light, Ca(OH)2, and Dry Ice to Improve Reusability of Super-Absorbent Polymers
Chaitanya Dasharath Karamchedu, 18, Senior, Jesuit High School, Portland, Oregon

ENEV056  Functionalizing Biochar with Layered Double Hydroxides for Removal of Phosphates and Nitrate from Aqueous Solutions
Stefan Wan, 18, Senior, Alexander W. Dreyfoos School of the Arts, West Palm Beach, Florida

ENEV057  The Potential of Selected Agricultural Wastes as Sound Absorber and Thermal Insulator Based on Their Surface Morphology
Ricky Dave Torres Mercado, 18, Junior, Nabaslot National High School, Pinamalayan, Oriental Mindoro, Philippines

ENEV058  Harmful Algae Bloom Prevention Using *Stropharia* Mycofiltration
Harshal Rajesh Agrawal, 16, Sophomore, Dr. Ronald E. McNair Academic High School, Jersey City, New Jersey

Tanisha Martheswaran, 17, Junior, Waterford School, Sandy, Utah

ENEV060  Utilization of Triglycerides from spent Coffee Grounds to Create Methyl Esters through Transesterification
Regina Elizabeth Lee, 18, Senior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

ENEV061  Innovative Vapor Condenser Inspired by Bromeliad Plant
Sureeporn Triphetprapa, 17, Junior, Kanjana Komkla, 18, Junior, Thidarat Phianchat, 18, Junior, Suratpittaya School, Suratthani, Thailand

ENEV062  Powerless Desalination: The Development of a Novel PEGylated Membrane to Exploit Ambient Thermal Energy Gradients of the Ocean
Hyrum Thomas Diesen, 19, Senior, Pleasant Grove High School, Pleasant Grove, Utah

ENEV063  Sustainable and Appropriate Technology System (SATS)
Mijoo Ryu, 17, Sophomore, Sun Woo Yoo, 17, Sophomore, Chaeyon Lim, 17, Junior, Banpo High School, Seoul, South Korea

ENEV064  Efficient Removal of Pb2+, Cd2+, and UO2+ from Water through Sustainable Nano Cellulose Coagulants Synthesized through One Step Modification of Raw Biomass
Aurnov Chattopadhyay, 19, Senior, University High School, Irvine, California

ENEV065  The Effects of *Brassica juncea* vs. *Eichhornia crassipes* on the Reduction of Cr(VI) to Cr(III) through Phytoremediation
Sara E. Zangi, 16, Sophomore, East Chapel Hill High School, Chapel Hill, North Carolina

ENEV066  Modeling Realistic Factors for the Improvement of SODIS-AOP
Helen Haiyue Peng, 17, Sophomore, Starkville High School, Starkville, Mississippi

ENEV067  The Development of a Mechanized Approach to Rapidly and SENSITIVELY Detect and Purify Water Contaminated with *Shigella*, *E. coli*, *Salmonella*, and *Cholera* through the Use of Carbon-Based Biosensors in Conjunction with Arduino-Controlled Micropipettes
Rachel Chang, 17, Junior, Ryan Matthew Thorpe, 17, Junior, Manhasset High School, Manhasset, New York

ENEV068  Slick and Clean: An Investigation into How Magnetite Can Be Used with Organic Sorbents in Oil Spill Clean-Up
Rebekah Kang, 17, Junior, Presbyterian Ladies’ College, Sydney, Sydney, New South Wales, Australia

ENEV069  For Pure Life
Ibrahim Mohamed Helmy Ali, 17, Junior, Mohamed Gamal Nafe, 18, Junior, Dr. Yusuf Ismail Secondary, Nag Hammadi, Qena, Egypt
Red Sea STEM, Hurgada, Egypt

ENEV070  Utilization of Triglycerides from spent Coffee Grounds to Create Methyl Esters through Transesterification
Regina Elizabeth Lee, 18, Senior, Palos Verdes Peninsula High School, Rolling Hills Estates, California

ENEV071  Innovative Vapor Condenser Inspired by Bromeliad Plant
Sureeporn Triphetprapa, 17, Junior, Kanjana Komkla, 18, Junior, Thidarat Phianchat, 18, Junior, Suratpittaya School, Suratthani, Thailand

ENEV072  Powerless Desalination: The Development of a Novel PEGylated Membrane to Exploit Ambient Thermal Energy Gradients of the Ocean
Hyrum Thomas Diesen, 19, Senior, Pleasant Grove High School, Pleasant Grove, Utah

ENEV073  Sustainable and Appropriate Technology System (SATS)
Mijoo Ryu, 17, Sophomore, Sun Woo Yoo, 17, Sophomore, Chaeyon Lim, 17, Junior, Banpo High School, Seoul, South Korea
ENEV054T Production of Multipurposed Bio-Bag with the Compound of Wild *Asphodelus aestivus* Root and Residual Marble Powder
Muhammed Eyyup Alma, 17, Sophomore, Necmettin Yururduzman, 18, Junior, Ozel Mehmet Sait Temel Lisesi, Kahramanmaras/Onikisubat, Kahramanmaras, Turkey

ENEV055 Analyzing the Practical Application of Filtering Pb²⁺ Using Freshwater Algae, Phase Four
Amanda Catherine Minke, 18, Senior, Immaculate Heart High School, Oro Valley, Arizona

ENEV056 Bio-Accumulation of Oil by *Aurelia aurita* Mucus
Karina Bjaevic, 18, Senior, Palos Verdes Peninsula, Rolling Hills Estates, California

ENEV057 Chocolate Garden
Amber Zhang Krazcowska, 15, Freshman, Pembroke School, Kensington Park, South Australia, Australia

ENEV058T A Study on the Effectiveness and Use of Freshwater Snail Waste in the Production of Agricultural Materials
Donggun Ahn, 17, Junior, Sooyeon Jang, 17, Junior, Yeon Soo Choi, 17, Junior, Changwon Science High School, Changwon-si, Gyeongsangnam-do, South Korea

ENEV059T Efficient Hydrogen Sulfide Treatment by Hydrogensulfide: Fe-EDTA Fuelcell
Jiyul An, 17, Junior, HeeJae Park, 17, Junior, Hong Sujin, 17, Junior, Chungnam Science High School, Gongju, Chungcheongnam-Do, South Korea

ENEV060 Filtering Turbidity Using Sediment Filters versus *Balfouria nae* Filters
Sydnee Kay, 18, Junior, Success Academy DSU, St. George, Utah

ENEV061 Graphene Oxide: A Novel Material for Water Filtration
Ankush Dhawan, 16, Freshman, Signature School, Evansville, Indiana

ENEV062 Aerobic Cometabolism of cis-DCE by *Rhodococcus rhodochrous* ATCC® 21198 with Isobutane Growth Substrate
Lauren A. Waldman, 17, Junior, American Heritage School, Plantation, Florida

ENEV063T Bangka's Tin Sea Sand-Fe3O4 as a Removal of Heavy Metals in By-Product of Tin Ore Processing
Intan Utami Putri, 17, Senior, Shofi Latifah Nuha Anfaresi, 17, Senior, State Senior High School 1 Sungailiat, Sungailiat, Bangka, Bangka Belitung, Indonesia

ENEV064T Smart Pleco: A Multi-Functional Eco-Friendly Unmanned Craft for Waterbodies Protection
Chon Hou Leong#, 17, Junior, Chon Hin Ho#, 18, Senior, Pui Ching Middle School, Macau, China, Macao Special Administrative Region

ENEV065T Macauba Palm: A Fruitful Future
Pauline Louise Ten Harmsen van der Beek, 18, Senior, Eline Peeters, 19, Senior, Melanie Martha Gesina Reijnaers, 19, Senior, Gertrudis College, Roosendaal, Noord-Brabant, Netherlands

ENEV066 Green Nanotechnology: Increasing Sewage Water Treatment Efficiency by Using Economical Porcellanite Nanoparticles
Ruba Yosof Alsulamli, 18, Senior, Jeddah Gifted School, Jeddah, Makkah Almukkarmah, Saudi Arabia

ENEV067 Converting Industrial Waste into Eco-Friendly Products for Pharmaceutical Applications
Dana Abdullah Alghamdi, 17, Junior, KFUPM Schools, Dhahran, Eastern Province, Saudi Arabia

ENEV068 Filtration of Copper-Contaminated Water Using *Crescentia cujete*'s Shell Based Activated Carbon
Jose Luis Ramirez-Colon, 18, Senior, Escuela Secundaria Especializada en Ciencias, Matematicas y Tecnologia, Caguas, Puerto Rico

ENEV069T Worm Feed from Palm Oil Waste
Chatchanok Klaitaphong, 17, Senior, Nuengthida Kwandee, 17, Senior, Pathompong Muangthong, 18, Senior, Suratpita School, Muang Suratthani, Suratthani, Thailand

ENEV070 Retrofit System for Smart Reduction of Detergent Usage by Washing Machines
Anastasia Livochka, 17, Junior, Lviv Lyceum of Technology, Lviv, Ukraine

ENEV071 Re-inventing Photobioreactors: Eliminating Industrial Emissions While Producing Energy
Kevin Mark Matos, 16, Sophomore, The Villages Charter School, The Villages, Florida

ENEV072 Unleashing the Way! Remediation of Lead Contaminated Water with *Coriandrum sativum* (Cilantro) Biochar
Manashee Seth Padiyath, 15, Freshman, Woodbury High School, Woodbury, Minnesota

ENEV073 Reducing Harmful Car Emissions by Interior Coating of a Non-Noble Metal Catalyst
Gary Than Nguyen, 18, Junior, Mississippi School for Mathematics and Science, Columbus, Mississippi

ENEV074 Biodegradation of Chlorpyrifos and Soil Remediation Using Native Soil Bacteria and Triton X-A Novel Approach
Prashanta Ranganathan, 18, Junior, Carmel Junior College, Jasmeshpur, Jharkhand, India

ENEV075T Activated Carbon: Houseplant System as a Low Cost Method of Air Purification for Improving Indoor Air Quality in Urban and Sub Urban Areas in Kenya
Zee Yogeshkumar Patel, 16, Sophomore, Priyen Devraj Pindoria, 15, Freshman, Shree Cutchi Leva Patel Samaj School, Nairobi, Nairobi, Kenya

ENEV076 Developing a pH Sensor Using a Raspberry Pi to Monitor Ocean Acidification, Year Two
Evelyn Amal Haase, 16, Sophomore, Molokai High School, Hoolehua, Hawaii

ENEV077 Crude Oil: Can Microbes Eat It?
Shefali Chopra, 19, Senior, Clear Falls High School, League City, Texas

ENEV078T Biodiversity of Microalgae and Use in Decontamination of Cheese Whey in Water Waste in the Tobal Carcasi
Gelver Edition Carvajal Medina, 16, Sophomore, Eduar Cuadros, 19, Sophomore, Institucion Educativa El Tobal, Carcasi, Santander, Colombia

ENEV079 Nanotechnology and Environmental Clean-Up: A Refined Solution - Distillation of Oil
William Philip Houf, 17, Sophomore, Santa Gertrudis Academy High School, Kingsville, Texas

ENEV080 On the Go: A Solar Power Heater Kit
Jordan Isaiah Pope, 17, Junior, Paul Laurence Dunbar High School, Baltimore, Maryland

ENEV081 Single Chamber MFC: Filtration of Arsenic with an Exoelectrogenic Biofilm
Nathan Michael Tidball, 16, Sophomore, Wilsonville High School, Wilsonville, Oregon
ENEV082T  Moringa Filter
Fatema Naser Alhosani, 16, Sophomore,
Khawla Abdalla Alhammadi, 15, Sophomore,
International School of Creative Science, Sharjah, Sharjah, United
Arab Emirates

ENEV083T  Newspaper Cuttings from Garbage to Gold
Rashed Wassim Kabbani, 16, Junior,
Mohammad Abdulredha Abualhassan, 16, Junior,
Abdulrahman Ali Abutalib, 16, Junior,
Al Ittihad Private School - Al Mamzar, Dubai, United Arab
Emirates
Al Ittihad Private School - Jumeirah, Dubai, United Arab Emirates

ENEV084  Testing Seed Viability after Imbibition of Produced Water
Treated with Enzyme Additive to Bioremediate Residual Toxins
Alana River Tessman, 16, Junior, Kern Valley High School, Lake
Isabella, California
Materials Science

MAT001T On the Glow: Assessing the Luminosity, Durability, and Reflectivity of Strontium Aluminate Applied to Road Striping
# Meredith Claire Guidry#, 18, Senior,
# Madison Ann Hasenkamp#, 18, Senior,
St. Joseph's Academy, Baton Rouge, Louisiana

MAT002 Fabrication of a Novel Nanoporous Hybrid and Multi-Layer Membrane for a Drug Delivery System
Devanik Biswas, 18, Junior, Stanton College Preparatory High School, Jacksonville, Florida

MAT003 Ion-Solid Interactions on the Nanoscale
Julia Sophie Graupner, 20, Senior, Carl-Zeiss-Gymnasium, Jena, Germany

MAT004T Polymeric Mortar of Brick and Block Laying: A Study of Marble Waste Incorporation
# Rafael Flores#, 20, Senior,
# Lucas Engelmann Flores#, 20, Senior,
Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha, Novo Hamburgo, Rio Grande do Sul, Brazil

MAT005 Development of Novel Oil-Water Separating Apparatus Based on Superhydrophobic Metal-Mesh
Zhiheng Zhang, 17, Junior, Beijing 101 Middle School, Beijing, China

MAT006 ESCOMBLOCK (Block Based on Debris)
Yosselin Rodriguez Cuevas, 19, Senior, Centro de Bachillerato Tecnologico Industrial y de Servicios No. 132, Hermosillo, Sonora, Mexico

MAT007T ACON (Concrete Organic Additive Based on Opuntia ficus)
Jasai Jahdai Rodriguez Rivera, 18, Senior, Francisco Javier Rivas Cebreros, 19, Senior,
Centro de Bachillerato Tecnologico Industrial y de Servicios No. 132, Hermosillo, Sonora, Mexico

MAT008 The Revolution of Plastic
# Joel Lee Zher Jong, 17, Junior, Sekolah Menengah Kebangsaan Batu Lintang, Kuching, Sarawak, Malaysia

MAT009 Novel Synthesis of Thermochromic VO2 Nanocomposite Films for Energy-Efficient Windows
Joel Abraham, 18, Senior, Westwood High School, Austin, Texas

MAT010 Novel Formulation of Highly Stable Metal-Organic Inks for Printed Electronic Applications
# Mason Richard Varuso, 19, Senior, Patrick F. Taylor Science & Technology Academy, Westwego, Louisiana

MAT011T A Wearable Electronic Anti-smog Face Mask
Qiaochu Fan, 17, Senior, duPont Manual High School, Louisville, Kentucky

MAT012 Collisions of a Buckyball with Graphene and SiC Sheets at Supersonic Speeds
Emily Jiayuan Liu, 18, Senior, duPont Manual High School, Louisville, Kentucky

MAT013 Childproof?
Kylee Rene Porche, 18, Junior, South Terrebonne High School, Bourg, Louisiana

MAT014 Electromagnetic Applications
Jason Dong, 17, Junior, Alfred M. Barbe High School, Lake Charles, Louisiana

MAT015 Synthesizing 3D Printable Self-Healing Materials
Jessica Jiaxin Sun, 18, Senior, Red Lion Area Senior High School, Red Lion, Pennsylvania

MAT016 Bio-Polymeric Study for Recycling and Replacing Polyethylene Terephthalate (Through Reprocessed Polyurethane Polyls and Algal Bioplastic Substitute)
# Andrew Dong-Hyun Kim, 18, Senior, The Woodlands College Park High School, The Woodlands, Texas

MAT017T Alumiracle: Coloring Anodized Aluminum with Natural Dyes
Satoe Tayama, 18, Senior, Rika Kaminishi, 19, Senior,
Chiba Prefectural Sakura High School, Sakura-city, Chiba-pref., Japan

MAT018T Enhancement of Magnetorheological Fluids for Prosthetic Knee Applications
# Kit Mun Chow#, 18, Senior,
# Clara Keng#, 18, Senior,
River Valley High School, Singapore, Singapore
Raffles Institution, Singapore, Singapore

MAT019 Emergent Properties from WS2 Empowered by Laser Sculpting and Au Nanoparticles Landscaping
Belle Miaor Sow, 18, Senior, NUS High School of Mathematics & Science, Singapore, Singapore

MAT020 Graphene Odyssey 2: Graphene Production via Resonant Frequency Exfoliation
Indigo Buenaventura Acosta, 15, Freshman, Taos Tyger/Acosta Home School, Taos, New Mexico

MAT021T Bio-Absorbent from Spondias pinnata Gum for Pet Pads
Nuthathon Phaiyarat, 18, Junior, Piyorose Prutisunchai, 18, Junior,
Thidaphon Thiyakham, 17, Junior,
Damrongratsongkroh School, Muangchegiangrai, Chiangrai, Thailand

MAT022T The Multifunctional Shockproof Packaging for Longer Shelf Life of Climacteric Fruits
Pakjira Thayaeng, 17, Junior, Samitanan Sunantawanit, 18, Junior,
Sireerak Dechpong, 18, Junior,
Princess Chulabhorn Science High School Phitsanulok, Phitsanulok, Thailand

MAT023 Optimization of Electro Pulsing on Yttria-Stabilized Tetragonal Polycrystalline Zirconia (3Y-TZP) Ceramic Water Filter Sintering
Richard Li Yang, 17, Junior, Troy High School, Troy, Michigan

MAT024 Investigating the Design of Nanoparticles to Target Difficult-to-Reach Tumors
Isha Lele, 17, Junior, Hathaway Brown School, Shaker Heights, Ohio

MAT025 Developing a Novel Flexible MoS2 Biosensor to Detect Lower-Concentrated Area of Biological Molecules at the Femtomolar Level
Erika Yang, 17, Junior, Granada High School, Livermore, California

MAT026 Aqueous vs. Interfacial Routes of Polyaniline
Hazel Rose Galvan, 17, Sophomore, Von Steuben Metropolitan Science Center, Chicago, Illinois

MAT027 Heteromultivalent Approaches to Clot-Targeted Nanomedicine: Combination Targeting of Platelets and Fibrin
Amaya Najma Razmi, 17, Junior, Hathaway Brown School, Shaker Heights, Ohio

MAT028 Bioactive Glass Enhances Recovery of Drosophila and Sf9 Cell Mitochondrial Function Following Antibiotic Treatment
Lacie Elizabeth Pichler, 18, Junior, Conrad Weiser High School, Robesonia, Pennsylvania

MATS039  A Comparative Analysis of Alternative Heating Methods of an Artificial Nylon Muscle
Maile Summer Paulmeier, 16, Sophomore, Bluffton High School, Bluffton, South Carolina

MATS030  Corb Cob Particleboard: Ecological Product Manufactured with Corb Cob and Husk Residue
Marcelo Abraoa de Melo Ramalho, 18, Senior, Beatriz da Costa Dantas, 17, Senior, Escola Estadual Joao de Abreu, Barauna, RN, Brazil

MATS031  Co-Assembled Ultra Strong Hydrogel as a Potential Scaffold for Tissue Engineering
Rina Sevostianov, 18, Senior, Makif Gimel Ashdod, Ashdod, Israel

MATS032  Oh Crack
Kristi Ann Webster, 18, Junior, Willcox High School, Willcox, Arizona

MATS033  Novel Agarose Processing Techniques: Development and Impregnation of Hyper-Porous Agarose Emission Foam and Micro-Cylindrical Agarose Particles
Hamzah Faiyaz Jhaveri, 18, Junior, Lake Highland Preparatory School, Orlando, Florida

MATS034  Graphene Doping
Devin Daniel Harris, 19, Senior, Dylan Trevor Hall, 19, Senior, Collinsville High School, Collinsville, Illinois

MATS035  New, But Reused: Recycled Insulation
Abby Sarah Polsky, 17, Junior, Great Mills High School, Great Mills, Maryland

MATS036  Optimization of Vertically Aligned Boron Nitride Nanotube Membranes via Magnetic Arrangement in a Lyotropic Precursor for Water Transport Applications
Connor Li, 18, Senior, Greenwich High School, Greenwich, Connecticut

MATS037  Novel Membranes for Synthetic Lungs and Planetary Applications
Suparnamaaya Prasad, 17, Junior, York High School, Yorktown, Virginia

MATS038  Development and Testing of 4555 Bioglass via Acid and Base Sol-Gel Polymerization and Fusing onto Gallost gallas domesticus Cervical Bones for Bone Grafting Treatment
Aditi Bawa, 19, Senior, Loudoun County High School, Leesburg, Virginia

MATS039  Nanofabrication and Electroanalysis of Carbon-MEMS: A Suspended Nanometric Gap for Sensitive Biosensing
Suryaprakash Vengadesan, 17, Junior, Irvine High School, Irvine, California

MATS040  Fabrication of Carbon Nanosphere-Based Gas Sensor
Jose Luis Perez-Gordillo, 18, Senior, Petra Mercado Bougart, Humacao, Puerto Rico

MATS041  Sugar Cane Bagasse as Raw Material to Minimize Deforestation and the Use of Plastics
Andrea Torres-Acevedo, 15, Freshman, Academia San Agustin y Espiritu Santo, Sabana Grande, Puerto Rico

MATS042  A Novel Method to Detect Alcohol Vapors Based in the Polymeric Nanofiber PEDOT-PSSA
Marialis Casillas, 18, Senior, Specialized School in Science and Math Thomas Armstrong Toro, Ponce, Puerto Rico

MATS043  Revolutionizing Engineering through Visible Light: The Safe and Cost-Effective Creation of Ultra-Light, Strong, and Easily Architected Materials
Harl Nanthakumar, 17, Junior, Christian Brothers Academy, Syracuse, New York

MATS044  Formation of TiO2 Surface Structure under IR Laser Ablation of Titanium in C2H5OH (5% H2O) Liquids Environment: Prospects for Subsequent Chemical Processing of the Modified Layer
Maria Borisova, 18, Junior, Samara Regional Centre for Intellectually Gifted Children, Samara, Russia

MATS045  A Novel Approach for Sensing Seismic Events: Applications of Graphene Nanoflake Powder Composites
Isaac Nicholas Jordan, 17, Junior, Animas High School, Durango, Colorado

MATS046  Antimicrobial “Super” Joints: Adding Silver to Titanium Nitride Physical Vapor Deposition Coating for Artificial Joints
Hanyue Terri Liu, 17, Junior, Xiangting Andrea Liu, 15, Freshman, International School of Beijing, Beijing, China

MATS047  Green and Sustain Energy for Tomorrow: From Waste Vegetable Oil to Economical Iron Nanoparticles Embedded Carbon as Cathode Catalyst in Fuel Cell
Surayouth Phukawattanatham, 18, Junior, Kraithum Kerthip, 18, Junior, Kamnoetvidya Science Academy, Rayong, Thailand

MATS048  A Novel Methodology to Assemble Organic Nanomaterials via Magnetoophoretic Alignment
Vera Alexandra Zarubin, 17, Junior, The Bronx High School of Science, Bronx, New York

MATS049  Multifunctional NGF-Au-SPIO Nanoparticles: Magnetically Directing Neurite Extension and Orientation
Grace Hu, 18, Senior, Jericho High School, Jericho, New York

MATS050  Cellulose Nanocrystals for Security Applications: Embedding Non-Optical Signatures Provided by Nanoparticles into Cellulose Nanocrystal Chiral Nematic Films
Nicky Wojtania, 18, Senior, Plano West Senior High School, Plano, Texas

MATS051  Bio-Implants for HRQoL Applications: RSM Model Optimization of the Laser Processing Parameters to Improve Bio-Compatibility of Ti-6Al-4V Alloys
Ashwin Kumar, 18, Junior, Texas Academy of Math and Science, Denton, Texas

MATS052  Exploring Piezoelectric Properties of Atomically Thin WSe2 for 2-Dimensional Nanoelectromechanical Systems
Terrance Li, 17, Sophomore, Newport Senior High School, Bellevue, Washington

MATS053  Molecular Dynamics Simulation and Experimental Fabrication of Nanoporous Graphene Membranes for Optimal Water Permeability in Reverse Osmosis Desalination
Apoorv Khandelwal, 18, Senior, Nikola Tesla STEM High School, Denton, Texas

MATS054  Using Specific Heat Capacity to Engineer a Thermal Evacuation Suit to Address Heat Transfer Processes
Nick Perez, 16, Freshman, Temescal Canyon High School, Lake Elsinore, California

MATS055  Novel Anti-Radiation Polypropylene-Eggshell Composite
Tri Ardiansa, 18, Junior, SMA Negeri 3 Semarang, Semarang, Central Java, Indonesia

Jaewoo Heo, 17, Junior, Seoul International School, Seoul, Gyunggi-Do, South Korea

MATS057  Multidrug Resistant Superbugs: Selective Separation, Identification and Killing Using Fluorescent, Magnetic Multifunctional Carbon Dots
Vikram Ruppa-Kasani, 17, Junior, Chattahoochee High School, Johns Creek, Georgia
MATS058 Growth of Monolayer MoSe2 and WSe2 with the Assistance of Halide Catalysts
Kristian Ming Nilsen, 18, Senior, Oceanside High School, Oceanside, New York

MATS059 G - Glove: An Environmentally Friendly and Cost Effective Alternative to Present Day Surgical Gloves
Jack Edward Mogus, 17, Junior, Garth Webb Secondary School, Oakville, Ontario, Canada

MATS060 Development of Lithium Ion Battery Nano-Synthesized Electrode Materials Using Fe3O4 and rGO
Minjung Park, 18, Senior, Chungbuk Science High School, Cheongju-Si, Chungcheongbukdo, South Korea

MATS061 The Role of Materials and Surfaces in the Transmission of Bacteria in Public Places
Camilla Hurst, 17, Junior, European School Luxembourg 1, Luxembourg, Luxembourg

MATS062 Can We Improve the Efficiency of Fiber-Optics?
Masao Chase Espinosa, 15, Freshman, Washington High School, Charles Town, West Virginia

MATS063T Mathematical Characterization of Improved Efficiency of Solar Energy Collection Based on Quantum Biology
Ashwin Kulshrestha, 18, Junior, Jainith Jagdish Patel, 18, Junior, Daniel Joseph Haller, 17, Junior, Marvin Ridge High School, Waxhaw, North Carolina

MATS064 Biocompatible Gold Nanorod-Embedded, Crosslinked Collagen Composites for Surgical Applications: Synthesis and Characterization
Sachin Subramanian, 17, Junior, BASIS Chandler, Chandler, Arizona

MATS066 Answers from Ashes
Harrison Thomas Homan, 17, Sophomore, James F. Byrnes High School, Duncan, South Carolina

MATS067 Enhancing LiFi and Lighting: CsPbBr3 Zero-Dimensional Perovskite and Quantum Dot Based Color Converters
Nadia Abdulrahman Almutlak, 18, Junior, AlTarbyah AlIslamiya Schools, Riyadh, Saudi Arabia

MATS068 Improving Resistive RAMs’ Performance by Using Single Crystal MAPbBr3 Perovskite
Sara Ahmed Alrabiah, 18, Senior, AlTarbya AlIslamiyah Schools, Riyadh, Saudi Arabia

MATS069T A Composite Material Made from Wastes of Glass, Polymers and Industrial Rubber as a Waste Management Initiative in Urban and Sub-Urban Areas in Kenya
Bilhah Nyaboke Ontiriah, 17, Sophomore, Mitosh Lalji Varsani, 16, Sophomore, Shree Cutchi Leva Patel Samaj School, Nairobi, Nairobi, Kenya

MATS070 Hydrothermal Synthesis of ZnO Nanorod Cluster Thin Films for Low-Dimensional Thermoelectric Applications
Andres Esteban Lombo, 18, Senior, Saint Thomas Aquinas Catholic Secondary School, Oakville, Ontario, Canada

MATS071 A Novel Corrosion Resistant Composite Material Developed from LPDE Waste Plastic and GGBFS (Ground Granulated Blast Furnace Slag)
Swasthik Padma, 16, Sophomore, Vivekananda English Medium School, Dakshina Kannada, Karnataka, India

MATS072 Shear Radial Strength: Combining Web Geometry with Shear Thickening Fluids to Create a Better Body Armor
Lucas Carey Lynn, 18, Junior, Wetumpka High School, Wetumpka, Alabama

MATS073 Modifying Substrate Mechanics to Bioengineer an in vitro Tumor Microenvironment
Codi Joy Elliott, 18, Senior, Sarasota High School, Sarasota, Florida

MATS074 Call and Charge the Mobile by Voice Communication
Naeem Hassan, 18, Senior, Ahmad Hassan, 18, Senior, Muhammad Liaqat Ali, 18, Junior, Daanish School Boys Chishtian, Chishtian, Punjab, Pakistan

MATS075T VALIX: Obtaining and Implementing Polysaccharides (Banana, Cassava and Yam Starch) in the Gradual Replacement of Synthetic Polymers Used in the Manufacture of Packing or Packaging
Valeria Valencia Henao, 18, Junior, Maria Ximena Arredondo Montoya, 17, Junior, Santiago Alexis Valencia Zapata, 18, Junior, Institucion Educativa Colegio Loyola Para la Ciencia y la Innovacion, Medellin, Antioquia, Colombia

MATS076T The Development of an Efficient Space Radiation Shielding Fabric
Hannah Mae Steele, 17, Junior, Liberty High School, Bedford, Virginia

MATS077 Carbon Fiber Chain Mail Protective Armor
Carson Wayne Weidman, 18, Senior, West Salem High School, Salem, Oregon

MATS078T Fibrin Scaffold for Dentin-Pulp Regeneration with DPSCs
Rose Mei Hong, 17, Junior, Jasmin Gao, 19, Senior, Del Norte High School, San Diego, California

MATS079 Electrode Materials Using Fe3O4 and rGO
Northview High School, Johns Creek, Georgia

MATS080 A Low Pressure Graphene Epitaxy on Cu from Activated Solid Amorphous Carbon
Noah Bruno Manz, 18, Senior, Farmington High School, Farmington, New Mexico

MATS081T Marine Degradable Plastic Based on Soybean By-Products
Mathematics

MATH001 Affine Planes, Projective Planes and Latin Squares
Jakub Novotny, 19, Junior, Gymnaziun Brno-Reckovice, Brno, Czech Republic

MATH002 Bijections between Graphs and Tilings with Walkup Property
Tanya Ivanova Otsetarova, 18, Junior, Akademik Kiri Popov High School of Mathematics, Plovdiv, Bulgaria

MATH003 On the Distortion of Embedding Perfect Binary Trees into Low-Dimensional Euclidean Spaces
Dona-Maria Radoslovava Ivanova, 19, Senior, Baba Tonka Upper Secondary High School, Ruse, Bulgaria

MATH004 The Effect of Language on the Time Required to Convey a Message
Kyle Thomas Carden, 16, Sophomore, Union Grove High School, McDonough, Georgia

MATH005 The Iterations of Tent Maps
Yang YuChen, 17, Junior, High School No.7 Chengdu Sichuan P.R.China, Chengdu, Sichuan, China

MATH006 A Class of Convex Curves Arising in Capillary Floating Problem
Shilun Li, 17, Junior, Guangdong Experimental High School, Guangzhou, Guangdong, China

MATH007 On the Effective Hilbert Zero Point Theorem
Yilian Tan, 17, Junior, No. 2 High School of East China Normal University, Shanghai, China

MATH008 Motivic Symbols and Classical Multiplicative Functions
Ane Kristine Espeseth, 19, Senior, University, Shanghai, China

MATH009 An Exploration in Textual Analysis
Grady Gerkin Daniels, 17, Junior, Bartow High School, Bartow, Florida

MATH010 Polynomials in Z[x] and Irrationality Measure
Griffin Nicolas Macris, 18, Senior, New Prague High School, New Prague, Minnesota

MATH011 The Paradox of Doing It Wrong in Order to Do It Right
Matthew Tiberius Favela-Tomlinson, 19, Senior, El Dorado High School, Silver Spring, Maryland

MATH012 A Method for Analyzing Basketball Teams
Shuzheng Zheng, 19, Senior, Unity Christian High School, Orange City, Iowa

MATH013 Generalized Problem of Apollonius
Egor Morozov, 18, Senior, Lyceum “Second School,” Moscow, Russian Federation

MATH014 Identities of Perkins Monoid and Millennium Problem
Dmitri Mikhailovskii, 17, Sophomore, School 564, St. Petersburg, Russian Federation

MATH015 Generalized Jacobi Identities and Jacobi Elements of the Group Ring of the Symmetric Group
Savelii Alexandrovich Novikov, 17, Sophomore, School 564, St. Petersburg, Russian Federation

MATH016 Systems of Tangent Circles Inscribed in Generalized Archimedes Arbelos
Makar Volkov, 18, Junior, The Rostov Region Center of Additional Education, Rostov-on-Don, Rostov Region, Russian Federation

MATH017 Optimizing the Search for Mersenne Primes
Carson Scott Cato, 18, Senior, Arkansas School for Mathematics, Sciences, and the Arts, Hot Springs, Arkansas

MATH018 Cylindrical Deformation of Triangles
Napo Na Ranong, 18, Senior, Kasidetch Thanycharaoke, 19, Senior, Alpharetta Theakittakasakul, 19, Senior, Princess Chulabhorn Science High School Phetchaburi, Cha-Am, Phetchaburi, Thailand

MATH019 Ideal k-Surface
Sandro Museliani, 15, Freshman, Nia Baramadze, 16, Sophomore, Georgian-American School, Tbilisi, Georgia

MATH020 Relative Entropy of Jackson Pollock’s Art: Drip vs. Dark
Elizabeth Stone, 16, Sophomore, Miami Country Day School, Miami, Florida

MATH021 Determining Optimal Pitch Selection Using Run Values and PITCHf/x Data
Cameron Benesch, 19, Senior, Niles North High School, Skokie, Illinois

MATH022 Safer Security: A Novel Algorithm for Detecting Carmichael Numbers
Sathwik Karnik, 17, Junior, Massachusetts Academy of Mathematics and Science, Worcester, Massachusetts

MATH023 Independence of the Miller-Rabin and Lucas Probable Prime Tests
Alec Maxwell Leng, 18, Senior, Lincoln High School, Portland, Oregon

MATH024 Which Maps Are 4-list Colorable?
Juei-Yin Lin, 17, Junior, Taipei First Girls High School, Taipei City, Chinese Taipei

MATH025 Bounds on the Metric Dimensions for Families of Planar Graphs
Carl Joshua Tiangco Quines, 17, Junior, Valenzuela City School of Mathematics and Science, Valenzuela, Manila, Philippines

MATH026 The Locus of Mid-Tangent Points of Planar Curves
James Chen, 17, Senior, West Salem High School, Salem, Oregon

MATH027 A Participant-Specific Estimate of Expected Organ Quality in Kidney Paired Donation
Naveen Krishna Durvasula, 16, Sophomore, Montgomery Blair High School, Silver Spring, Maryland

MATH028 Novel Application of Collatz-like Sequences to Cryptographically Secure Pseudo-Random Number Generation
James Chen, 17, Senior, West Salem High School, Salem, Oregon

MATH029 A Novel Approach to Collatz Conjecture Proof: Effect of Addition on Prime Factorization and Unique Numeric Potential Concept
Matt Foscik, 15, Freshman, Empire High School, Tucson, Arizona

MATH030 Discrete Ricci Flow on Discrete 3-Manifolds
Anton Wu, 17, Senior, Half Hollow Hills High School East, Dix Hills, New York

MATH031 Upper Bound on the Burning Number of Graphs
Max Ruikang Land, 18, Senior, Dutch Fork High School, Irmo, South Carolina

MATH032 Benford’s Law: Fact or Fiction?
Jacob Lee Vreugdenhil, 18, Junior, Caden Glen Zonnefeld, 18, Junior, Unity Christian High School, Orange City, Iowa
MATH033 A Novel Supervised Machine Learning Approach to Predicting Crime Information
Palash Shah, 16, Sophomore, Westfield High School, Chantilly, Virginia

MATH034 Benford's Law vs. the Boom: A Statistical Analysis of North Dakota Population from 1980 to 2015
Wesley R. Kemp, 18, Junior, Cavalier Public School, Cavalier, North Dakota

MATH035 Approximations of Zeros in Differentiable Functions
Adrian Omar Olivera-Olivera, 17, Senior, Centro Residencial de Oportunidades Educativas de Mayaguez, Mayaguez, Puerto Rico, Puerto Rico

MATH036 An Addition to the Problem of Points
Daniel Alejandro Santiago, 16, Freshman, Centro Residencial de Oportunidades Educativas de Mayaguez, Mayaguez, Puerto Rico, Puerto Rico

MATH037 Transposed Matrices in Archaeological Seriation to Analyze Aging and Distance between Archaeological Features in an Integrated Development Environment
Alex Manuel Colon Vazquez, 17, Junior, Specialized Science and Math Secondary School Thomas Armstrong Toro, Ponce, Puerto Rico, Puerto Rico

MATH038 Orthogonal Polynomials and the Two Dimensional Nevai Condition
Gonen Zimmerman, 17, Junior, Kfar Hayarok High School, Ramat Hasharon, Center, Israel

MATH039 The Reve's Puzzle
Ilya Nikolaevich Stepanov, 17, Sophomore, Municipal Classical Lyceum, Kemerovo, Russian Federation

MATH040 Efficient Point-Counting Algorithms for Supereelliptic Curves via the Cartier Operator and the Hasse-Weil Bound
Matthew Manchung Keisuke Hase-Liu, 18, Senior, Lynbrook High School, San Jose, California

MATH041 Looking into the Past for Insight on the Future: Predictive Analytics and Machine Learning for Time Series Data
Dahlia Dry, 17, Sophomore, Fort Myers High School, Fort Myers, Florida

MATH042 Mapping Edges to Nodes by Utilizing Morton Codes in Stochastic Kronecker Graphs
Arjun Srinivasan Ramani, 19, Senior, West Lafayette Junior-Senior High School, West Lafayette, Indiana

MATH043 A 6-Chromatic Unit Distance Graph in Space
Stephanie Li, 17, Junior, Thomas Lee, 16, Sophomore, Horace Mann School, Bronx, New York Stayvesant, New York, New York

MATH044 n-Dimensional Fractions and a Generalized Calkin-Wilf Tree
Ajmain Yamin, 18, Senior, Bronx High School of Science, Bronx, New York

MATH045 Some Properties of the Jacobi Point in the Triangle
Daria Leonidovna Orlova, 17, Junior, Municipal Budgetary Educational Institution 'Secondary School No. 40' Named after Rufina Ovseeskaya, Barnaul, Altai Region, Russian Federation

MATH046 Decomposing Fractions into the Sum of Distinct Unit Fractions and Their Correlating Patterns
AnaMaria Perez, 15, Freshman, Albuquerque Academy, Albuquerque, New Mexico

MATH047 Investigating Novel Analysis by Benford Methodology for Fraud and Anomaly Detection
Anish Raju, 15, Freshman, BASIS Chandler, Chandler, Arizona

MATH048 The Homotopy Theory of Parametrized Objects
Karthik Yegnesh, 17, Junior, Methacton High School, Eagleville, Pennsylvania

MATH049 Chance or Coincidence-Counting 3-Arithmetic Progression in Block-Generated Thue-Morse String
Yuan-Jung Juang, 18, Senior, National Tainan Girls' Senior High School, Tainan City, Chinese Taipei

MATH050 The Application of the Complex Numbers to Solve Diophantine Equations by Finding the Relations between the Coefficients
Yuliia Suprun, 16, Sophomore, Municipal Institution Sumy Specialized School of I-III Levels Named After the Hero of the Soviet Union O. Butko, Sumy, Ukraine

MATH051 Generation, Construction, Matches: An Analysis of n-Sided Dice
Shamay G. Samuel, 18, Senior, Renasha Mishra, 18, Senior, Delhi Public School, R. K. Puram, New Delhi, India Delhi Public School R.K. Puram, Delhi, New Delhi, India

MATH052 Encryption with Irrational Numbers
Cenk Cankeles, 19, Senior, Mehmet Burak Donmez, 19, Senior, Nafi Gural Fen Lisesi, Kutahya, Merkez, Turkey

MATH053 A Novel Solution for Integer Factorization with Cryptographic Applications
Evan Jason Kirby, 19, Senior, East Ridge High School, Clermont, Florida

MATH054 A Geometrical Analysis of Harmony and Voice Leading in Music Using Quotient Orbifolds
Aditya Sivakumar, 17, Junior, Beaverton High School, Beaverton, Oregon

MATH055 Polygon Triangulation Problem
Saya Haydar Qader, 19, Junior, Nilufer High School, Arbil, Iraq
Microbiology

MCRO0001T Use of Phosphorus Solubilizing Bacteria with Application in Agriculture
Ana Cristina Valenzuela Cervantes, 17, Junior, Misael Alexander Valenzuela Zuniga, 17, Junior, Colegio de Bachilleres del Estado de Sinaloa “Prof. Hermes Gonzalez Maldonado”; Guasave, Sinaloa, Mexico

MCRO0002 Performance of Lime, Chlorhexidine Gluconate Solution, Bleach Solution and Aeration of the Soil against Mycoplasma bovis in Recycled Sand Bedding, A Four Year Study
Cady C. McGehee, 18, Senior, Okeechobee High School, Okeechobee, Florida

MCRO0003 Prevention Is Better than a Cure: A Novel Approach to Inhibit Pseudomonas aeruginosa from Creating Biofilms
Prerna Ravinder, 15, Freshman, Bartow High School, Bartow, Florida

MCRO0004 Biowarfare: How Do Bacteriophage Viruses Lyse Bacterial Cells?
Angela Shar, 16, Sophomore, Vanguard High School, Ocala, Florida

MCRO0005 Mutagenesis of Soil Bacteria for Life on Mars
Samuel Marin Scott, 17, Junior, Kahuku High and Intermediate School, Kahuku, Hawaii

MCRO0006 The Effect of Bacterial Metabolism and Bacterial Interaction on the Electrical Output of Microbial Fuel Cells
Shakson Kyoh Isaac, 16, Sophomore, Mililani High School, Mililani, Hawaii

MCRO0007 How Does Dandelion Affect E. coli?
Zhiwen Xu, 17, Sophomore, Fayetteville High School, Fayetteville, Arkansas

MCRO0008 Topical Antibiotics Consisting of Iron Oxide Nanoparticles
Michelle Nguyen, 17, Junior, Rockdale Magnet School for Science and Technology, Conyers, Georgia

MCRO0009T Investigating a New Approach for Biosynthesis of Green Pesticide 5-Aminolevulinic Acid Using Engineered E. coli and Biomass
Rebecca Yinbei Li, 16, Sophomore, Alex Jie Li, 17, Junior, Mounds View High School, Arden Hills, Minnesota

MCRO0010 Nano Today, Huge Tomorrow: Improving Antibiotic Drug Delivery for S. epidermidis Strains with a Novel CNT Dispersion
Afeefah Fatimah Khazi-Syed, 18, Senior, Harmony School of Innovation - Fort Worth, Fort Worth, Texas

MCRO0011 Establishment of a Working System for Engineering Programmable Bacteriophages
Candace Walther, 18, Senior, University School of Milwaukee, Milwaukee, Wisconsin

MCRO0012 Applied Bacterial Biominalization: Increasing Magnetosome Formation within Magnetospirillum magnetcum through Genetic Recombination of Genes Essential to Magnetosome Formation and Mutation Mediated by UV Radiation
Seth Holden Young, 19, Senior, The Classical Academy, Colorado Springs, Colorado

MCRO0013 The Effectiveness of Oregano Oil in Treating Ostertagia ostertagi
Gretchen M. Lee, 17, Junior, Pettisville High School, Pettisville, Ohio

MCRO0014 Identification, Pharmacological Screening, and Antiviral Mechanistic Determination of Fractions and Compounds Isolated from Chondrus crispus and Laminaria digitata Extracts
Beau Taylor Bingham, 18, Senior, Cascia Hall Preparatory School, Tulsa, Oklahoma

MCRO0015 The Effect of Tetracycline, Azithromycin, and Hypothermia on Populations of Naegleria lovaniensis
Joseph Li Du, 18, Junior, Jefferson Forest High School, Forest, Virginia

MCRO0016T Empowering the Antibacterial and Antifungal Effects of Juglone by Obtaining Juglone: Beta Cyclodextrin Binary System for Pharmaceutical Purposes
Nadejda Hincu, 19, Senior, Theoretical High School “Orizont”, Chisinau, Republic of Moldova

MCRO0017 To Floss, or Not to Floss: An Oral Microbiome Investigation
Vivek Gopalakrishnan, 18, Senior, Lexington High School, Lexington, Massachusetts

MCRO0018 A Comparative Methodology: Processing Laryngotracheal Swabs for 16S rRNA Gene Sequencing
Madhu Gowda, 18, Senior, Middleton High School, Middleton, Wisconsin

MCRO0019 Self-Derived Peptides: Inhibition of Bacterial Growth without Resistance
Amy Mei Zhou, 19, Senior, Queensland Academies - Health Sciences Campus, Southport, Queensland, Australia

MCRO0020T The Synergistic Effects of Silver Nanoparticles and Antibiotics on Drug-Resistant Bacteria
Andy Jesse Zhao, 17, Junior, Yuxin Sha, 17, Junior, Kyra Ti Chan, 17, Junior, Shanghai American School Puxi, Shanghai, China

MCRO0021 Tiny Titans: Induced Sporulation of Bacillus anthracis
Jeremy Turner Cotton Ward, 18, Junior, Ridgway Christian High School, Pine Bluff, Arkansas

MCRO0022 Elucidating the Mechanism of Virulence in E. coli O104:H4: Identification of the Role of Biofilms in Stx-Phase Induction
Neehal Reddy Tumma, 15, Sophomore, Port Huron Northern High School, Port Huron, Michigan

MCRO0023 Analyzing the Antibiotic Properties of Snake Venom, Phase 1
Cody Owen Smith, 17, Sophomore, North Toole County High School, Sunburst, Montana

MCRO0024T A Comparative Study of the Antimicrobial Effects of Transition Metal Nanoparticles
Richard Joseph Romero, 18, Senior, Fernando Guerrero, 18, Senior, Rio Rancho High School, Rio Rancho, New Mexico

MCRO0025 Bacteria Hysteria: The Antibacterial Activity of Ginger
Baotram Vu Nguyen, 18, Senior, Berks Catholic High School, Reading, Pennsylvania

MCRO0026 Bee Propolis, the Natural Antibiotic
Kendrick Micheal Dobbs, 18, Senior, John Marshall High School, Glen Dale, West Virginia

MCRO0027 Construction and Mutational Analysis of a Heavy Metal Biosensor in E. coli
Anthony Joseph Eckdahl, 19, Senior, Central High School, Saint Joseph, Missouri
MCRO028 Using Microbial Metabolites to Develop an Alternative to Combat Klebsiella pneumoniae carbapenemase (KPC)
Maria Vitoria Valoto, 17, Senior, Colégio Interativa, Londrina, PR, Brazil

MCRO029 An Early Warning System for Zika Virus in Mosquito Populations Based on Real-Time Field Detection of Viral RNA in Mosquito Saliva
Rahul Subramaniam, 16, Sophomore, Greenwich High School, Greenwich, Connecticut

MCRO030 Analysis of Toll-Like Receptor Expression in Xenopus laevis Macrophage Subsets
Hannah Docter-Loeb, 18, Junior, School Without Walls, Washington, District of Columbia

MCRO031 Investigating the Effects of UV Radiation on Yeast Colony Growth
Nicholas Michael Couchara, 17, Sophomore, Gwinnett School of Mathematics, Science, and Technology, Lawrenceville, Georgia

MCRO032 Saving the North American Ash Tree, Year Two: Establishing Metarhizium anisopliae as an Endophyte in Fraxinus uhdei
Nicolas A. Wamsley, 18, Junior, Timber Ridge Scholars Academy, Pacific, Missouri

MCRO033 The Effects of Household Remedies on Mold
Dylan Benjamin Benson, 17, Sophomore, Hankinson Public School, Hankinson, North Dakota

MCRO034 The Effects of Nitazoxanide on Chaperone/Usher Pathway Assembled Virulence Factors in Gram-Negative Bacteria
Raphael Leon Iskra, 17, Junior, Commmack High School, Commack, New York

MCRO035 Role of SRCR Domains in Collagen IV-Crosslinking Activity of LOXL2
Abner Xavier Pena, 18, Junior, Escuela Secundaria Especializada en Ciencias, Matematicas y Tecnologia, Caguas, Puerto Rico

MCRO036 Shifting Sun vs. Putrid Pilobolus
Jennel Mead, 18, Senior, Cheyenne South High School, Cheyenne, Wyoming

MCRO037 The Effect of Tungsten Oxide on Disinfection of E. coli
Sabrina Ye, 15, Freshman, Mills E. Godwin High School, Richmond, Virginia

MCRO038 Kimchi Bacterial Affects against Common Sinusitis Bacteria
Tristen Kelson, 17, Junior, Ogden Senior High School, Ogden, Utah

MCRO039T An Investigation into Immune Properties of Tetrahymena: The Effect of Environment and Genotype on Tetrahymena thermophila Dicer Upregulation, Survival, Morphology, and Phenotype
Tyrell Johnathan Floyd#, 18, Senior, Anna Graciela Mancera, 19, Senior, Salt Lake Center for Science Education, Salt Lake City, Utah

MCRO040 Unraveling the Role of Novel Type I Interferon in Human Paramyxovirus Infections
Hannah Lizzette Miletello, 17, Junior, Saint Joseph's Academy, Baton Rouge, Louisiana

MCRO041 Pyrimidine Derivatives Conjugated to Gold Nanoparticles to Combat Antibiotic Resistance
Titash Biswas, 17, Junior, Crescenta Valley High School, La Crescenta, California

MCRO042 Dethiosulfuvibrio Strain F2b: A New Non-Thiosulfate Reducing Bacterium that Depgrades Mariculture Waste
Stephen Francis Grabowski, 19, Senior, Baltimore Polytechnic Institute, Baltimore, Maryland

MCRO043 The Repercussions of Probiotic Supplementation of Escherichia coli Growth
Jazmine Odeet Cardenas, 17, Junior, J.W. Nixon High School, Laredo, Texas

MCRO044 A Quantitative Analysis of the Presence and Absence of a Variety of Mold Groups
Josianne Mabel Prochnow, 17, Junior, Hankinson Public School, Hankinson, North Dakota

MCRO045T Chewing Gum's Antimicrobial Activity Using Plant Derived Essential Oils and Xylitol
Michelle Angelie Narvaez-Ramos, 17, Senior, Loren Aldarondo-Torres, 17, Senior, Centro Residencial de Oportunidades Educativas de Mayaguez, Mayaguez, Puerto Rico

MCRO046 The Limits of Pseudomonas chlororaphis O_2 under Osmotic Stress
Ariel Norman, 17, Junior, Woods Cross High School, Woods Cross, Utah

MCRO047 Drastic Conditions Call for Drastic Measures: The Viability of Terrestrial Extremophiles in Simulated Martian UV Radiation
Ana Sofia Mendez Ussoy, 18, Senior, North Carolina School of Science and Mathematics, Durham, North Carolina

MCRO048 Cutaneous Skin Bacteria: A Search for Antifungal Activity
Taylor Michelle Mosley, 18, Senior, Arkansas School for Mathematics, Sciences and the Arts, Hot Springs, Arkansas

MCRO049 Intra-Microcolony Spatial Positioning Affects Antibiotic Susceptibility in Neisseria gonorrhoeae
Mahmoud Abouelkheir, 18, Senior, Midwood High School, Brooklyn, New York

MCRO050 A Novel Method to Induce and Upregulate the Production of Stable Antistaphylococcal Compounds via the Combined-Cultivation of S. salivarius and Streptocytetes
Arjun Jain, 17, Junior, Westwood High School, Austin, Texas

MCRO051 Assessing Rice Bran's Protective Efficacy against Porcine Rotavirus Infection in IPEC-J2 Cells
Christine Longchau Flora, 17, Junior, Roanoke Valley Governor's School for Science and Technology, Roanoke, Virginia

MCRO052 Inhibition of Bone Metastasis in MDA-MB-231 and PC-3 Cells by the Extracellular Adherence Protein of Staphylococcus aureus
Trishala Kumar, 16, Sophomore, American Heritage, Plantation, Florida

MCRO053 Next-Gen Sequencing Analysis of Dental Biofilm Microbiome upon Gifts Nano Charcoal Cleaning
Pranav Chhalayil, 16, Sophomore, Maharishi School, Fairfield, Iowa

MCRO054 Biochemical and Structural Study of the Escherichia coli Transcription Elongation Complex with Lambda-N and HK022 Nun
Joel Lima, 18, Senior, Elmont Memorial Junior-Senior High School, Elmont, New York

MCRO055T Probiotic Metabolites Promote Anti-Inflammatory Functions of Immune Cells
Danielle Chen Wu, 17, Junior, Richard Hong Fu, 17, Junior, Indiana Springs School, Indiana Springs, Alabama

MCRO056 The Host Range Specificity of Bacteriophage T4r
Judy Tianhong Zhong, 16, Sophomore, Upper Dublin High School, Fort Washington, Pennsylvania

MCRO057 The Effect of Circulation Rate on Bacteria within Library Books
Cheyenne Nancy Deibert, 17, Sophomore, Clarksville Academy, Clarksville, Tennessee
MCRO058 The Zone of Inhibition in Streptococcus mutans and Streptococcus oralis Using Antibacterials
Maycee Dawn Redfearn, 17, Junior, DSU SUCCESS Academy, St. George, Utah

MCRO059 Purple Power
Rachel Jones, 19, Senior, Liberal High School, Liberal, Kansas

MCRO060 The Effects of Silver Nanoparticles on the Ionic Silver Resistance Plasmid (pMG101)
Adam Radek Martinez, 15, Freshman, Waterloo Collegiate Institute, Waterloo, Ontario, Canada

MCRO061T The Effect of the Wavelength of Light on the Growth Rate of Cyanobacteria and its Survival in a Martian Atmosphere
Catherine Pelangi Aitken, 15, Freshman, Dana Zhao Jian, 15, Freshman, San Ramon Valley High School, Danville, California

MCRO062 Engineering of Fusion Protein Constructs to Efficiently Combat Neurological Damage Caused by E. coli K1 Meningitis
# Sepehr Asgari, 17, Sophomore, Carmel High School, Carmel, Indiana

MCRO063 Tracking Seasonal Changes of Specific Pathogenic Bacteria around Mobile Bay
Leanne Jeong, 17, Junior, Alabama School of Mathematics and Science, Mobile, Alabama

MCRO064 That Gut Feeling: Identifying the Gut Microbiota in Different Groups of Children
Elora Rael Smith, 17, Sophomore, Sargent High School, Monte Vista, Colorado

MCRO065T The Influence of Pollution on the Bacterial Diversity in Dams
Jacqueline Janse van Rensburg, 18, Senior, Zamazimba Swelihle Madi, 17, Senior, Lyttelton Manor High School, Pretoria, Gauteng, South Africa

MCRO066 Sweet Zones of Inhibition: The Antimicrobial Efficacy of Honey against Gram Positive and Gram Negative Bacteria as Compared with Antibiotics
Allison Faith Bobnock, 17, Junior, Crestview High School, Crestview, Florida

MCRO067 Rescue of Nucleotide DNA Repair Deficiencies to UVB and Solar-Simulated Irradiation by Pyrimidine Dimer Glycosylases and UV Endonucleases
# Stuti Paavani Garg, 17, Junior, Westview High School, Portland, Oregon

MCRO068 Cell Membrane-Coated Nanodevice for Anti-Virulence Therapy against Antibiotic Resistant Bacteria
# Maggie Shin-Young Chen, 17, Junior, Canyon Crest Academy, San Diego, California
PHYS001 Determining Impulse of 3-D Printed Rocket Nozzles  
Weston Oliver Rogers, 18, Senior, Colquitt County High School, Norman Park, Georgia

PHYS002T Big Bang Pickle  
Sonja Maria Elisabetha Gabriel, 18, Senior, Hannes Hipp, 19, Senior, Storch-Gymnasium, Bad Saulgau, Baden-Württemberg, Germany Studienkolleg St. Johann Blonried, Aulendorf, Baden-Württemberg, Germany

PHYS003 Behind a Wisp of Smoke: Study of the Morphology of Airflow and the Cause of Stripes Formed by Smoke Particles Over a Heat Source of Constant Temperature  
Xunjing Wei, 18, Senior, Shanghai High School, Shanghai, Shanghai, China

PHYS004 Research on Abnormal Thermal Expansion Properties of MnNiGe-based Compounds  
Yuefi Liu, 18, Junior, Capital Normal University High School, Beijing, China

PHYS005 Asteroid Photometry with Small-Aperture Telescopes  
Junda Liu, 20, Senior, Suzhou High School of Jiangsu Province, Suzhou, Jiangsu, China

PHYS006T Numerical Methods of Raytracing in Curved Spacetimes According to Einstein's Theory of General Relativity  
Jakub Krzysztof Szewczyk, 18, Senior, Grzegorz Eugeniusz Uriasz, 19, Senior, II Liceum Ogólnokształcące im. Generalowej Zamışowskiej i Heleny Modrzejewskiej w Poznaniu, Poznan, Wielkopolska, Poland

PHYS007 The Thermoelectrically Refrigerated Cloud Chamber  
Antonin Badura, 19, Junior, Gymnazium Brno, Trida Kapitana Jarose, Prispevkova Organizace, Brno, South Moravian Region, Czech Republic

PHYS008 Porphyrazine in Cell: Light-Triggered Killer Plus Viscosity Measurer  
Anna Aleksandrovna Kogan, 18, Junior, Lyceum #40, Nizhny Novgorod, Nizhgorodskaya Oblast, Russian Federation

PHYS009T Identification of X-Ray Sources and Discovering New Variable Stars  
Sergey Timofeev, 16, Freshman, Raul Karachurin, 15, Freshman, Lyceum No.1568, Moscow, Russian Federation

PHYS010 Shock Waves in Shallow Water on a Rotating Disk  
Kirill Smirnov, 18, Junior, The Advanced Education Science Center Kolmogorov's Boarding School of the Moscow State University, Moscow, Russian Federation

PHYS011T Earthshine Spectrum: Earth as an Exoplanet  
Juhong Bae, 17, Sophomore, Jeongin Park, 17, Sophomore, Jongjun Park, 17, Sophomore, Daegu-il Science High School, Daegu, South Korea

PHYS012 Foiled: Testing Lift and Drag on Airfoils in a Wind Tunnel  
Chloe Elisabeth Ayers, 18, Senior, Colleyville Heritage High School, Colleyville, Texas

PHYS013 Dancing with the Stars: Simulating Multi-Star Solar Systems and the Probability of Planetary Ejection  
# Molly Megan Nehring, 16, Sophomore, Monte Vista High School, Monte Vista, Colorado

PHYS014 Theoretical Asteroid Repulsion  
Zachariah Elijah Goodrich, 17, Junior, Grants High School, Grants, New Mexico

PHYS015 Terraforming Mars: Can Its Soil Support Plant Life?  
Lydia Barron, 15, Freshman, Dora Consolidated Schools, Dora, New Mexico

PHYS016 Surface vs. Bulk Chiral Orientation Effects in Liquid Crystals  
Catherine Leigh Areeklett, 18, Senior, Hathaway Brown School, Shaker Heights, Ohio

PHYS017 Driving Yourself to Deaf: Comparing Sound Levels Produced by Hand-held T-Post Drivers  
Ryan Dougherty, 16, Freshman, Prairieiland High School, Pattonville, Texas

PHYS018 The Mathematical Identification of Exoplanet Candidates through N-body Simulations  
Ana Luisa Tio Humphrey, 17, Sophomore, T.C. Williams High School, Alexandria, Virginia

PHYS019T Experimental and Numerical Investigation of Relation between Color and Thickness of Extremely Thin Soap-Bubble Films  
Mai Inden, 18, Senior, Arisa Kikuiri, 16, Junior, Aichi Prefectural Ichinomiya Senior High School, Ichinomiya, Aichi-Pref., Japan

PHYS020T A Swinging Atwood's Machine that Hiccups  
Zi-Yi Tai, 18, Senior, Shao-Yi Yu, 18, Senior, Taipei Municipal First Girls, Taipei City, Taiwan, Chinese Taipei

PHYS021 Multi-Orbit Space Debris Cloud Tracking Using Iterative Closest Points Registration with Machine Learning  
# Amber Zoe Yang, 18, Senior, Trinity Preparatory School, Winter Park, Florida

PHYS022 Fabrication of a Multilayer Graphene Based Single Electron Transistor with Chemically Transferred Graphene  
# Parker Jean Cowe, 19, Senior, Lake Highland Preparatory School, Orlando, Florida

PHYS023 Entanglement Distillation: Building a QED Circuit to Alleviate Decoherence  
Eljah Keene Kaimiola Mossman, 17, Junior, Kamehameha Schools Kapalama High School, Honolulu, Hawaii

PHYS024T Muon Scattering Tomography: Utilizing Silicon Photomultiplier Arrays to Trilaterate Muon Multiple Coulomb Scattering Events  
Trevor Daino, 18, Senior, Michael Kronovet, 19, Senior, Arpad Attila Voros, 18, Senior, Marvin Ridge High School, Waxhaw, North Carolina

PHYS025 Evaluation of Exoplanet Detection Methods: The Limits of Current Knowledge  
Keon Azar, 17, Junior, Harrison High School, Harrison, New York

PHYS026T Using a Novel Methodology to Constrain the Supermassive Black Hole–Galaxy Coevolution and Analyze the Selection Bias  
Sahil Hedge, 18, Senior, Shawn Brian Zhang, 17, Junior, Prospect High School, Saratoga, California

PHYS027T Effects of Neodymium Magnetic Fields on Rhizoclonium Algae  
Shaah Chaudhari, 18, Junior, Ethan Leung, 17, Junior, Jash Patel, 18, Senior, Fort Myers High School, Fort Myers, Florida

PHYS028 On T-Reflection via Analytic Continuation in Quantum Mechanics  
Sambuddha Chattopadhyay, 18, Senior, Montgomery Blair High School, Silver Spring, Maryland

PHYS029 Quick Aligning Telescopes  
Dominic Catanzaro, 17, Senior, Cathedral Catholic High School, San Diego, California
PHYS031  Study on Wireless Power Transfer Technology toward the Application for Cardiac Pacemaker
Mengyang Li, 17, Junior, Chongqing Nankai Secondary School, ShaPingBa District, Chong Qing, China

PHYS032  Nuclear-Precessional Hydroscope
Andrei Sergeevich Poliakov, 18, Junior, Lyceum #40, Nizhny Novgorod, Russian Federation

PHYS033  Extra Radial Muon Orbit Distortion with E821 Beta Function
Rushabh Mehta, 18, Senior, Syosset Senior High School, Syosset, New York

PHYS034  Swift XRT and UVOT Investigation of Low-Mass X-Ray Binary 1RXS J180408.9-342058
Audrey Saltzman, 18, Senior, Byram Hills High School, Armonk, New York

PHYS035  Spectral Measurements of Near-Earth Asteroids
Kelsey Mackenna Barber, 18, Senior, Bountiful High School, Bountiful, Utah

PHYS036  Identification of Asteroid Collisional Families and Orbital Groups through Computational Clustering Techniques
Annie Tianjin Yun, 17, Senior, West High School, Salt Lake City, Utah

PHYS037  On the Stability of Bahcall-Wolf Cusps of Dark Matter Orbiting Supermassive Black Hole Binary Systems
Josef McCormack Zimmerman, 18, Senior, Academy of Science, Sterling, Virginia

PHYS038  Quantum Eraser with Applications to Optical Quantum Information Processing of Polarization-Encoded Qubits
Mary Catherine Lorio, 17, Junior, Saint Joseph's Academy, Baton Rouge, Louisiana

PHYS039T Detecting Exoplanet Transits via CCD Photometry
Kylie Yui Hansen, 18, Junior, Kayson Taka Hansen, 16, Sophomore, Twin Falls High School, Twin Falls, Idaho

PHYS040  Deciphering the Sedimentary Record of Galle Crater, Mars
Alida Schott, 17, Junior, Baltimore Polytechnic Institute, Baltimore, Maryland

PHYS041  Laser Shielding Odyssey: A Novel Method for Confining Matter Transported at Relativistic Velocities in Vacuum by a Laser-Tube, Which May Solve a Problem of Stephen Hawking's "Star-Shot" Initiative
Dana Yahia Arabiyan, 18, Senior, Alridwan Schools, Amman, Jordan

PHYS042T Discovery of Qatar 6-b Exoplanet
Amani Abdulrahman M S Al-Rajhi, 17, Junior, Abeer Khalifa Al-Harbi, 17, Junior, Qatar Secondary School For Girls, Doha, Qatar

PHYS043  Deviation Patterns of the Orbital Trajectories of the Galilean Satellites
Benjamin Breer, 17, Junior, The Gwinnett School of Mathematics, Science, and Technology, Lawrenceville, Georgia

PHYS044  Finding the Perfect Slot
Roarke Zimmer, 19, Senior, Alpine High School, Alpine, Texas

PHYS045  Analysis of Gerchberg-Saxton Algorithm
Mateusz Sieniawski, 19, Senior, Zespół Szkol Uniwersytetu Mikolaja Kopernika Gimnazjum i Liceum Akademickie, Torun, Warmińsko-Mazurskie, Poland

PHYS046  Investigating the Properties of Dark Matter
Gabriel Mintzer, 18, Senior, Central Campus, Des Moines, Iowa

PHYS047  A Novel Spectroscopic-Chemical Sensor Using Photonic Crystals
Sulekh Frederic Fernando-Periris, 17, Junior, Mount Vernon High School, Mount Vernon, Ohio

PHYS048  3D Printed Micro Patterned Gas Electron Multiplier
Adam Syndergaard, 18, Senior, Maple Mountain High School, Spanish Fork, Utah

PHYS049  The Search for Newborn Stars: Observing Bok Globules in the Visible and Infrared
Anderson Thrasher, 17, Junior, Henry W. Grady High School, Atlanta, Georgia

PHYS050  Astronomical Image Processing: A Novel Application of Image Processing Aimed at Asteroid Detection
Tucker Edison Honeycutt, 17, Sophomore, Covenant Christian Academy, Huntsville, Alabama

PHYS051  A Linked Learning Approach to Automated Galaxy Morphology Classification
Zhengdong Wang, 19, Senior, Hamilton High School, Chandler, Arizona

PHYS052  Stability Statistics: The Effect of Incremental Stability Deviations on Rocket Flight Optimization and Precision
Giancarlo Dimitri Cabeza, 17, Junior, Western High School, Davie, Florida

PHYS053  Determining the Ages and Distances of Open Clusters
Erica Alesa Sawczyniec, 18, Senior, Kihei Public Charter High School, Kihei, Hawaii

PHYS054  Study of the Change of the Halomass in Galaxies Depending on Their Proximity to Filaments in the Universe
Queralt Portell de Montserrat, 18, Senior, Institut Manuel Carrasco i Formiguera, Barcelona, Barcelona, Spain

PHYS055  Parallax Modelling of OGLE Microlensing Events
Elias Waagaard, 20, Senior, Bromangymnasiet, Hudiksvall, Gävleborg, Sweden

PHYS056  27.5" or 29" Rolling Friction vs. Agility
Colton Anthony Ziemba, 16, Junior, Russell Christian Academy, Meridian, Mississippi

PHYS057  Radiation from Telecom Devices: Impact on Life and Combating Threats
Akshaj Mishra, 15, Freshman, Signature High School, Evansville, Indiana

PHYS058  Case Study of Data Mining in Observational Astronomy: The Search for New OB Stars in the Small Magellanic Cloud
Cormac James Larkin, 20, Senior, Colaiste an Spioraid Naoimh, Cork City, Munster, Ireland

PHYS060  All About that Bass
Caroline Isabella Whisonant, 15, Freshman, Winnfield Senior High School, Winnfield, Louisiana

PHYS061  Identification of Type Ia Supernova Explosion Mechanisms in Dwarf Spheroidal Galaxies
Rachel Guo, 17, Junior, Justin Xie, 17, Junior, Irvington High School, Fremont, California
Plant Sciences

PLNT001T  Production of Strawberry in Inert Substrate
Greta Yanett Vivero, 20, Senior,
Fatima Edith Cardozo, 18, Senior,
Instituto De Enseñanza Agropecuaria No. 7, Garupa, Misiones, Argentina

PLNT002  BioPatriam: Biodiversity Preservation with Brazilian Native Plant
Maria Eduarda Santos de Almeida, 18, Senior, Instituto Federal de Educaçao, Ciencia e Tecnologia do Rio Grande do Sul (IFRS) - Campus Osorio, Osorio, Rio Grande do Sul, Brazil

PLNT003T  Evaluation of Biofungicidal Activity of the Castor Oil Plant
(Ricinus communis) Seed for the Control of Anthracnose (Colletotrichum gloeosporioides) in Avocado (Persea americana) in vitro
Soфиа Pacheco-Thomas, 18, Junior,
Priscilla Solera-Rodriguez, 18, Junior,
Colegio Tecnico Profesional Piedades Sur, San Ramon, Alajuela, Costa Rica

PLNT004  Identification of dsRNA Mycoviruses in Plant-Pathogenic Fungus Fusarium oxysporum
Martin Matl, 18, Sophomore, Gymnázium Brno, Trída Kapitana Jarose, Prispekova Organizace, Brno, Jihomoravsky Kraj, Czech Republic

PLNT005T  Production and Application of Efficient Microorganisms (E.M.) Technology and Dissemination of Their Advantages for the Cultivation of Coffee, in the Ballota Farm, Huancabamba District
Koraima Elizabeth Tamayo Cisneros, 16, Freshman,
Ariana Koryn Casimiro Salazar, 17, Freshman,
Institucion Educativa San Francisco de Asis, Oxpampa, Pasco, Peru

PLNT006T  Multiplication of Weberbauer Cactus Seedlings Using HAS (Hydroponic Autotrophic System), from Microcuttings of Vitroplants for Its Reforestation
Brayan Miguel Maidana Lopez, 15, Freshman,
Santiago Mauricio Valdivia Cervantes, 16, Freshman,
Institucion Educativa San Juan Bautista de La Salle, Arequipa, Peru

PLNT007  The Best Affordable Alternative Nanofertiliser
Carol van Rooyen, 18, Senior, Queen Elizabeth Girls High School, Harare, Zimbabwe

PLNT008  Essential Oil of Some Species of the Family Asteraceae Dumort East Kazakhstan
Rodion Yurievich Ivashchenko, 19, Junior, High School #38 for Gifted Children, Ust-Kamenogorsk, Vostochno-Kazakhstanskaya, Kazakhstan

PLNT009  The Effect of Acid Precipitation on the Vascular and Endocrine System of Plants
Qiao Jiao, 18, Junior, Canterbury School, Fort Myers, Florida

PLNT010  Soil Amendment Optimization, Phase IV: Enhancing the Performance of Biochar and Hydrophilic Polymer Enriched Soils with the Incorporation of Corn Gluten Meal
Samantha Jo Guldan, 17, Junior, Cathedral High School, New Ulm, Minnesota

PLNT011  Better with Bacteria: The Effects of Bacteria on Chlorella vulgaris
James Bryan Martinez, 17, Junior, Bartlesville High School, Bartlesville, Oklahoma

PLNT012T  Polyphenols in Georgian Grapes
Giorgi Tabagava, 18, Junior,
Ketevan Tkeshelashvili, 17, Junior,
Georgian-American School, Tbilisi, Tbilisi, Georgia

PLNT013  Bad Altitude: Climate Change in the Alpine May Alter Beneficial Relationships between Plants and Their Fungal Symbionts
Isabella Ivy Bowland, 17, Junior, Fairview High School, Boulder, Colorado

PLNT014  Creating a Model System for Micronutrient Fortification
Sedra Khutija Khan, 18, Senior, Niles Township West High School, Skokie, Illinois

PLNT015  Mycorrhizal Fungi as an Alternative to Conventional Fertilizers
Connor Joseph Bock, 17, Sophomore, Oak Ridge High School, Oak Ridge, Missouri

PLNT016  Glycosphatases Concentrations in Organic vs. Conventional Wheat
Tyler Shaud Schwarzbach, 18, Sophomore, Big Sandy High School, Big Sandy, Montana

PLNT017  Up the Creek
Mary-Anne Sandra Poyitt, 17, Junior, Redeemer Baptist School, North Parramatta, New South Wales, Australia

PLNT018  Extracting Neem and Epazote Compounds by HPLC Methods
Anjeli Nandwani, 19, Senior, Lake Highland Preparatory School, Orlando, Florida

PLNT019  The Reaction of Vegetation to Cultivation after Remaining Undisturbed for 15 Years
Neeraj Bhakta, 18, Junior, C. H. Yoe High School, Cameron, Texas

PLNT020  Salinity Solutions
Lachlan John Dick, 19, Senior, Hellyer College, Burnie, Australia

PLNT021  Analyzing the Effects of Anionic Polyacrylamide on Row Crop Health and Emergence
Darrin Andrew McFall, 19, Senior, Buffalo Island Central High School, Monette, Arkansas

PLNT022  Inhibition of Sclerotinia sclerotiorum via Cover Crop, Coniothyrium minitans, and Foliar Application
Mason Carl Burlage, 18, Junior, Beckman Catholic High School, Dyersville, Iowa

PLNT023T  Revolution of Self-Fertilizing Crops: Novel Transformation of IFS1 and IFS2 Genes Using Binary Vector for the Stimulation of a Symbiotic Bond between B. japonicum and Host Plant
Jared Wieland, 15, Freshman,
Kristopher Wieland, 19, Senior,
Wilsonville High School, Wilsonville, Oregon

PLNT024  A Neurotoxin in the Pollen of Southern African Cycads
Anika Carmen Meyer, 15, Freshman, Waterloof Hoerskool, Pretoria, Gauteng, South Africa

PLNT025T  The Lethal Effect of the Peppermint Oil on the White Fly
Farah Bassam Al Shloul, 17, Junior,
Lana Saed Mughrabi, 17, Junior,
Amman, Umm Al Summaq, Jordan

PLNT026  Investigation of the Disparity between the Abundance of Tamalia spp. Galls on Arbutus unedo and Arctostaphylos spp.
Kaden Zayne Thabet Agha, 17, Junior, York School, Monterey, California

PLNT027  A Study of Circadian Genetics and Abiotic Stress towards Sustainable Agriculture
Maya N. Geradi, 17, Junior, Wilbur Cross High School, New Haven, Connecticut

PLNT028T  Insecticidal Activity of Acacia (Samanea saman) Bark Extract against Adult Rice Black Bug (Scictinophora sp.)
Myrelle Angela T. Colas, 16, Freshman,
Rubelien Chezka Fernandez Gloria, 16, Freshman,
Nadine Antonette Obafai, 17, Freshman,
Davao City National High School, Davao City, Davao del Sur, Philippines
**PLNT029** The Effects of Auxins and Cytokinins on the Survival of *Azospirillum lipoferum* and *Azospirillum brasilense* and the Root Colonization of Zea mays
# Brock Patrick Vetick, 19, Senior, Lyons-Decatur Northeast High School, Lyons, Nebraska

**PLNT030** The Effectiveness of Algae as a Negative Emission Technology
Daniel Ulion Joshua, 16, Sophomore, Madison Central High School, Madison, Mississippi

**PLNT031** Effects of North Dakota Road Dust on *A. thaliana*: An Assay of Chlorophyll and Ascorbate Peroxidase
Monica Rose Zent, 18, Senior, Dickinson High School, Dickinson, North Dakota

**PLNT032** Does Water pH Affect Plant Growth?
Addie James Schnabel, 18, Junior, Ashley Public School, Ashley, North Dakota

**PLNT033** Identification of Volatiles Produced by Agrobacterium
Michael XiYang Lin, 17, Junior, Farragut High School, Knoxville, Tennessee

**PLNT034** The Effect of Irrigation Rates on the Growth and Yield of *Gossypium hirsutum* L.
# David Anthony Mendoza, 18, Senior, Christ the King Cathedral School, Lubbock, Texas

**PLNT035T** The Effects of an Infusion of Pine Tree Needles (*Pinus pinaster*) Using It as Herbicide over Weeds in a Home Garden
Katria Marie Santiago Lozada, 16, Junior, Jeylimar Fuentes Rivera, 17, Junior
# Francisco Morales Rivera, Naranjito, Puerto Rico

**PLNT036T** Control of Tomato Yellow Leaf Curl Disease with Biopesticide Extracted from Goat Weed *Ageratum conyzoides* Linn
Naruephon Phaengma, 16, Sophomore, Janyaporn Kotimanusvanij, 17, Sophomore, Witchakorn Nanthaikeuakun, 17, Sophomore, The Demonstration School of Khon Kaen University (Modindaeng), Khon Kaen, Thailand

**PLNT037T** *Spondias pinnata* Gum Coating on Longan Fruits Can Prolong Their Freshness during Storage
# Pawared Donloei, 19, Senior, Thanakorn Yodkhham#, 19, Senior, Damrongratsongkroh School, Muang, Chiangrai, Thailand

**PLNT038** Mistletoe on Novel Hosts
Seneca Riley Blank, 17, Junior, Tucson High Magnet School, Tucson, Arizona

# Teeyah Yuva Raju, 17, Junior, Mira Loma High School, Sacramento, California

**PLNT040** Corn Silage Yield Test
Jace Michael Marriott, 15, Freshman, Fremont High School, Plain City, Utah

**PLNT041** Microclimatological Feedbacks at Treeline
# Michelle T. Kummel, 16, Junior, William J. Palmer High School, Colorado Springs, Colorado

**PLNT042** Make Way for Duckweed: Observing the Growth Rates of *Lemma* and Its Effect on Atmospheric Carbon Dioxide Concentrations in a Simulated Carbon Sink
# Casey John Shaw, 17, Junior, Liberty High School, Joes, Colorado

**PLNT043** Supercharged Plants to Fight Global Warming: Data Mining for Key Genes of Photosynthetic Acclimation to Climate Change
Megan May Zou, 17, Junior, Ransom Everglades School, Miami, Florida

**PLNT044** Molecular Characterization and Enhanced Efficacy in the Development of a Novel Host-Specific Bioherbicide Candidate for *Cyperus rotundus*
# Haniya Shareef, 17, Junior, Lincoln Park Academy, Fort Pierce, Florida

**PLNT045T** Optimization of Algal Biomass Production under Salt Water Conditions
Lindsay Hitari Chow Shiroma, 16, Sophomore, Min Hua Tsou, 16, Sophomore, Mililani High School, Mililani, Hawaii

**PLNT046** The Effect of Sodium Chloride on Hybrid Taxodium Species
Anna Colleen Koonce, 17, Junior, St. Joseph's Academy, Baton Rouge, Louisiana

**PLNT047** Molecular (DNA) and Biochemical Investigations into Agricultural Weed Populations of the South Eastern United States
Indu Priya Nandula, 16, Sophomore, Cleveland High School, Cleveland, Mississippi

**PLNT048** Modeling the Spatio-Temporal Dynamics of Late Blight: Optimization, Validation, and Applications
# Benjamin Firester, 18, Junior, Hunter College High School, New York, New York

**PLNT049** In vitro and in vivo Efficiency Assessment of Selected Biopesticides against the Sweet Potato Whitefly, *Bemisia tabaci* (Genadius) Biotype B on Tomato Plants
# Ana Laura Trevino, 18, Senior, Weslaco East High School, Weslaco, Texas

**PLNT050** Developing Rapid Technologies to Access Root Cell-Type Specific Gene Regulation in Rice (*Oryza sativa L.*)
Yushan Su, 17, Junior, Martin Luther King High School, Riverside, California

**PLNT051** Fabulous Molecular Markers: Preventing Favism by Identifying Faba Bean Mutants
Melody Song, 17, Junior, Evan Hardy Collegiate Institute, Saskatoon, Saskatchewan, Canada

**PLNT052T** *Cnidioscolus aconitifolius*, *Azadirachta indica*, *Moringa oleifera* and *Mentha spicata* as an Organic Plagueicide for the Prevention of Premature Crops
Laina Sofia Llano, 18, Junior, Tyrone O. Nieves, 17, Junior, Residential Center of Educational Opportunities in Ceiba, Ceiba, Puerto Rico

**PLNT053** The Effects of Mycorrhizal Fungi on *Ustilago maydis*
Amanda Grace Wilson, 17, Sophomore, Northwestern High School, Kokomo, Indiana

**PLNT054T** Pollen Count and Analysis of Store Honey and NC Honey Samples for Content and Purity
Larry Lee McCallum, 16, Sophomore, Swathi Gadipudi, 18, Junior, Elizabeth Madison Rogers, 18, Senior, Lumberton High School, Lumberton, North Carolina
Terry Sanford High School, Fayetteville, North Carolina
Cumberland International Early College High School, Fayetteville, North Carolina

**PLNT055** A Method to Control Microwave Radiation Impact on *Solanum lycopersicum* (Tomato), Using *Zingiber officinale* (Ginger) Extract
Marian Shobita Rajamohan, 17, Junior, South Pacific Academy, Pago Pago, American Samoa

**PLNT056** Testing the Effect of *Derris malaccensis* (Ava Niukini) Plant Extract on *Rhizopeplus sanguineus* (Brown Dog Tick)
Dalin Myung, 16, Sophomore, South Pacific Academy, Pago Pago, American Samoa
PLNT057T Optimization of Cellobiase Function in Breakdown of Cellulosic Material Using Co-Enzymes: A Model for Biofuel Enhancement

Jay Maturi, 18, Junior,
Pranav Ramkumar Sriram, 17, Junior,
University High School of Indiana, Carmel, Indiana
Carmel High School, Carmel, Indiana

PLNT058T CAgel Accelerated Tyrosine Pathway to Combat Leukotrichia

Harsh Jain, 17, Senior,
Tanya Goyal, 17, Senior,
Maharaja Agarsain Public School, Delhi, India

PLNT059 A Novel Strategy Using Amino Acids as Elicitors to Combat Pathogenicity Caused by Alternaria solani on Selected Crops

Prakruthi R U Kumar, 16, Sophomore, Army Public School,
Parachute Regiment Training Centre, Bangalore, Karnataka, India

PLNT060 Novel Methods of Augmenting Plant Pollination

Paul R. Gauvreau, 17, Junior, Canyon Crest Academy,
San Diego, California

PLNT061T Innovative Method of Raising Paddy Seedlings by an Economically Viable and Ecologically Sustainable Method: A Boon to Farmers

Ramkumaar Ekambaram Thondaiman, 15, Freshman,
Siva Bharathi Anbu Bharathi, 14, Freshman,
Nsn Matriculation Higher Secondary School, Chennai, Tamil Nadu, India

PLNT062 Amplifying DNA Sequences Representative of Genetically Modified Products Using the Polymerase Chain Reaction

Gaurav Mittal, 15, Freshman, Manheim Township High School,
Lancaster, Pennsylvania

PLNT063T The Effects of Mycorrhizal Fungi on the Growth of Tomato Plants

Rashawn Shaw, 19, Senior,
Andrew Paradis, 20, Senior,
Excel High School, Boston, Massachusetts

PLNT064 Effects of the Hartmann Lines in the Cultivation of Phaseolus vulgaris

Krystal Arianne Rosario Cruz, 15, Freshman, S.U. Dr. Cayetano Coll y Toste, Arecibo, Puerto Rico

PLNT065 Investigation into Arabidopsis thaliana Circadian Systems

Abigail Marie Hunt, 18, Junior, Wentzville Holt High School,
Wentzville, Missouri
Robotics and Intelligent Machines

ROBO001 Drone Defense System: Detection, Tracking, Classification and Targeting of Flying Objects in 3D and Real Time
Tassilo Constantin Schwarz, 18, Senior, Johannes-Heidenhain-Gymnasium Traunreut, Traunreut, Bayern, Germany

ROBO002 Program for the Deaf and Dumb
Elgur Alishiev, 17, Sophomore, R.Pirmazarov, Baku, Absher on, Azerbaijan

ROBO003 Using Reinforcement Learning to Guide Game Rule Design
Yu Lou, 18, Senior, Beijing Number 4 High School, Beijing, China

ROBO004 Simulation and Improvement of Non-Obstacle Flocking for Multi-agents System with a Virtual Leader
Dongqing Wang, 18, Senior, The Experimental High School Attached to Beijing Normal University, Beijing, China

ROBO005T Self-Adapting Machines on Basis of Microcontroller
# Dimitri Korkotashvili#, 16, Sophomore,
# Aleksandre Khokhiashvili#, 17, Junior,
# Tamar Korkotashvili, 15, Freshman,
LPPL Vladimir Komarovi Tbilisi Physics and Mathematics No. 199 Public School, Tbilisi, Tbilisi, Georgia

ROBO006 Android Application Development for Algorithmic Music Generation through Artificial Neural Networking
Sriram Gopalakrishnan, 18, Senior, Centennial High School, Boise, Idaho

ROBO007 Device for Teaching and Learning the Braille Alphabet
Luis Javier Mora Barrantes, 18, Senior, Colegio Tecnico Profesional de Mora, Ciudad Colon, San Jose, Costa Rica

ROBO008T The Next Generation Multi-Robot Exploration: Biased Viewpoint Sampling via Dynamic Voronoi Space Partitioning and Receding Horizon Scheme
Jaeho Lee, 18, Senior, Chaeju Lee, 18, Senior, Woochang June, 18, Senior, Korea Science Academy of KAIST, Busanjin-Gu, Busan, South Korea

ROBO009 Vision Based Robot Intelligence
Ved Kumar, 16, Sophomore, Guilderland High School, Guilderland, New York

ROBO010 Mars Habitation Constructor: An Autonomous Device Capable of Printing Structures on the Surface of Mars Using Native Materials
Cole J. Tucker, 17, Junior, Thomas Worthington High School, Worthington, Ohio

ROBO011T The Development of an Intelligent and Dexterous Robotic Arm
# Thomas Tran Anderson, 17, Junior,
# Ryan Christopher Gross#, 17, Junior,
Spring Mills High School, Martinsburg, West Virginia

ROBO012T FRUIT: Food Retrieval Utilizing Intelligent Technology

ROBO013T A Bionic Cognitive Based SLAM System
Cheng-Hsuan Ho, 18, Junior, Yang Yeh, 18, Junior, Taipei Municipal Jianguo High School, Taipei City, Taiwan, Chinese Taipei

ROBO014T Implementing New Methods of Prosthetic Control
# Qingfeng Li, 16, Sophomore, Laramie High School, Laramie, Wyoming

ROBO015 Safecopter: Developing a Collision Avoidance System Based on an Array of Time-of-Flight 3D Cameras
# Robert Gabriel Tacescu, 17, Junior, Clovis North High School, Fresno, California

ROBO016 Computer-Aided Bleeding Detection in Wireless Capsule Endoscopy Images Using Deep Convolutional Neural Networks
Eunji Lee, 17, Junior, Sacred Heart Academy, Hamden, Connecticut

ROBO017 UAV Obstacle Avoidance and Collision Prevention System
Ryan Westcott, 16, Freshman, Oregon Episcopal School, Portland, Oregon

ROBO018 Disability Breaker
Maik Amed Ghaly, 16, Sophomore, Sohag Secondary Military School, Sohag, Egypt

ROBO019 The Prototype of Mars Rover
Artem Pavlenko, 18, Junior, City Palace of Children's (Youth) Creativity, Omsk, Russian Federation

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Anika Cheerla, 16, Sophomore, Nikhil Cheerla, 18, Senior, Monta Vista High School, Cupertino, California

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Amy Yue Jin, 17, Junior, The Harker School, San Jose, California

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Jack Kendall, 20, Senior, Stiftsschule Einsiedeln, Einsiedeln, Schwyz, Switzerland

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Vladyslav Maksymovych Marchenko, 17, Junior, Liviv Physics and Mathematics Lyceum, Liviv, Ukraine

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Samuel Williamson Griesemer, 18, Senior, Joplin High School, Joplin, Missouri

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Sayli Pankaj Bande, 14, Freshman, JSS Public School, Bangalore, Karnataka, India

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Valerii Andreevich Chernov, 18, Junior, Presidential Physics and Mathematics Lyceum No 239, Saint-Peterburg, Russian Federation

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Vincent Paul August Moeykens, 18, Junior, Windsor High School, Windsor, Vermont

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Jihye Park, 17, Sophomore, Youngchae Chee, 17, Junior, Daejeon Dongsin Science High School, Daejeon, South Korea

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Aratrika Ghatak, 17, Junior, Evergreen Valley High School, San Jose, California

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Yoon-Kon Nam, 17, Senior, Boin, Seoul, Songpa-gu, South Korea

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# Zachary Scott Rolfness, 18, Junior, Paradise Valley High School, Phoenix, Arizona

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# Esra Topcu*, 20, Senior, Tugce Manavoglu, 19, Senior, Turk Telekom Mesleki Ve Teknik Anadolu Lisesi, Eskisehir, Turkey
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