

16-Year-Old Engineer Works to Improve Spinal Surgery Using Machine Learning and Computer Vision: Full Awards

Phoenix, AZ — Society for Science & the Public, in partnership with the Intel Foundation, announced Grand Awards of the Intel ISEF 2019. Student winners are ninth through twelfth graders who earned the right to compete at the Intel ISEF 2019 by winning a top prize at a local, regional, state or national science fair.

For each Best of Category winner, a \$1,000 grant will be given to the winners' school and the Society for Science & the Public Affiliated Fair they represent.

Gordon E. Moore Award

Gordon E. Moore Award \$75,000

ENBM008 — *Utilizing Computer Vision and Machine Learning Systems to Develop a Live Time Navigational and Surgical Aid for Spinal Reconstructions*

- Krithik Ramesh, Cherry Creek High School, CO, United States of America

Intel Foundation Young Scientist Award

Young Scientist Award of \$50,000

CELL040 — *Modeling Neurodegeneration in vitro: A Dynamic Study of Tau in a Microfluidic Chamber System via Quantum Dot Labeling*

- Allison Jia, The Harker School, CA, United States of America

ENMCo25 — *Bioinspired Submersible Dual Propulsion System: A Novel Approach to Ultra-Efficient Submarine Propulsion Utilizing Starting and Stopping Vortex Rings Mirroring Jellyfish Motion*

- Rachel Seevers, Paul Laurence Dunbar High School, KY, United States of America

Dudley R. Herschbach SIYSS Award

The SIYSS is a multi-disciplinary seminar highlighting some of the most remarkable achievements by young scientists from around the world.

EGCH005 — *Highly-dispersed Ni Supported by N-doped Carbon Derived from Silk for Electrocatalytic CO₂ Reduction*

- Shicheng Hu, Shanghai Foreign Language School Affiliated to SISU, China

MATSo03 — *The Flash Shade: Directional Darkening Technology*

- Adrien Jathe, Metropolitan School Frankfurt gGmbH, Germany

SOFT049 — *Improved Gate Level Simulation of Quantum Circuits*

- Adam Kelly, Skerries Community College, Ireland

Craig R. Barrett Award for Innovation

Award for Innovation in STEM

BMED046 — *A Novel, Noninvasive Approach to Melanoma Diagnosis Using Optical Coherence Tomography and Bioconjugated Gold Nanoparticles*

- Shriya Reddy, Northville High School, MI, United States of America

European Union Contest for Young Scientists Award

Trip to the EU Contest.

MCRO052T — *Investigating the Role of the Novel ESCRT-III Recruiter CCDC11 in HIV Viral Budding: Identifying a Potential Target for Antiviral Therapy*

- Leo Takemaru, Ward Melville High School, NY, United States of America
- Poojan Pandya, Half Hollow Hills High School West, NY, United States of America

PHYS038 — *Disentangling Spatial Correlations from Inhomogeneous Materials with Shift-Invariant Artificial Neural Networks: A Novel Approach to Study Superconductivity*

- Kaylie Hausknecht, Lynbrook Senior High School, NY, United States of America

ANIMAL SCIENCES

Intel ISEF Best of Category Award of \$5,000

ANIM003T — *Developing Novel, Low-Cost Methods to Support Citizen Scientists in the Conservation of Bat Species*

- Dylan Bagnall, The King's Hospital, Leinster, Ireland
- Richard Beattie, The King's Hospital, Leinster, Ireland

First Award of \$3,000

ANIM003T — *Developing Novel, Low-Cost Methods to Support Citizen Scientists in the Conservation of Bat Species*

- Dylan Bagnall, The King's Hospital, Leinster, Ireland
- Richard Beattie, The King's Hospital, Leinster, Ireland

Second Award of \$1,500

ANIM015T – Bird Environmental DNA from the Air

- So Tsukamoto, Shizuoka Prefectural Kakegawa-Nishi High School, Shizuoka Prefecture, Japan
- Yuma Okamoto, Shizuoka Prefectural Kakegawa-Nishi High School, Shizuoka Prefecture, Japan

ANIM030 – Control of Varroa destructor Infestation with a Dual-Function, Thymol-Emitting Honey Bee Hive Entranceway

- Raina Jain, Greenwich High School, CT, United States of America

ANIM035 – Habitat Preference Drives Brain Shape in Crocodylomorphs

- Anthony D'Amore, Smithtown High School East, NY, United States of America

Third Award of \$1,000

ANIM012T – Aliens Invade Hong Kong: First Record of the New Guinea Flatworm (Platydemus manokwari) as an Invasive Species in Hong Kong, China

- Elysia Ye, Chinese International School, China, Hong Kong Special Administrative Region
- Muhua Yang, St. Joseph's College, China, Hong Kong Special Administrative Region

ANIM036 – Prevention of Oxidative Stress Induced Diseases through the Effects of Curcumin on Planarial Stem Cells and Regeneration

- Sanjita Pamidimukkala, Dougherty Valley High School, CA, United States of America

ANIM047 – The Use of Chickens (Gallus gallus domesticus) as Bio-recyclers of Household Organic Waste

- Emma Serisier, Bishop Druitt College, New South Wales, Australia

ANIM051T — *The Neural Mechanism Underlying Stimulus Evaluation of the Honeybee Brain*

- Angela Ding, Corona del Sol High School, AZ, United States of America
- Nisha Kulkarni, BASIS Chandler, AZ, United States of America

Fourth Award of \$500

ANIM009 — *Silybum marianum and Rauwolfia serpentina as Novel Agents for Alzheimer's Disease Treatment and Lifespan Extension in a Caenorhabditis elegans Model*

- Sindhuja Uppuluri, Westwood High School, TX, United States of America

ANIM016T — *Novel Subtle Acoustic Communication: Successful Elucidation of the Cryptic Ecology of Runner Plant Bugs (Hallodapus spp.) with Emphasis on Their Stridulatory Mechanisms*

- Ayana Miyazaki, Nagasaki Prefectural Nagasaki Nishi High School, Nagasaki-Pref., Japan
- Haruka Hinami, Nagasaki Prefectural Nagasaki Nishi High School, Nagasaki-Pref., Japan
- Yui Tamada, Nagasaki Prefectural Nagasaki Nishi High School, Nagasaki-Pref., Japan

ANIM039 — *Use of Pulsed Photobiomodulation in Nerve Regeneration after Injury-Induced Peripheral Neuropathy in Danio rerio: Effect of Mitochondrial Protein Genetic Variant, mpv17, in A Delta and C Nerve Fiber Growth*

- Nadia Ansari, Sage Hill School, CA, United States of America

ANIM043 — *What Is Honey? A Comparison of Honey from Iowa Beekeepers vs. National Store Brand Honey Using Pollen and Chemical Analyses*

- Amara Orth, Lewis Central High School, IA, United States of America

ANIM053 — *The Effect of Chronic Exposure to Artificial Light at Night on the Development & Fecundity of Manduca sexta*

- Carolyn Almonte, Burlington Township High School, NJ, United States of America

ANIM054 — *Modeling the Effects of Invasive Species on Crocodylian Populations*

- Karin Ebey, Los Alamos High School, NM, United States of America

BEHAVIORAL AND SOCIAL SCIENCES

Intel ISEF Best of Category Award of \$5,000

BEHA027 — *Sensory Integration in Adolescents with a History of Multiple Concussions*

- Giovanni Santucci, Ossining High School, NY, United States of America

First Award of \$3,000

BEHA027 — *Sensory Integration in Adolescents with a History of Multiple Concussions*

- Giovanni Santucci, Ossining High School, NY, United States of America

Second Award of \$1,500

BEHA031 — *Diagnosing Autism with Machine Learning: Binary Classification for Eye Movement in Virtual Reality Environment*

- Rhythm Garg, Texas Academy of Mathematics and Science, TX, United States of America

BEHA034 — *The Novel Volumetric Quantification of the Chemobrain Phenomenon within a Pediatric Population*

- Jessica Goldstein, Plainview-Old Bethpage John F. Kennedy High School, NY, United States of America

BEHA035 — *Brain Inflammatory Responses Compromise NG2-Glial Homeostasis during Depression*

- Matthew Mullahy, Smithtown High School East, NY, United States of America

Third Award of \$1,000

BEHA004 — *Real-Time Analysis of Emotions for Neurological Disorder Patients*

- Shreya Ramesh, Milton High School, GA, United States of America

BEHA015 — *The Neural Mechanisms Underlying the Other Race Effect for Expression Perception*

- Tsung-Tien Hsiung, Taipei First Girls High School, Taiwan

BEHA033 — *A Data-Driven Optimization of Economic Resource Allocation*

- Vihaar Nandigala, Walled Lake Western, MI, United States of America

BEHA039 — *A Neuromodulator Exerts Antagonistic Effects on the Network State of *Aplysia californica**

- Lucian Dobroszycki, The Bronx High School of Science, NY, United States of America

Fourth Award of \$500

BEHA001 — *Combating Stuttering via an Empowered Multi-modal Neural Network based on Facial and Audio Recognition Data*

- Ronald Xu, Winter Springs High School, FL, United States of America

BEHA003 — *iSense: Artificial Intelligence Based Early Detection Tool to Identify Linguistic Bio-Markers of Mood Disorders and Recognize At-Risk Individuals*

- Divya Nori, Milton High School, GA, United States of America

BEHA005 — *The Impact of High School Scheduling on Test Scores*

- Olivia McNair, Perham High School, MN, United States of America

BEHA028 — *Unveiling the Nature of Graffiti Disapproval in NYC: A Novel Mapping Method for Defining the Trends of Graffiti Complaints*

- Kellen Cooks, Ossining High School, NY, United States of America

BEHA045 — *A Card and Board Game to Reduce Gender-Based Implicit Biases using Perspective-Taking and Counter Stereotyping and Other Methods of Influence*

- Prerna Magon, Police DAV Public School, PAP Campus, Jalandhar, India

BIOCHEMISTRY

Intel ISEF Best of Category Award of \$5,000

BCHM014 — *Deuterium Oxide (D₂O) on Maintaining Viability in Coliphage Bacteriophages under Low Temperatures to Model Live Attenuated Viral Vaccine Additives*

- Annika Morgan, Joel Barlow High School, CT, United States of America

First Award of \$3,000

BCHM014 — *Deuterium Oxide (D₂O) on Maintaining Viability in Coliphage Bacteriophages under Low Temperatures to Model Live Attenuated Viral Vaccine Additives*

- Annika Morgan, Joel Barlow High School, CT, United States of America

Second Award of \$1,500

BCHM007 — *Coupling Multiple Stresses to the Activation of Akt-Kinase Signaling Pathway*

- Amogh Bhatnagar, University School of Milwaukee, WI, United States of America

BCHM027T — *An Innovative Method of Room Temperature Biospecimen Preservation via Tetramethyl Orthosilane (Sol-Gel) Encapsulation and Polyethylene Glycol Extraction*

- Jack Boylan, duPont Manual High School, KY, United States of America
- Kavya Koneru, duPont Manual High School, KY, United States of America

Third Award of \$1,000

BCHM006 — *Targeted Drug Delivery for Drug Resistant Cancer*

- Ashton Body, Episcopal School of Jacksonville, FL, United States of America

BCHM030 — *QuitPuff: A Point-of-Care Diagnostic for Early Risk Detection of Oral Pre-Cancer and Cancer in Chronic Smokers*

- Nikhiya Shamsheer, Greenwood High International School Bangalore, Karnataka, India

BCHM037 — *Exploring the Biomechanics of Red Blood Cells: Paving the Way to Efficient and Physiological Modeling of Erythrocytes in Shear Flow*

- Prathysha Kothare, Parkland High School, PA, United States of America

Fourth Award of \$500

BCHM003T — *Study and Characterization of Zea mays Stigma Extract: An Alternative to Obtain Eugenol*

- Maria Ferreira, Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha, Rio Grande do Sul, Brazil
- Muriel Krohn, Fundacao Escola Tecnica Liberato Salzano Vieira da Cunha, Rio Grande do Sul, Brazil

BCHM012 — *RNA Regulation: Identifying and Preventing AMP Depurination in Early Life RNA Polymerization*

- Michelle Nazareth, Georgiana Bruce Kirby Prep School, CA, United States of America

BCHM031 — *Improve Algae Biotechnology*

- Roumany Sefin, Industrial Advanced Technical School, Port Fuad, Egypt

BCHM042 — *IFN γ Susceptibility in Chordoma*

- Ananthan Sadagopan, Westborough High School, MA, United States of America

BIOMEDICAL AND HEALTH SCIENCES

Intel ISEF Best of Category Award of \$5,000

BMED046 — *A Novel, Noninvasive Approach to Melanoma Diagnosis Using Optical Coherence Tomography and Bioconjugated Gold Nanoparticles*

- Shriya Reddy, Northville High School, MI, United States of America

First Award of \$3,000

BMEDo46 — *A Novel, Noninvasive Approach to Melanoma Diagnosis Using Optical Coherence Tomography and Bioconjugated Gold Nanoparticles*

- Shriya Reddy, Northville High School, MI, United States of America

BMEDo65 — *Prostate Carcinomas in African Americans Have Distinct miRNA Expression and Biological Markers for Poor Prognosis*

- Malhaar Agrawal, Horace Mann School, NY, United States of America

Second Award of \$1,500

BMEDo47 — *Enabling Influenza Virus-like Particles (VLPs) as a Universal Vaccine*

- Madeleine Yang, Detroit Country Day School, MI, United States of America

BMEDo60T — *Development of a Microscope for Fully Automated Real-Time Cancer Cell Tracking*

- Nicole Segaran, Carmel High School, IN, United States of America
- Yannik Singh, Carmel High School, IN, United States of America

BMEDo70 — *Segmentation of Lung Lobe Structures using a Novel Artificial Intelligence Framework for Precise Lung Cancer Radiation Therapy*

- Shrila Shah, Yorktown High School, NY, United States of America

BMEDo89 — *Ptychosperma macarthurii (MacArthur Palm) Seeds Inhibit Growth of ex vivo Cancer Cells*

- Nalani Miller, Kamehameha Schools Kapalama Campus, HI, United

Third Award of \$1,000

BMED001 — *Inhibition of Glutamate Excitotoxicity in Glaucoma by Liposomes*

- Alexandr Zarivnij, Cirkevni Gymnazium Nemeckeho Radu, Czech Republic

BMED002 — *Accuracy of a Novel Method to Measure In-Stent Restenosis Using Embedded Nanosensors*

- Ethan Levy, Dr. Michael M. Krop Senior High School, FL, United States of America

BMED003 — *The Role of NGAL as a Biomarker for Early Detection of Acute Kidney Injury*

- Evelyn Bodoni, Cherry Creek High School, CO, United States of America

BMED022 — *Cancer's Other Half: Limiting Metastasis by Restricting Blood Vessel Formation*

- Maiya Mao, Bergen County Academies, NJ, United States of America

BMED028 — *Efficacy of Anti-Annexin 2 Antibodies on Retinal Neoangiogenesis in a Model of Oxygen-Induced Retinopathy*

- Angela Youn, Tenafly High School, NJ, United States of America

BMED032 — *Ending the EpiPen Epidemic: Creating an Intestinal Organoid to Understand the Immune Mechanisms Involved in a Peanut Allergy*

- Isabella Heffernan, Saint Mary Academy Bayview, RI, United States of America

BMED058 — *Precision Care for Leukemia: Discovery of Novel Therapeutics for High-Risk ALL via Epigenetic and Computational Transcriptome Profiling*

- Ruhi Sayana, The Harker School, CA, United States of America

Fourth Award of \$500

BMED015 — *Understanding Fibrinolysis in Sickle Cell Disease: Characterization of in vitro Blood Clot Resolution by Monocytes*

- Niara Botchwey, Charles R. Drew Charter School, GA, United States of America

BMED051 — *Computational Screening of Small Molecules for Antibacterial Agents that Target T-Box Riboswitches*

- Shifra Narasimhan, Athens High School, OH, United States of America

BMED055 — *Negative Pressure Wound Therapy: Cancer Metastasis Stimulated by HIF-1ALPHA Regulated MALAT1 and SOX Cooperation*

- Shruthi Shekar, Jericho High School, NY, United States of America

BMED063 — *Big Data Analytics: Identification of Novel Cancer Progression Gene Signatures for Precision/ Personalized Medicine*

- Kevin Sheng, Roanoke Valley Governor's School for Science and Technology, VA, United States of America

BMED064 — *The Effect of 460 Nm Light on Seizure-Like Activity (SLA) in Bang-Sensitive Drosophila as Measured by Seizure Velocity, Distance Traveled and Seizure Duration*

- Margaret Farr, Saratoga Springs High School, NY, United States of America

BMEDo73 – The Development of a Novel Treatment for Lactose Intolerance Using Synbiotic Formulations

- Eliza Martin, PLC Sydney, NSW, Australia

BMEDo74T – The Effect of Silver Nanoparticles Socks on the Treatment of Diabetic Foot

- Abdulhadi Jallab, Jassim Hamad Independent Secondary School for Boys, Qatar
- Hareth Omar, Jassim Hamad Independent Secondary School for Boys, Qatar

BMEDo76 – Arc, GAD67, and the Orbitofrontal Cortex: Reconsidering the Molecular and Systemic Basis of Major Depressive Disorder

- Joseph Sexton, West Forsyth High School, GA, United States of America

BMEDo82T – Identifying Key Pathways/Mechanisms for the Generation of Pancreatic Beta Cells by Trans-differentiation of Acinar Cells

- Abby Liu, Hamilton High School, AZ, United States of America
- Ella Ai, Hamilton High School, AZ, United States of America
- Thalia Liu, Hamilton High School, AZ, United States of America

BIOMEDICAL ENGINEERING

Intel ISEF Best of Category Award of \$5,000

ENBMoo8 – Utilizing Computer Vision and Machine Learning Systems to Develop a Live Time Navigational and Surgical Aid for Spinal Reconstructions

- Krithik Ramesh, Cherry Creek High School, CO, United States of America

First Award of \$3,000

ENBM008 — *Utilizing Computer Vision and Machine Learning Systems to Develop a Live Time Navigational and Surgical Aid for Spinal Reconstructions*

- Krithik Ramesh, Cherry Creek High School, CO, United States of America

ENBM070 — *Project ATTIS: An Assistive Aid for Parkinson's Patients Using Vibrational White Noise to Reduce Resting Tremors*

- Anne Jing, Assumption College School, Canada

Second Award of \$1,500

ENBM005 — *TheraArm: Orthosis Therapy for Arm Rehabilitation and Movement Assistance*

- Andrei Spiride, Plano East Senior High School, TX, United States of America

ENBM007 — *A Novel Optical Diagnostic Method for Non-Invasive Detection of Blood Glucose Using Reverse Iontophoresis Modulation and Personalized Neural Networks*

- Rohan Ahluwalia, Westview High School, OR, United States of America

ENBM011 — *Engineering a Novel Wearable Biosensing Mechanism through the Implementation of Microelectromechanical Systems and Machine Learning to Realize Anomalies Hinting towards Future Cardiac Episodes*

- Prerit Choudhary, College Park High School, TX, United States of America

ENBM026T — *TremorWear: A Smart-Sensing, Device-Independent*

Tremor-Suppression Library for Wearable Tremor Orthoses

- Alex Zhang, Montgomery High School, NJ, United States of America
- Charles Ma, Montgomery High School, NJ, United States of America

Third Award of \$1,000

ENBM006 — Solar Powered Ozone and UVC-Based Decontaminator

- Alyssa Keirn, Rocky Mountain High School, CO, United States of America

ENBM016 — Applying Thermopile Array Sensors and Machine Learning to Detect Falls of Older Adults

- Melissa Nie, Saint Paul Academy and Summit School, MN, United States of America

ENBM021 — Stereoscopic Three-Dimensional X-Ray Reconstruction Processing: A Low-Radiation Cost-Effective Versatile Medical Imaging Procedure for Safe and Rapid Scanning

- David Yue, Texas Academy of Mathematics and Science, TX, United States of America

ENBM030 — Rapid, Smartphone-Based Diagnosis of Skin Melanoma through Differences in Tumor Cell Thermal Regulation Combined with Diffuse Spectroscopic Analysis

- Melissa Woo, Greenwich High School, CT, United States of America

ENBM036 — Improving Spinal Fusions: Redesigned Pedicle Probe to Prevent Vertebral Breaches

- Nicolas Fedrigo, Claremont Secondary School, British Columbia, Canada

ENBMO71 — *An Improved Inexpensive Closed-Loop Insulin Pump for Automatic Management of Types 1 and 2 Diabetes*

- Anna Quinlan, Menlo-Atherton High School, CA, United States of America

Fourth Award of \$500

ENBMO27 — *Design and Construction of a Cost-Effective Full Arm Prosthetic with Computer Vision*

- Noam Yakar, Tenafly High School, NJ, United States of America

ENBMO42 — *Non-Invasive Electronic Wireless Knee Biomechanical and Physiology Monitoring for Post-Operative Rehabilitation*

- Rachel Naidich, Thomas Jefferson High School for Science and Technology, VA, United States of America

ENBMO43 — *Hydrogel Modification to Encapsulate and Release Exosomes for Targeted Delivery*

- Anagha Aneesh, Walter Payton College Preparatory High School, IL, United States of America

ENBMO46 — *Stimulating Gamma Brain Waves via the Visual System Using Flashing LED Lights: Optimizing a Potential Treatment for Alzheimer's*

- Meredith Hillier, Newport Senior High School, WA, United States of America

ENBMO47 — *Designing, Prototyping and Testing of a Multi-Lumen Urinary Catheter with Sustained Unidirectional Biocide Flow*

- Ishaan Brar, Stockdale High School, CA, United States of America

ENBM051 – Assessing the Angular Dependence of Skull-to-Brain Impact Dynamics to Inform Future Bicycle Helmet Design

- Jeffrey Wisoff, Amador Valley High School, CA, United States of America

ENBM055 – A Novel Multimodal Wearable Sensor System for Continuous Monitoring of Chronic Diseases

- Jason Li, North Carolina School of Science and Mathematics, NC, United States of America

ENBM073 – A Smartphone-Based, Point-of-Care Iron Sensor Utilizing Colorimetric Techniques

- Mindy Long, Hamilton High School, AZ, United States of America

CELLULAR AND MOLECULAR BIOLOGY

Intel ISEF Best of Category Award of \$5,000

CELL040 – Modeling Neurodegeneration in vitro: A Dynamic Study of Tau in a Microfluidic Chamber System via Quantum Dot Labeling

- Allison Jia, The Harker School, CA, United States of America

First Award of \$3,000

CELL032 – ETM Is Indispensable to Endothelial Cell Physiology during Pathological Angiogenesis*

- Madhav Subramanian, Jericho High School, NY, United States of America

CELL040 – Modeling Neurodegeneration in vitro: A Dynamic Study of Tau in a Microfluidic Chamber System via Quantum Dot Labeling

- Allison Jia, The Harker School, CA, United States of America

Second Award of \$1,500

CELL011 — *The Role of Aging, Antioxidants, and Mutant Huntington Lowering in the Oxidative Stress Response of HD Neurons*

- Ritika Jeloka, Melbourne High School, FL, United States of America

CELL033 — *3D Spatiotemporal Profiling of Adrenergic and Cholinergic Transmission*

- Paula Zhu, Albemarle High School, VA, United States of America

CELL060 — *Differential Expression of Retrotransposons in Stem Cell Lineages of the Preimplantation Embryo*

- Eddie Dai, Olathe North High School, KS, United States of America

Third Award of \$1,000

CELL015 — *EpCAM Enhances Gefitinib-induced Drug Resistance in Colon Cancer Cells*

- Yun-Chi Chen, Taipei First Girls High School, Taiwan

CELL028 — *Enhancing Microtubule Dynamics with Fidgetin-Like 2 Depletion*

- Jed Katzenstein, Dobbs Ferry High School, NY, United States of America

CELL038 — *Development of a CD4+ Neoantigen Vaccine in the Panc02 Tumor Model*

- Jocelyn Mathew, Centennial High School, MD, United States of America

CELL039 — *Increasing Metabolic Substrates Improves Spreading Depolarization Recovery in a Brain Slice Model of Stroke: An Innovative Therapy for Reducing Brain Injury after Stroke*

- Rusty Ludwigsen, Early College Academy, NM, United States of America

CELL059 – *Direct Evolution of Antibody Fragments Targeting CD32a for Application in Immunotherapy to Eradicate HIV Latency*

- Long Ngo, Oregon Episcopal School, OR, United States of America

Fourth Award of \$500

CELL020 – *Engineered Atsttrin Protein Stabilizes Dysregulated Macrophage Polarization, Subsequent Osseous and Cartilaginous Tissue Remodeling in Ankylosing Spondylitis*

- Magdalene Ford, Ossining High School, NY, United States of America

CELL024 – *Alpha-synuclein Enhances Toxicity of Tau Oligomers in vitro*

- Katelynne Berland, New Horizons Governor's School for Science and Technology, VA, United States of America

CELL030 – *Utilizing Ligand Structuring Metaservers to Model Pathogenic p16 Mutation Effects on Binding Sites of Cell Signaling Pathways*

- Christopher Li, West High School, UT, United States of America

CELL031 – *Palbociclib Treated MDA-MB-231 Breast Cancer Cells Exhibit Increased Invasive Behavior in Zebrafish Xenograft Model*

- Matthew Weltmann, Half Hollow Hills High School East, NY, United States of America

CELL036 – *Investigation of Aspects of Neuron Function in Schizophrenia Using hiPSC Cells*

- Ryan Onatzevitch, Yorktown High School, NY, United States of America

CELL053T – *CCDC11 Regulates Efficient Midbody Recruitment of Ist1*

Suggesting Impaired Organization of ESCRT Machinery

- Arooba Ahmed, Half Hollow Hills High School East, NY, United States of America
- Jiachen Lee, Half Hollow Hills High School East, NY, United States of America
- Jillian Parker, Half Hollow Hills High School West, NY, United States of America

CHEMISTRY

Intel ISEF Best of Category Award of \$5,000

CHEM040 – Novel Colorimetric Sensors for Detecting Chemicals in Vapor, Liquid, and Solid Phases

- Helena Jiang, F. W. Buchholz High School, FL, United States of America

First Award of \$3,000

CHEM040 – Novel Colorimetric Sensors for Detecting Chemicals in Vapor, Liquid, and Solid Phases

- Helena Jiang, F. W. Buchholz High School, FL, United States of America

CHEM052T – C.C.E. Larvicide: Cassia Cinnamon Crude Extract as a Novel, Cost Effective and Eco-Friendly Mosquito Larvicide

- Melwin Choon Lei Cheng, Chung Ling High School Penang, Malaysia
- Yong Shiang Tham, Chung Ling High School Penang, Malaysia

Second Award of \$1,500

CHEM009 – Experimentally Designing Sustainable Clay-Based Adsorbents to Remove Arsenic from Drinking Water

- Rajat Doshi, Henry B. Plant High School, FL, United States of America

CHEM050 — *Synthesis and Use of Robust Cobalt (II) Catalysts for the Reduction of CO₂ to CO*

- Ankush Dhawan, Signature School, IN, United States of America

CHEM065 — *Analysis of Manufacturing Process of D-Glucose-Based Thermoformed-Polymers*

- Suvin Sundararajan, Westfield High School, MA, United States of America

CHEM073 — *A Porous Silicon Optical Nanosensor for the Detection of Volatile Organic Compounds*

- Anushree Chaudhuri, Westview High School, CA, United States of America

Third Award of \$1,000

CHEM001 — *Synthesis of HIV-1 Reverse Transcriptase Inhibitors*

- Tereza Gistrova, Gymnazium Zlin - Lesni Ctvrt, Zlínský Kraj, Czech Republic

CHEM007 — *Sustainable Manufacturing of Gamma Butyrolactone*

- Tianyu Dong, Northview High School, GA, United States of America

CHEM019 — *Water Purification by Capillary Action in Paper Towels*

- Vongayi Marazanye, High Achievers Coach Educational Centre, Zimbabwe

CHEM033 — *UiO-66 Metal Organic Frameworks (MOFs) Decorated with Cadmium Sulfide Quantum Dots: An Investigation of the Effectiveness of*

(MOFs) as a Drug Delivery System for Melanoma Treatment

- Lasya Damaraju, West Shore Junior/Senior High School, FL, United States of America

CHEM045 — Phosphorous/Nitrogen Co-Doped Carbon Derived from Soybean as High Performance Electrode Material for Supercapacitor

- Amna Khan, Little Rock Central High School, AR, United States of America

Fourth Award of \$500

CHEM003 — BuckyPaper: Investigating the Viability of Multi-Walled Carbon Nanotubes in Sensors for the Detection of Various Gases

- Andy Shar, Vanguard High School, FL, United States of America

CHEM021T — Morphology Effects of Electrocatalytic Carbon Dioxide Reduction onto Copper/Silver Bimetallic Nanostructures

- Wei-Ying Chien, Taipei First Girls High School, Taiwan
- Yu-Hsien Chang, Taipei First Girls High School, Taiwan

CHEM046 — Synthesis of Silver Compounds with Potential Anti-Cancer Activity: Silver(I) Complexes with Xylyl-Substituted Heterocyclic Thiones and Selones

- Aakriti Lakshmanan, Ardrey Kell High School, NC, United States of America

CHEM047 — The Effects of a Silica Coating on the Aggregation of Gold Nanoparticles

- Paige Sherman, Hunter College High School, NY, United States of America

CHEM048T — *Chloramine Test Kits for an Efficient Process of Swimming Pools' Disinfection*

- Athicha Santilanon, Mahidol Wittayanusorn School, Nakhon Pathom, Thailand
- Napat Sajjamongkol, Mahidol Wittayanusorn School, Nakhon Pathom, Thailand
- Natprawee Pattayawij, Mahidol Wittayanusorn School, Nakhon Pathom, Thailand

CHEM060 — *Organic Biodegradable Alternative to Plastic*

- Shaziyah Laher, Nizamiye Al Azhar Institute, Eastern Cape, South Africa

CHEM071 — *Constructing Earth-Abundant Core Shell Plasmonic Photocatalysts for Hydrogen Production via Water Splitting*

- William Porayouw, Redlands High School, CA, United States of America

COMPUTATIONAL BIOLOGY AND BIOINFORMATICS

Intel ISEF Best of Category Award of \$5,000

CBIO016 — *Enabling Personalized Medicine: A Novel Deep Learning Tool for Classifying Genetic Mutations Using Text from Clinical Evidence*

- Jason Ping, Bergen County Academies, NJ, United States of America

First Award of \$3,000

CBIO016 — *Enabling Personalized Medicine: A Novel Deep Learning Tool for Classifying Genetic Mutations Using Text from Clinical Evidence*

- Jason Ping, Bergen County Academies, NJ, United States of America

Second Award of \$1,500

CBIO005 — *Tracing Cell Lineages from Single-Cell Data using Markov Affinity Estimation*

- Lauren Li, Westview High School, OR, United States of America

CBIO042 — *A Novel Design for Investigating Cell Deconvolution Methods for Tumor Microenvironment*

- Virginia Ma, Columbus Academy, OH, United States of America

CBIO053 — *Discovery of Hidden Gene Regulators: A Novel Machine Learning Approach to Transcriptional Pause Site Determination*

- Anudeep Golla, Fairview High School, CO, United States of America

Third Award of \$1,000

CBIO015 — *An Iterative Transfer Learning Approach to Multiobjective de novo Drug Design with Recurrent Neural Networks and Nondominated Sorting*

- Jacob Yasonik, Homestead High School, WI, United States of America

CBIO036 — *Decoding Neural Networks: Novel Computational Methods to Discover Anti-Tumor B Cell Receptor Binding Motifs*

- Cynthia Chen, The Harker School, CA, United States of America

CBIO038T — *A Modular and Dynamic GPU-based Maize Simulation Using L-Systems*

- Govind Pimpale, Santa Teresa High School, CA, United States of America
- Marek Pinto, Santa Teresa High School, CA, United States of America

- Nitish Reuben, Santa Teresa High School, CA, United States of America

CBIO051T — A Web Based Mobile Healthcare System that Aims to Reduce Under 5 Child Mortality Rate (U5CM) and Maternal Deaths in Kenya: A Case Study Dadaab Refugee Camp

- Kunjal Dhokiya, Shree Cutchi Leva Patel Samaj School, Kenya
- Supraja Sayee Srinivasan, Shree Cutchi Leva Patel Samaj School, Kenya

Fourth Award of \$500

CBIO006 — Predicting the Development of Secondary Central Nervous System Cancer through Ensemble Learning Methods

- Julia Christina Camacho, Texas Academy of Mathematics and Science, TX, United States of America

CBIO020 — Deep Learning to Evaluate the Combinatorial Impact of Genetic Variants on Gene Expression

- Collin Wang, Detroit Country Day School, MI, United States of America

CBIO034 — CeRNetwork: A Platform for in silico Discovery and Classification of Competing Endogenous RNA Molecules for Multi-Omic Network Diffusion and Novel miRNA-Sequestering Drug Design

- David Toomer, Hayfield Secondary School, VA, United States of America

CBIO035 — Discretizing a Hybrid Cardiac Reconstruction: A Novel Simulation of Sustained Fibrillation

- Arianna Pahlavan, Jericho High School, NY, United States of America

CBIO052 — Retina: A Non-Invasive, Predictive Smartphone Application to Test for Cardiovascular Risk and Diabetic Retinopathy via Analysis of Cardiovascular Risk Factors and Retinal Fundus Images

- Kasyap Chakravadhanula , BASIS Scottsdale, AZ, United States of America

EARTH AND ENVIRONMENTAL SCIENCES

Intel ISEF Best of Category Award of \$5,000

EAEV047 — Evaluating Nano-Ferrofluid as a Technique for Microplastic Removal in Water

- Katie Lu, Central High School, MO, United States of America

First Award of \$3,000

EAEV006 — Real-Time Sinkhole Detection Using Civil Engineering Techniques, the Internet of Things (IoT), and Artificial Intelligence

- Sophia Wang, Amity Regional High School, CT, United States of America

EAEV047 — Evaluating Nano-Ferrofluid as a Technique for Microplastic Removal in Water

- Katie Lu, Central High School, MO, United States of America

Second Award of \$1,500

EAEV029 — Optimizing Metformin HCl Removal: Utilizing Molecular Sieves and Absorbents within Sand Filtration Units

- James Licato, Washington-Lee High School, VA, United States of America

EAEV041 — Algal Bioplastics: Developing a Sustainable Cycle of Compostable and Water-Soluble Plastics by Repurposing Waste Products of Algal Biofuel Production

- Melanie Quan, Las Lomas High School, CA, United States of America

EAEV071 — *The Effect of Carboxymethyl Cellulose on the Filtration Capabilities of Zebra Mussels*

- Jack Delli-Santi , Lake Travis High School, TX, United States of America

EAEV086 — *Biomimicking Torrey Pine Needles: Atmospheric Moisture Harvesting through Hydrophilic and Hydrophobic Micro-Patterns*

- Emily Tianshi, The Cambridge School, CA, United States of America

Third Award of \$1,000

EAEV009T — *Bioremediation of Tetracycline Polluted Soils: How Antibiotic Resistance Can Reduce Antibiotic Pollution in the Environment and a Solution to Groundwater Antibiotic Pollution*

- Sanjana Hiremath, Plano East Senior High School, TX, United States of America
- Sriya Teerdhala, Plano East Senior High School, TX, United States of America

EAEV028 — *A New Experimental Approach for Study Metasomatism of Peridotite in the Earth's Mantle*

- Tal Blonder, Midrashiya Hartman, Israel

EAEV038 — *Multidecadal Trends in Tropical Cyclone Behavior within Tropical North Atlantic Sub-basins*

- Kelsey Ge, Ward Melville High School, NY, United States of America

EAEV050T — *A Comprehensive Spatiotemporal Model for Interpolation of Tropospheric Fine Particulate Matter Concentration*

- Esmond Tsang, Mississippi School for Mathematics and Science, MS, United States of America

- Vayd Ramkumar, Mississippi School for Mathematics and Science, MS, United States of America

EAEVO75 — *Mapping Arsenic Movement due to Tsunami Events: Developing a Comprehensive Hot Spot Map of Arsenic Contamination in Wailoa State Park in Hilo, Hawaii*

- Jared Goodwin, Hilo High School, HI, United States of America

EAEVO76 — *Augura: Flood Risk Prediction Using Machine-Learning and Geographic Information Systems*

- Sagnik Anupam, Delhi Public School, R. K. Puram, New Delhi, India

EAEVO85 — *Water Recycling: The Effect of Soap Nut Grey Water on the Environment (Soil Microbiome, Year 4)*

- Shreya Ramachandran, American High School, CA, United States of America

Fourth Award of \$500

EAEVO13T — *POLIPLASTIK: From Waste to a Sustainable Biopolymer*

- Alex Hernandez Gil, Colegio de Bachilleres del Estado de Hidalgo, Hidalgo, Mexico
- Cristian Lorenzo Aldana, Colegio de Bachilleres del Estado de Hidalgo, Hidalgo, Mexico

EAEVO22T — *Potential Identification and Application of the Rhizophora apiculata and Sonneratia alba as a Bio Antifouling Agent for Antifoulant Paints*

- Caroline Nggebu, Denpasar 3rd State Senior High School, Bali, Indonesia
- Wiratathya Putramas I Made, Denpasar 3rd State Senior High School,

Bali, Indonesia

EAEVo35 — Metals and Metalloids in Corn Detected with the Inductively Coupled Plasma-Mass Spectrometer

- McKayla Gilbert, Farmington High School, NM, United States of America

EAEVo42 — Pretreatment of Brassica rapa with Pyrabactin Increases Tolerance to Drought Conditions

- Yuktha Chiguripati, W. Tresper Clarke High School, NY, United States of America

EAEVo44 — Machine Learning Classifiers to Predict Red Tide in Florida

- Marvin Li, James M. Bennett High School, MD, United States of America

EAEVo57 — A Novel Method of Monitoring the Health of Our Global Fresh Water Supply Using DNA Barcoding of Chironomidae (Diptera)

- Sonja Michaluk, Hopewell Valley Central High School, NJ, United States of America

EAEVo69 — Evaluating the Impact of Coal Ash Pollution through a C. elegans Developmental Model

- Mary Giles, Roanoke Valley Governor's School for Science and Technology, VA, United States of America

EAEVo80 — Induced Seismicity: Relationships between Earthquake Frequency and Magnitude to Saltwater Injection in Oklahoma Arbuckle Group

- Skylar Gale, Evergreen Senior High School, CO, United States of America

EAEVo87 — *Studying Avian Biodiversity Changes after Wetland Restoration: A Novel Approach via Remote Sensing and Citizen Science*

- Ashwin Sivakumar, Flintridge Preparatory School, CA, United States of America

EMBEDDED SYSTEMS

Intel ISEF Best of Category Award of \$5,000

EBED002 — *Particulate Raindrop Analysis for More Accurate Storm Forecasts*

- Max von Wolff, Megina Gymnasium Mayen, Germany

First Award of \$3,000

EBED002 — *Particulate Raindrop Analysis for More Accurate Storm Forecasts*

- Max von Wolff, Megina Gymnasium Mayen, Germany

Second Award of \$1,500

EBED027T — *BMCI-Net: A Novel Approach to Non-Invasive, Fully Mobile Prosthetic Control Using Robust Pattern Detection and Filtration of EMG and EEG Signals through Supervised Machine Learning*

- Divjot Bedi, Thomas Jefferson High School for Science and Technology, VA, United States of America
- Rishabh Misra, Thomas Jefferson High School for Science and Technology, VA, United States of America

EBED036 — *Development of a Flexible Durometer Sensor for Improving Hardness Tactile Modality Using Piezoelectric Polymers*

- Carrie Hsu, Herricks High School, NY, United States of America

Third Award of \$1,000

EBED008 — *Development of an Autonomous Aerial Vehicle Using Computer Vision and Artificial Intelligence to Assist First Responders in Dangerous Situations*

- Samuel Cadotte, Kalaheo High School, HI, United States of America

EBED011T — *Engineering a Portable, Low-Cost Refreshable Braille Display for Communication with the Deaf-Blind Population*

- Josh Nakka, Palmer Ridge High School, CO, United States of America
- Katelynn Salmon, Palmer Ridge High School, CO, United States of America

EBED025 — *Developing Three-Dimensional Spatial Cognition for the Visually Impaired Using Computational Depth Mapping and Vibro-Tactile Display*

- Tyler Delargy, Bangor High School, ME, United States of America

EBED026 — *Safe Gas Regulator*

- Wahalamuni Udapola, Sandalankawa Central College, North Western Province, Sri Lanka

Fourth Award of \$500

EBED005 — *Freeze Protected Vaccine Cold Box for Off-Grid Locations, Year Three*

- Susanna Dorminy, Sola Fide Home School, GA, United States of America

EBED013 — *"Wand" for the Upper Limbs Limitations: A Voice and Motion*

Recognition Based Remote Control

- Yuhan Xiao, Beijing 101 Middle School, Beijing, China

EBEDO15T — aWear: An Assistive Wearable System to Assist Nurses and Residents of Aged Care Homes

- Ivy Brain, Launceston College, Tasmania, Australia
- Mitchell Torok, Rosny College, Rosny, Australia

EBEDO16T — SkyHound: A Low-Cost 3D Printed Autonomous WiFi Tracking Search Drone to Locate Missing Victims of Natural Disasters

- Neel Jain, West Linn High School, OR, United States of America
- Pooja Jain, West Linn High School, OR, United States of America

EBEDO46 — Brain-Inspired Circuitry for the Future of AI and IoT: Optimizing the Analog Response of RRAMs under Pulsing for Synaptic Use

- Akhilesh Balasingam, Archbishop Mitty High School, CA, United States of America

ENERGY: CHEMICAL

Intel ISEF Best of Category Award of \$5,000

EGCH005 — Highly-dispersed Ni Supported by N-doped Carbon Derived from Silk for Electrocatalytic CO₂ Reduction

- Shicheng Hu, Shanghai Foreign Language School Affiliated to SISU, China

First Award of \$3,000

EGCH005 — Highly-dispersed Ni Supported by N-doped Carbon Derived

from Silk for Electrocatalytic CO₂ Reduction

- Shicheng Hu, Shanghai Foreign Language School Affiliated to SISU, China

Second Award of \$1,500

EGCH003T — Optimizing and Fine-Tuning Electrode Pore Sizes Utilizing Varying Ratios of the Immiscible Polymer Blend PAN-PS for High Energy Density and Wide Temperature Range Supercapacitors

- Ashay Shah, Plano East Senior High School, TX, United States of America
- Ashna Shah, Plano East Senior High School, TX, United States of America

EGCH018 — Flexible and High-Powered Supercapacitor from Low-Cost and Simple Building Method

- Brayden Noh, Auburn High School, AL, United States of America

Third Award of \$1,000

EGCH006 — Nature-inspired Biomass Material: from Cr-containing Wastewater Purification to Efficient Energy Storage

- Yutong Wang, The High School Affiliated to Renmin University of China, Beijing, China

EGCH025 — Improvement of Perovskite Solar Cell Efficiency through PLA Additive Induced Boundary Passivation with Application of Machine Learning in Crystal Image Analysis

- Aum Upadhyay, Interlake High School, WA, United States of America

EGCH027 — Discovery of FAZnF₃, a Hybrid Organic-inorganic Perovskite

for Photocatalytic Water Splitting

- Kaien Yang, Thomas Jefferson High School for Science and Technology, VA, United States of America

EGCH029T — Application of Electrospun Poly(acrylic acid)-Platinum/Carbon Catalyst Ink to Optimize Polymer Electrolyte Membrane Fuel Cell Performance

- Audrey Shine, Plainview-Old Bethpage John F. Kennedy High School, NY, United States of America
- Danielle Kelly, Friends Academy, NY, United States of America

Fourth Award of \$500

EGCH011 — Biochar Technology: A Carbon-Negative Energy System

- Vivian Chinoda, Queen Elizabeth Girls' High School, Zimbabwe

EGCH022 — Fabrication of Light Responsive Super Capacitor for Energy Harvesting & Energy Storage Applications

- Woud AlSadoun, KFUPM Schools, Eastern Province, Saudi Arabia

EGCH032 — A Novel Process to Fabricate Stable Bipolar Membranes for the Next Generation of Hydrogen Fuel Cells

- Nikhita Bontha, Hanford High School, WA, United States of America

EGCH033 — Investigation of Thin-Film Silver as Top Electrode Material for Transparent Organic Solar Cells

- Jing-Jing Shen, Beachwood High School, OH, United States of America

*EGCH041 — Utilizing a Modified Wastewater-Based Medium as a Feedstock for Engineered *Saccharomyces cerevisiae* to Biologically Produce Fatty*

Alcohols and Carboxylic Acids as Alternatives to Petrochemicals

- Rajat Ramesh, American Heritage School, FL, United States of America

ENERGY: PHYSICAL

Intel ISEF Best of Category Award of \$5,000

EGPH024T — *SHOWPAM: System of High-efficiency Ocean Wave Power with Acoustic Metamaterial*

- Joonyoung Lee, Korea Science Academy of KAIST, Busan, South Korea
- Mincheol Park, Korea Science Academy of KAIST, Busan, South Korea

First Award of \$3,000

EGPH024T — *SHOWPAM: System of High-efficiency Ocean Wave Power with Acoustic Metamaterial*

- Joonyoung Lee, Korea Science Academy of KAIST, Busan, South Korea
- Mincheol Park, Korea Science Academy of KAIST, Busan, South Korea

Second Award of \$1,500

EGPH006 — *Bamboo as a New Thermoelectric Material*

- Chih-I Luo, Taipei Fuhsing Private School, Taiwan

Third Award of \$1,000

EGPH012T — *Optimization of High-Efficiency Organic-Inorganic Lead Halide Perovskite Solar Cells via a Novel Polycaprolactone Additive Pathway*

- Anisa Prasad, Staples High School, CT, United States of America
- Sirina Prasad, Staples High School, CT, United States of America

EGPH022T — *Development of Novel Wind Turbines Hybridized between Permanent Magnet Disks and Additional Motor/Generator for Extending Operating Range and Enhancing Conversion Efficiency*

- Jittapon Khajonpirom, Phitsanulok Pittayakom School, Thailand
- Rungsiman Kulpetjira, Phitsanulok Pittayakom School, Thailand

Fourth Award of \$500

EGPH001 — *The Influence of Various Biological and Chemical Properties on the Efficiency of Nanocrystalline Solar Cells*

- Anna Skierska, II Liceum Ogólnokształcące im. Mieszka I w Szczecinie, Zachodniopomorskie, Poland

EGPH008 — *A Green Nanotechnological Approach for Energy Efficiency and Conservation: Tungsten-Doped Vanadium Dioxide Thermo-chromic Smart Windows*

- Cynthia Chen, Greenwich High School, CT, United States of America

EGPH015 — *Solar Updraft Tower-Wind Turbine Hybrid: Maximizing Power Output through Vortex Shedding, Water Droplet Atomization and Arduino Servo Control Feedback Loop*

- Rachel Spaulding, Eastern High School, KY, United States of America

ENGINEERING MECHANICS

Intel ISEF Best of Category Award of \$5,000

ENMCO25 — *Bioinspired Submersible Dual Propulsion System: A Novel Approach to Ultra-Efficient Submarine Propulsion Utilizing Starting and Stopping Vortex Rings Mirroring Jellyfish Motion*

- Rachel Seevers, Paul Laurence Dunbar High School, KY, United States of

America

First Award of \$3,000

ENMCo14 — *Development of a Fully Reusable and Autonomously Landing Suborbital Launch Vehicle*

- Ryan Westcott, Oregon Episcopal School, OR, United States of America

ENMCo25 — *Bioinspired Submersible Dual Propulsion System: A Novel Approach to Ultra-Efficient Submarine Propulsion Utilizing Starting and Stopping Vortex Rings Mirroring Jellyfish Motion*

- Rachel Seevers, Paul Laurence Dunbar High School, KY, United States of America

Second Award of \$1,500

ENMCo20 — *Agriculture Soil Probe Rover*

- Tate Schrock, Arickaree School, CO, United States of America

ENMCo24 — *The Development and Application of Harvesting Kinetic Energy from Marine Fish*

- Huai-Pu Chen, Keelung Municipal Anle Senior High School, Taiwan

ENMCo32 — *An Innovative Hybrid Diffusion Burner Design for NOx Reduction in High Temperature Applications, Year Three of an Ongoing Study*

- Brendan Crotty, Hickory Hill Academy Homeschool, OK, United States of America

ENMCo40 — *Phase 3: A High Performance Rowing Oar with Design Inspired by Biomimicry*

- Lucy Lake, Barker College, New South Wales, Australia

Third Award of \$1,000

ENMCo02 — *Permanent Magnet Synchronous Motor with Innovative Stator-Rotor Structure to Extend Torque and Speed Range*

- Haosong Zhong, Boren Sino-Canadian School, Guangdong, China

ENMCo12T — *AMSD (Autonomic Modular Scouting Drone): In Services for Society*

- Jakub Jurzak, Liceum Ogólnokształcące nr I im. Marii Skłodowskiej-Curie w Sucheju Beskidzkiej, Małopolska, Poland
- Szymon Stasik, Liceum Ogólnokształcące nr I im. Marii Skłodowskiej-Curie w Sucheju Beskidzkiej, Małopolska, Poland

ENMCo36T — *Design and Engineering of a Cam-Based Infinitely Variable Transmission for Automotive Use*

- Anton Lok, Palos Verdes High School, CA, United States of America
- Steven Davis, Palos Verdes High School, CA, United States of America

ENMCo50 — *Art or Science? String-Bow Interactions on a Novel Optoelectronic Cello*

- Andrew Land, Carlmont High School, CA, United States of America

ENMCo58T — *A Continued Study of a More Realistic Solution to Refugee Housing Using the Isoperimetric Honeycomb Conjecture*

- Alicia Kuhlmann, Bingham High School, UT, United States of America
- Samantha Davis, Bingham High School, UT, United States of America

ENMCo59T — *eTouch Project: An Affordable Braille e-Reader with the Cloud-Based Digital Library for the Blind*

- Antonina Zakorchemna, Fryeburg Academy, ME, United States of America
- Artem Laptiev, Fryeburg Academy, Maine, ME, United States of America

ENMCo72T — *Avinocular: An Autonomous Mobile Robot for Aircraft Inspection*

- Hei I Lei, Pui Ching Middle School, Macao, China, Macao Special Administrative Region
- Su Fong, Pui Ching Middle School, Macao, China, Macao Special Administrative Region

Fourth Award of \$500

ENMCo03 — *Unconventional Microaccelerometers for Nanosatellite-Specific Attitude Control Systems*

- Stefan Ursu, Colegiul Nicolae Titulescu, Brasov, Romania

ENMCo07 — *Construction and Control of a Mobile Platform with Omnidirectional Drive*

- Vincent Voigtlaender, Martin-Andersen-Nexo-Gymnasium, Germany

ENMCo16 — *Miniature Underwater Bridge Pier Cleaning Robot*

- Jingke Hu, Hangzhou Xuejun High School of Zhejiang Province, China

ENMCo17 — *Portable Graphene Oxide Desalination*

- Marcus Schlauch, Clear Brook High School, TX, United States of America

ENMCo30 — *Origami Paper Parachutes in HADR Operations*

- Natalie Yam, Anglo-Chinese School (Independent), Singapore

ENMCo43 — *A Robotics Assistive Device Application in Minimizing Manibus Tremors and Persons Afflicted with Bradykinesia*

- Shaylee Stanger, Clearfield High School, UT, United States of America

ENMCo54 — *Welcome to "Sistance": A New Form of Base Communication for Deaf-Blind Children*

- Mackenzie Hunt, New Tech Institute, IN, United States of America

ENMCo65 — *Design and Numerical Analysis of a Novel Co-Flow Jet System to Improve the Lift, Range, and Fuel Efficiency of a Commercial Airline Wing*

- Hans Ehrnrooth, Pine Crest School, FL, United States of America

ENMCo71 — *AccessO2: An Innovative, Non-Electric, Life-Saving, Oxygen Concentrator*

- Sanjit Thangarasu, Poolesville High School, MD, United States of America

ENVIRONMENTAL ENGINEERING

Intel ISEF Best of Category Award of \$5,000

ENEVo59 — *Photocatalytic Oxidation Utilizing Doped Titanium Dioxide for Air Purification*

- Adyant Shankar, Nashua High School South, NH, United States of America

First Award of \$3,000

ENEVo02 — *The Prototype of a Vehicle which Takes Preventive Measurement of Soil Conditions Autonomously*

- Piotr Lazarek, Zespól Szkól Ogólnokształcących Filomata, Śląsk, Poland

ENEVO45 — *The Solution to Pollution Is...Plastic? Accelerating Oil Spill Remediation by Using Polymer Exposure to Destabilize Emulsions*

- Zoe Gotthold, Richland High School, WA, United States of America

ENEVO59 — *Photocatalytic Oxidation Utilizing Doped Titanium Dioxide for Air Purification*

- Adyant Shankar, Nashua High School South, NH, United States of America

Second Award of \$1,500

ENEVO15 — *Agrobotics: An Autonomous Arduino Uno/Due Computer Vision Based Raspberry Pi High Throughput Plant Phenotyping Precision Agriculture Robot Using Dual Linear Mechanisms*

- Risha Dianne Valera, Plano West Senior High School, TX, United States of America

ENEVO27 — *SymBead Aquatic Technologies: The Development of a Low-Impact, Cost-Effective, Multi-Pollutant Bioremediation System*

- Braden Milford, Cascia Hall Preparatory School, OK, United States of America

ENEVO64 — *Optimizing Thermal Hydrolysis for Increased Biogas Generation in Wastewater Treatment*

- Rachel Joseph, Somers High School, NY, United States of America

ENEVO78T — *Zero Lost Drop*

- Abdel Rahman Hanafy, STEM School of Alexandria, Egypt

- Salma Lateef, STEM School of Alexandria, Egypt

ENEV103 — A Novel, Fast, Low-Cost Approach to Achieve Near 100% LDPE Degradation: Bioremedial Landfill Implementation

- Shloka Janapaty, Presentation High School, CA, United States of America

Third Award of \$1,000

ENEV004 — Stepping Down into Cooler Water (Fountains vs. Waterfalls)

- Zoe Diederich, Coral Reef Senior High School, FL, United States of America

ENEV022 — A Concrete Solution for Oyster Recruitment and Growth: Designing an Artificial Structure to Increase Oyster Shell Growth and Oyster Spat Settlement Using Calcite Media

- Kyle Bramblett, Titusville High School, FL, United States of America

ENEV040 — Visible-light Responsive Multifunctional Membrane for the Separation of Oil-Water Mixtures and Simultaneous Water Decontamination Supported by Theoretical Models

- Shouq Madani, KFUPM Schools, Eastern Province, Saudi Arabia

ENEV055T — Optimizing the Removal of Methylene Blue from Aqueous Solution Using Cucurbita pepo and an Analysis of Desorption Efficiency and Material Reusability

- Samantha Chen, Manhasset High School, NY, United States of America
- Serena Zhao, Manhasset High School, NY, United States of America

ENEV082T — A Novel Computational Tool to Inform Cost-Effective Nutrition Interventions in Sub-Saharan Africa

- Garyk Brixi, Winston Churchill High School, MD, United States of America
- Lillian Petersen, Los Alamos High School, NM, United States of America

ENEVO87 — *Value Added Sensors from Environmental and Industrial Waste*

- Ajlan Al-Kaabi, Omar Bin Al-Khattab Secondary School, Qatar

ENEVO97 — *TLC - Tigernut Liquid Coagulant: An Undiscovered Biocoagulant for Water Turbidity Reduction*

- Sabrina Mogus, White Oaks Secondary School, Ontario, Canada

ENEV101T — *Finding the Optimal Way to Detect Rapid Ohia Death Utilizing Aerial Photography*

- Alexander Bell, Kealakehe High School, HI, United States of America
- Evan Curry, Kealakehe High School, HI, United States of America
- Nicholas White, Kealakehe High School, HI, United States of America

Fourth Award of \$500

ENEVO01 — *A Holistic Engineering Plan Incorporating Predictive Data Modeling into the Process of Remediating Cyanophyta Algae Blooms and Applying Photoautotrophic Prokaryotes Biomass to Improve Agricultural Outcomes*

- Griffin Wagner, Vero Beach High School, FL, United States of America

ENEVO11 — *Designing an Algae-Immobilized Membrane Bioreactor for Wastewater Bioremediation and High-Density Algae Production*

- Min Tsou, Mililani High School, HI, United States of America

ENEVO35T — *Production of CFH Filter Using Discarded Chicken Feather*

and Cotton Fabric

- Dohun Kim, Chung-Buk Science High School, Chungcheongbukdo, South Korea
- Jiwung Lee, Chung-Buk Science High School, Chungcheongbukdo, South Korea
- Taewon Eum, Chung-Buk Science High School, Chungcheongbukdo, South Korea

ENEVO39 – Removing Hydrocarbons/Organic Contaminants from Water Using a Novel Ultrahydrophobic/Oleophilic Self-Cleaning Polypropylene Material

- Abdullah Alsinan, Dhahran Ahliyya School, Eastern Province, Saudi Arabia

ENEVO41 – Improving the Performance of WO₃ for the Photodegradation of Organic Dyes in Wastewater

- Deemah Almulhim, KFUPM Schools, Eastern Province, Saudi Arabia

ENEVO44 – Using Raw Bamboo Waste to Sustainably Purify Water

- Akash Rathod, Okemos High School, MI, United States of America

ENEVO46 – Application of Microbial Fuel Cell Biosensors in Detecting Water Pollution

- Anna Vargas, Tabb High School, VA, United States of America

ENEVO72T – Optimizing Hydrogels in Cosmetics: Creating Effective Self-Assembled Nanostructures Coupled with an Antioxidant-Rich and High SPF Pollution-fighting Soybean Oil Cream

- Arvind Prasad, Sycamore High School, OH, United States of America
- Govind Nadathur, Sycamore High School, OH, United States of America

ENEVo86 – Designing an in situ Soil Conductivity Monitoring System for Precision Agriculture and Water Management

- Rohan Wagh, Sunset High School, OR, United States of America

ENEVo92T – An E-Waste Management Initiative for Developing Countries: Using Acrylonitrile Butadiene Styrene, High Impact Polystyrene, Polypropylene, Polyvinyl Chloride, Rubber and Aluminosilicate Glass to Make a Composite Material

- Harnil Jham, Shree Cutchi Leva Patel Samaj School, Kenya
- Isha Jobanputra, Shree Cutchi Leva Patel Samaj School, Kenya

ENEVo99T – Activated Carbon Foam Surfaced Carbon Dioxide Scrubber with an Environmentally Sustainable Gas Purification System Using Bicarbonate Ions

- John Richardson, Massanutten Regional Governor's School, VA, United States of America
- Madison Nichols, Massanutten Regional Governor's School, VA, United States of America

MATERIALS SCIENCE

Intel ISEF Best of Category Award of \$5,000

MATSo03 – The Flash Shade: Directional Darkening Technology

- Adrien Jathe, Metropolitan School Frankfurt gGmbH, Germany

First Award of \$3,000

MATSo03 – The Flash Shade: Directional Darkening Technology

- Adrien Jathe, Metropolitan School Frankfurt gGmbH, Germany

MATSo44 – The Universe in a Nutshell: Bacterial Cellulose Membrane Using Macadamia Byproduct

- Juliana Davoglio Estradioto, Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul (IFRS) - Campus Osório, Rio Grande do Sul, Brazil

Second Award of \$1,500

MATSo09 – Novel Nanostructured Metal Powder by Simple Hot Water Treatment: An Economic and Sustainable Oil-Water Separation

- Anusha Bhattacharyya, Little Rock Central High School, AR, United States of America

MATSo22 – Acrylate Polymerization: Formation of UV Curable Antimicrobial Copolymers

- Nathan Tidball, Wilsonville High School, OR, United States of America

MATSo74 – Developing a Bacterial Cellulose and Kombucha Tea Waste Product Based Scaffold with an Integrated Oxygen Generating Construct for Islet Cell Transplantation

- Angelin Mathew, American Heritage School, FL, United States of America

MATSo79 – OceanBioplas: The Plasticity of Marine Exoskeleton-Inspired Materials and Their Degradability in the Environment (Soil and Seawater/Saltwater)

- Jacqueline Prawira, Mountain House High School, CA, United States of America

Third Award of \$1,000

MATSo14 — Development of the Gypsum Board Materials Containing Eggshell Aiming at the Solution of Sick Building Syndrome

- Taito Tanaka, National Institute of Technology, Yonago College, Tottori-Pref., Japan

MATSo17 — Novel Luciferase-Fluorescent Nanodiamond Assay for Cytotoxic Evaluation of Chemotherapy Drugs in Cancer and Mesenchymal Stem Cells

- Shu-Yun Cheng, Taipei Fuhsing Private School, Taiwan

MATSo20 — Effectiveness of Detergents Analysed Using Rotating Magnetic Nanoparticles

- Jovan Yap, Dunman High School, Singapore

MATSo27T — Zinc Oxide-Capped Carbon Nanoforest: Novel Method of Defects Engineering via Focused-Laser-Beam Modification

- Valerie Tan Yi Jie, Dunman High School, Singapore
- Zhong Wei Isaac Kwek, Dunman High School, Singapore

MATSo42 — Using Self Assembled Monolayers for the Fabrication of Implantable Strain Gauge Sensors

- Justin Hu, James Madison High School, VA, United States of America

MATSo45 — Lighting Up the Brain: Development of a Novel Molecular Probe for the Early, Minimally-invasive Diagnosis and Treatment of Alzheimer's Disease

- Shaan Baig, Dawson College, Quebec, Canada

Fourth Award of \$500

MATSo12 — Get a Grip: Creating Soft Robotic Grippers via Self-folding by Infrared Activation

- Ana Ratanaphruks, Wake STEM Early College High School, NC, United States of America

MATSo23T — Graphene-Enabled Templating Synthesis of Metal Origami for Next-Generation Soft Robotics

- Clive Choong, NUS High School of Mathematics & Science, Singapore
- Elden Yap, NUS High School of Mathematics & Science, Singapore
- Harish Kumar, NUS High School of Mathematics & Science, Singapore

MATSo37T — Development of in-situ Fabrication Techniques of Martian Construction Material

- Cristian Rodriguez, CREC Academy of Aerospace and Engineering, CT, United States of America
- Srikar Godilla, CREC Academy of Aerospace and Engineering, CT, United States of America

MATSo40T — Replacement of Synthetic UV-Absorbents by Lignin

- Jan Matufka, Grammar School of St. Nicholas, Slovakia
- Peter Skripko, Grammar School of St. Nicholas, Slovakia

MATSo50 — Designing High-Performing, Low-Cost Shock Absorbing Composites for Injury Protection by Impregnating Woven Fabrics with Shear Thickening Fluids

- Aaditya Saha, Chamblee Charter High School, GA, United States of America

MATSo65 — Novel

Graphene Nanoplatelet and Ketjenblack Embedded Pigmentless Acrylic

Emulsions for Next Generation Flexible Electronics

- Daniel Kang, John F. Kennedy High School, Guam

MATSo66T — Gas Sensor Research Based on Insect Wing Hierarchical Microstructure

- Man Lei Lam, Escola De Aplicacao Anexa A Universidade De Macau, China, Macao Special Administrative Region
- Zheng Zhong, The Affiliated School of the University of Macao, China, Macao Special Administrative Region

MATSo71T — HemaDrop: A Novel Elemental Composition Technology for Microliter-Size Blood Droplets via Solid State Techniques

- Nikhil Suresh, BASIS Scottsdale, AZ, United States of America
- Saaketh Narayan, BASIS Scottsdale, AZ, United States of America

MATHEMATICS

Intel ISEF Best of Category Award of \$5,000

MATHo26 — Classifying Magic Squares and Their Associated Symmetries Using a Chord Diagram Approach

- AnaMaria Perez, Albuquerque Academy, NM, United States of America

First Award of \$3,000

MATHo26 — Classifying Magic Squares and Their Associated Symmetries Using a Chord Diagram Approach

- AnaMaria Perez, Albuquerque Academy, NM, United States of America

Second Award of \$1,500

MATHo16 — Generating Set for Nonzero Determinant Links under Skein

Relation

- Aayush Karan, University School of Milwaukee, WI, United States of America

MATH038 — A Trust Model in Bootstrap Percolation

- Rinni Bhansali, Half Hollow Hills High School East, NY, United States of America

Third Award of \$1,000

MATH014 — Finding Chebyshev-Type Functions

- Zong-Hong Cheng, The Affiliated Senior High School of National Taiwan Normal University, Taiwan

MATH017 — On the Application of Heat Diffusion across a Manifold for Dimensionality Reduction

- John Piwinski, BASIS San Antonio Shavano Campus, TX, United States of America

MATH025T — On the Largest Axes-Parallel Rectangle among Points in a Square

- Seo Yeong Kwag, Blair Academy, NJ, United States of America
- Taeyang Park, Peddie School, NJ, United States of America

Fourth Award of \$500

MATH007T — The Mathematical Correlations in an Origami Coiled Structure

- Drake Ludgate, Brush High School, CO, United States of America
- Nathaniel Miner, Brush High School, CO, United States of America

MATH020 — *Loop Spaces, P-Curvature, and Homotopy*

- Daniel Santiago,
Centro Residencial de Oportunidades Educativas de Mayagüez, Puerto Rico

MATH032 — *Dynamics of the Tangent Map*

- Andrei Mandelshtam, University High School, CA, United States of America

MATH041 — *Planetary Transfer Calculator*

- Callum Predavec, Mosman High School, NSW, Australia

MICROBIOLOGY

Intel ISEF Best of Category Award of \$5,000

MCRO052T — *Investigating the Role of the Novel ESCRT-III Recruiter CCDC11 in HIV Viral Budding: Identifying a Potential Target for Antiviral Therapy*

- Leo Takemaru, Ward Melville High School, NY, United States of America
- Poojan Pandya, Half Hollow Hills High School West, NY, United States of America

First Award of \$3,000

MCRO052T — *Investigating the Role of the Novel ESCRT-III Recruiter CCDC11 in HIV Viral Budding: Identifying a Potential Target for Antiviral Therapy*

- Leo Takemaru, Ward Melville High School, NY, United States of America
- Poojan Pandya, Half Hollow Hills High School West, NY, United States of America

MCRO067T — *Cyanocide: A Novel Strategy for Harmful Algal Bloom Mitigation via Initiation of Programmed Cell Death*

- Miamar Burgos-Rosario, Hayfield Secondary School, VA, United States of America
- Saijai Supanklang, Hayfield Secondary School, VA, United States of America
- Sarah Syed, Hayfield Secondary School, VA, United States of America

Second Award of \$1,500

MCRO005 — *Green Watts: Investigating Power Production of a Single Chamber Plant Microbial Fuel Cell in a Modular System Comparing Crop Plants, Triticum aestivum, Saccharum officinarum and Zeamays - A Novel Fifth Year Study*

- Luke Long, Canterbury School, FL, United States of America

MCRO024 — *Food Preservation, Not Perversion: Development of a New Preservation Method for Alimentary Products*

- Maitane Alonso Monasterio , Avellaneda Ikastetxea, Spain

MCRO035 — *Turning Over a New Phage: A Novel Approach to Phage Therapy*

- Emily Kang, Canyon Crest Academy, CA, United States of America

MCRO056 — *Identifying Antibiotic Molecules in Ceanothus leucodermis and Quantifying Their Antibacterial Activity with a Novel, Simulation-Aided Method*

- Daniel Feng, University High School, CA, United States of America

MCRO073 — *Dynamic Roles of Epstein-Barr Virus Reactivation: Identifying Novel Mechanisms of EBV-Positive Lymphoma Progression and*

Treatment

- Logan Dunkenberger, Roanoke Valley Governor's School for Science and Technology, VA, United States of America

Third Award of \$1,000

MCRO014 — *Implications for Biogas Energy Use via Methanogenesis in Mars Conditions*

- Alexandria Montgomery, West Salem High School, OR, United States of America

MCRO015 — *Nanoceramic Coating of Central Venous Catheters Has Inhibitory Effect on Colonization by E. coli and Bacillus cereus*

- Varsha Naga, Winter Springs High School, FL, United States of America

MCRO017 — *An Algorithmic Platform to Optimize the Prescription of Antibiotics to Minimize Antibiotic Resistance Developing in Patients or Communities*

- Sophie Kearney, Midway High School, TX, United States of America

MCRO023 — *Nature Inspired Bactericidal Nanotextured Surfaces with ZnO Nanostructures*

- Yee Lin Tan, National Junior College, Singapore

MCRO043 — *Viruses to the Rescue?: Using Microtiter Assays and an In-Lab Developed Simulated Anatomic Lung Model to Determine the Effectiveness of Bacteriophage Therapy as a Preventative Measure against Poly-Microbial Biofilms in Cystic Fibrosis Patients*

- Divyam Goel, West High School, UT, United States of America

MCRO050 — *Controlling the Chikungunya Virus Disease in Dengue Endemic Areas through the Development of a Peptide Vaccine*

- Sruthi Kalavacherla, Amador Valley High School, CA, United States of America

MCRO077 — *Effects of Grape Components on Periodontitis*

- Anne Liang, duPont Manual High School, KY, United States of America

Fourth Award of \$500

MCRO018T — *Natural Alternative to Synthetic Drugs: Juglone-Sodium Alginate Binary Systems*

- Anastasia Zdrobau, Theoretical High School, Republic of Moldova
- Catarina-Severina Martin, Theoretical High School, Republic of Moldova

MCRO028 — *Innovative Approach to the Antibacterial and Prebiotic Lycium barbarum Extract: Solution after the Antibiotic Era*

- Blanka Novak, Istvan Dobo Secondary Grammar School, Heves, Hungary

MCRO032 — *Human Photosynthesis: Functional Chloroplast Sequestration in Human Mesenchymal Stem Cells*

- Brent Perlman, Byram Hills High School, NY, United States of America

MCRO039 — *Identifying Novel Mechanisms of Quorum Sensing Receptor Protein RpfR: Relevance to the BDSF Quorum Sensing Signaling Pathway*

- Neehal Tumma, Port Huron Northern High School, MI, United States of America

MCRO053 — *Development of a qPCR Assay for Quantification*

of Saccharibacteria

- John Lin, Boston Latin School, MA, United States of America

MCRO055 — *Effects of i-Motifs and G-quadruplexes on Bacterial Gene Transcription*

- Isabella Wiebelt-Smith, Central High School, MO, United States of America

MCRO057 — *The Antiviral Function of XAF1 during Immune Response*

- Cheryl Luo, Yorktown High School, NY, United States of America

MCRO060 — *Serum Marker of Glyphosate Exposure Associated with Changes in Oral and Gut Microbiome Composition*

- Aria Eppinger, Winchester Thurston School, PA, United States of America

MCRO066 — *Investigating the Bactericidal and Anti-Biofilm Effects of Naringenin on Enterobacter cloacae*

- Vanessa Siggers, Murphy High School, AL, United States of America

PHYSICS AND ASTRONOMY

Intel ISEF Best of Category Award of \$5,000

PHYS038 — *Disentangling Spatial Correlations from Inhomogeneous Materials with Shift-Invariant Artificial Neural Networks: A Novel Approach to Study Superconductivity*

- Kaylie Hausknecht, Lynbrook Senior High School, NY, United States of America

First Award of \$3,000

PHYS007 — *Plotting New Horizons: A Statistical Analysis of Potential Factors Influencing the Probability of Planetary System Formation*

- Dahlia Dry, Fort Myers High School, FL, United States of America

PHYS038 — *Disentangling Spatial Correlations from Inhomogeneous Materials with Shift-Invariant Artificial Neural Networks: A Novel Approach to Study Superconductivity*

- Kaylie Hausknecht, Lynbrook Senior High School, NY, United States of America

Second Award of \$1,500

PHYS033 — *Improving Particle Classification in WIMP Dark Matter Detection Experiments Using Neural Networks*

- Brendon Matusch, Lo-Ellen Park Secondary School, Ontario, Canada

PHYS042 — *Heisenberg-Scaling Measurement Protocol for Analytic Functions with Quantum Sensor Networks*

- Kevin Qian, Montgomery Blair High School, MD, United States of America

PHYS060 — *Probing Stellar Remnant for Planet Candidate; Analysis of K2 Target 251248385*

- Stephanie Yoshida, Punahou School, HI, United States of America

PHYS070 — *Analysis of Molecular Spectra in Asymptotic Giant Branch Carbon Stars*

- Vivek Vijayakumar, San Marcos High School, CA, United States of America

Third Award of \$1,000

PHYS004 — *Development of an Interdisciplinary Test Stand to Unravel the Myth of Rubber Powered Flight*

- Noah Dormann, Chiemgau-Gymnasium Traunstein, Germany

PHYS043 — *Effect of Epitaxial Compression on Structural and Electrical Transport Properties of 3D Topological Dirac Semimetal Cd₃As₂*

- Nikita Salunke, Evergreen Valley High School, CA, United States of America

PHYS046 — *Solving the Tyranny of the Rocket Equation: A Theoretical and Experimental Study of Laser Propulsion*

- Natan Dominko Kobilica, Gimnazija Bezigrad, Slovenia

PHYS057 — *Searching for Hidden Black Holes: An Investigation of Chaotic Regimes in Non-Linearly Coupled Harmonic Oscillators*

- Rebecka Mahring, Viktor Rydbergs Gymnasium Odenplan, Stockholm, Sweden

PHYS061 — *Implementing Quantum Dot Qubits in Optimized Linear Quantum Computing Architectures through Evolutionary Computational Modeling*

- Lucas Braun, School of Science & Technology, OR, United States of America

Fourth Award of \$500

PHYS011 — *Faraday Heaping Unravelled: Study of Heaping Behavior of Granular Materials under Vertical Vibration*

- Qingyi Wang, No. 2 High School of East China Normal University, Shanghai, China

PHYS041 — *Examining the Potential of Selective Bacterial Lysis through Pulsed Magnetic Fields at the Resonant Frequency of the Escherichia coli Cell Membrane*

- Joshua Harmon, Camdenton High School, MO, United States of America

PHYS056 — *Flock Fragmentation: The Dispersal of Saturated Flocks in a System of Self-Propelled Particles*

- Parker Jou, Carmel High School, IN, United States of America

PHYS064 — *Using Dimple Technology to Optimise the Aerodynamics of Heavy Motor Vehicles*

- Rune Edeling, Eunice High School, Free State, South Africa

PHYS067 — *Development of a Thin and Inexpensive Open-Air Proton Beam Detector for Characterizing the Beam Profile and Position*

- Ethan Rosenfeld, Phoenix Country Day School, AZ, United States of America

PHYS068 — *Nanoscale Optical Probing of Two-Dimensional Heterostructures Suspended on Nano-Slits*

- Joy Ma, Fairview High School, CO, United States of America

PHYS069T — *Hand-Held Detector with Retro-Reflective Mosaic Screens to Visualize Optical Inhomogeneities*

- Dea Ilarionova, Cervantes Gymnasium AIA-GESS, Georgia
- Marina Gudzhavidze, Cervantes Gymnasium AIA-GESS, Georgia
- Shorena Gudzhavidze, Cervantes Gymnasium AIA-GESS, Georgia

PLANT SCIENCES

Intel ISEF Best of Category Award of \$5,000

PLNT059 — *Testing the Effectiveness of Mycorrhizae in the Phytoremediation of Heavy Metals from Stormwater*

- Amara Ifeji, Bangor High School, ME, United States of America

First Award of \$3,000

PLNT024 — *Organic Stimulation of Plant Growth: Inoculation of Bacterial Endophytes from *Leersia oryzoides**

- Adham Kassem, College Park High School, TX, United States of America

PLNT059 — *Testing the Effectiveness of Mycorrhizae in the Phytoremediation of Heavy Metals from Stormwater*

- Amara Ifeji, Bangor High School, ME, United States of America

Second Award of \$1,500

PLNT013 — *Fractals and Catastrophic Bifurcation: Exploring Treeline Structure Using Drones and Mathematical Models in R*

- Kathryn Kummel, William J. Palmer High School, CO, United States of America

PLNT050 — *Using Soil Enhancements to Increase Zea mays Profitability in Limited Production Agricultural Areas*

- Emma Kratcha, Hankinson Public School, ND, United States of America

PLNT064T — *Novel Suction-Bait Trap to Manage Infestation of Melon Fruit Flies in Cucurbits*

- Manya M. Kumar, Kendriya Vidyalaya No.1 Naval Base Kochi, Kerala, India
- Richard Joseph, Kendriya Vidyalaya No.1 Naval Base Kochi, Kerala, India

PLNT066T — *Development of Food Poisoning Resistant Lettuce Using Endophytes in Petasites Japonicus Leaves*

- Jihyun Ra, Kangwon Science High School, South Korea
- Yoonji Kim, Kangwon Science High School, South Korea

Third Award of \$1,000

PLNT003 — *Natural Antioxidants Reduce the Toxic Effect of Heavy Metals on the Growth of Rice (Oryza sativa L.)*

- Hongjia Yang, High School Affiliated to Shanghai Jiao Tong University, Shanghai, China

PLNT011 — *Susceptibilities of Various Growth Stages of Metrosideros polymorpha to Ceratocystis lukuohia Infection*

- Shwe Win, Hilo High School, HI, United States of America

PLNT037 — *Combating Undernutrition in Developing Countries with a Compact Aeroponics System Utilizing Contaminated Water*

- Haley Jostes, Stillwater Area High School, MN, United States of America

PLNT038 — *Growth Promotion and Yield Enhancement of Crop Seeds with Plant Products: Effects of Extracts, Endophytic Symbionts, and Endosperm*

- Damian Galasso, Galasso Homeschool, AZ, United States of America

PLNT045 — *Edible Coatings in Post Harvest of Oranges (Citrus sinensis)*

- Joao Pedro Silvestre Armani, Colegio Gabriela Mistral, Parana, Brazil

PLNT056T — *Environmental Friendly Seedling Nursery Balls from Cow Dung*

- Sutthida Iamsaard, Phanomsarakham Phanom Adun Witthaya School, Thailand
- Thirakarn Wannakarn, Phanomsarakham Phanom Adun Witthaya School, Thailand

Fourth Award of \$500

PLNT009 — *A Comprehensive Analysis of Agronomic and Disease Resistance Gene Mutations in Katy Rice Mutants through DNA Next-generation Sequencing*

- Mary Jia, Arkansas School for Mathematics, Sciences and the Arts, AR, United States of America

PLNT018 — *Stop and Smell the Flowers: A Continuation of the Assessment of the Effects of Aeration in Regards to the Lifespan and Bacteria Presence of the Chrysanthemum Grandiflorum*

- Hannah Taylor, Agriscience Magnet Program, TX, United States of America

PLNT028 — *Using Zaxinone to Postpone Leaf Senescence in Rice Plants*

- Haya Altuwaijry , Riyadh School for Boys and Girls, Saudi Arabia

PLNT040 — *NanoAOX: Localization of Antioxidants via Nanoparticles to Enhance Plant Growth*

- Dheiksha Jayasankar, Sir Winston Churchill Secondary School, Ontario, Canada

PLNT041T — *The Effect of Surface Tension on Plant Growth in Fogponics*

- Kamron Zaidi, Richmond Hill High School, Ontario, Canada
- Sabrina Zaidi, Richmond Hill High School, Ontario, Canada

PLNT048 — *A Minimally-Invasive 3D-Printed Microneedle Array Applicator System (MU-NAAS) for Delivery of Therapeutics to Citrus Leaf Tissue*

- Laboni Santra, Oviedo High School, FL, United States of America

PLNT057T — *Saponin Hydrogel for Controlling Snail Invasion*

- Natthamon Sriprom, Damrongratsongkroh School, Chiangrai, Thailand
- Phan-Anong Chuenchokchai, Damrongratsongkroh School, Chiangrai, Thailand
- Ramita Chueamuangphan, Damrongratsongkroh School, Chiangrai, Thailand

PLNT061 — *Identifying Differential Expression and Conserved Alternative Splicing (AS) Events in Zea mays (Maize)*

- Pragati Muthukumar, Commack High School, NY, United States of America

ROBOTICS AND INTELLIGENT MACHINES

Intel ISEF Best of Category Award of \$5,000

ROBO059 — *Looking through Walls with Artificial Intelligence: An Innovative Solution for Real-Time Retrieval of the Human Figure behind Visual Obstruction*

- Kevin Meng, Plano West Senior High School, TX, United States of America

First Award of \$3,000

ROBO022T — *The Development of a Holistic System for Broad-Spectrum Crop Disease Diagnosis and Treatment*

- Pranav Senthilvel, duPont Manual High School, KY, United States of America
- Shreshth Srivastava, duPont Manual High School, KY, United States of America

ROBO059 — *Looking through Walls with Artificial Intelligence: An Innovative Solution for Real-Time Retrieval of the Human Figure behind Visual Obstruction*

- Kevin Meng, Plano West Senior High School, TX, United States of America

Second Award of \$1,500

ROBO003 — *A Novel, Self-balanced Robot with Leading Technology in Crossing All Angles of Transmission Lines*

- Bradley Xu, Shanghai American School - Pudong Campus, Shanghai, China

ROBO040 — *A Game of Jamming: A Multi-Agent Game Theoretic Learning Based Cognitive Anti-Jamming Communication System to Combat an AI Jammer*

- Milidu Jayaweera, La Cueva High School, NM, United States of America

ROBO048 — *Developing a Novel, Accurate, and Rapid Computer Vision and Machine Learning Based Skin Disease Diagnosis Pipeline, Hardware Apparatus, and Mobile Application*

- Raghav Ganesh, Lynbrook High School, CA, United States of America

ROBO076 — *Robotic Revolution in the Construction Industry: An Autonomous Roof Shingling Robot*

- Joseph Saturnino, Bishop Ryan Catholic Secondary School, Ontario, Canada

Third Award of \$1,000

ROBO006 — *Fast MRI: Reconstructing MR Images Using Undersampled k-space and a GAN*

- Siddarth Ijju, Cherry Creek High School, CO, United States of America

ROBO026 — *The Effect of a Genetic Algorithm on Traffic Efficiency*

- Laura Thompson, Mountain Vista Governor's School, VA, United States of America

ROBO039 — *Real-Time Freespace Segmentation Using Deep Learning on Autonomous Robots for Detection of Negative Obstacles*

- Anish Singhani, Monte Vista High School, CA, United States of America

ROBO049T — *Novel Reinforcement Learning Methods in Collaborative Environments*

- Ashish Rao, Cupertino High School, CA, United States of America
- Bidipta Sarkar, Cupertino High School, CA, United States of America
- Tejas Narayanan, Cupertino High School, CA, United States of America

ROBO052 — *PhonoNet: Deep Learning for Raga Identification in Indian Classical Music*

- Sauhaarda Chowdhuri, Westview High School, CA, United States of America

ROBO060 — *Feeding Robot Using Image Processing Technology for Parkinson Patients*

- Long Vu , Lao Cai High School No. 1, Viet Nam

Fourth Award of \$500

ROBO013 — *Using a Computer Program Applied to an Electromagnetic Walking Apparatus to Simulate Earth's Gravity in Space*

- MaryAlice Young, Bishop Kenny High School, FL, United States of America

ROBO019 — *PIC-TALK: Creating a Digital Ecosystem that Consists of Open Source Hardware and Software Products for Visually Impaired People*

- Musa Sadik Unal, Kartal Anadolu Imam Hatip High School, Turkey

ROBO020 — *Drones for Invasive Species Monitoring*

- Zachary Hohl, Edgewood Junior Senior High School, FL, United States of America

ROBO024 — *Data Analytics for Fake News Detection*

- Haohui Liu, Raffles Girls School (Secondary), Singapore, Singapore

ROBO033 — *Frugal Flight: Indoor Stabilization of a Computationally Independent Drone without GPS*

- Nikhil Devanathan, Kennewick High School, WA, United States of America

ROBO047 — *ExploreYourMind: Software for Harmonic Combination of Video and Music*

- Nazar Ponochevnyi, Specialized School #52 in Kyiv With In-depth Study

of Information Technology, Kyivs'ka Oblast, Ukraine

ROBO050 — *Textual Origin Classification and Implicit Bias Detection with Deep Recurrent Neural Networks*

- Jerry Wei, Oakton High School, VA, United States of America

ROBO074 — *Positively Identifying Species Using CNNs and Hypernetworks to Aid Wildlife Conservation Efforts*

- Aditya Radhakrishnan, Suguna PIP School, Tamil Nadu, India

SYSTEMS SOFTWARE

Intel ISEF Best of Category Award of \$5,000

SOFT049 — *Improved Gate Level Simulation of Quantum Circuits*

- Adam Kelly, Skerries Community College, Ireland

First Award of \$3,000

SOFT041 — *Weight Friction: A Simple Method to Overcome Catastrophic Forgetting and Enable Continual Learning in Neural Networks*

- Gabrielle Liu, Ravenwood High School, TN, United States of America

SOFT049 — *Improved Gate Level Simulation of Quantum Circuits*

- Adam Kelly, Skerries Community College, Ireland

Second Award of \$1,500

SOFT016 — *It's Break Time: An Iris-Based Eye Fatigue Monitor*

- Yufeng Sun, The Experimental High School Attached to Beijing Normal University, Beijing, China

SOFTo20 — *Myelofon: Way of Expressing Thoughts for the People with Speech Disorders*

- Daniil Kazantsev, Municipal Lyceum #12, Russian Federation

SOFTo32 — *An AI-based System for Discovering Potential Adverse Drug Events Using Open Data*

- Brandon Fan, Blacksburg High School, VA, United States of America

SOFTo44T — *The Fifth Sense: A Novel Aid Device for Visually Impaired People, Translating Computer Vision into Surround Sound for Obstacle Detection*

- Ian Langleben, Dawson College, Quebec, Canada
- Liana Martins-Medina, Marianopolis College, Quebec, Canada

Third Award of \$1,000

SOFTo01 — *Development of a Highly Parallel BEM-Solver*

- Robin Christ, Lessing Gymnasium Lampertheim, Hessen, Germany

SOFTo10T — *Preventing Left Turn Road Accidents Using Photosensory Technologies and Computer Vision*

- Humza Salim, T.C. Jasper High School, TX, United States of America
- Yousuf Ahmad, Jasper High School, TX, United States of America

SOFTo23 — *A Deep Learning-Based Drowning Detection Method for Dynamic Swimming Pool Environments Using Spatiotemporal Neighborhood Analysis*

- Jessica Yu, West Linn High School, OR, United States of America

SOFTo29 — *General Distributed Backtracking Framework for Solving*

Combinatorial Constraint Satisfaction Problems

- David Vulakh, Paul Laurence Dunbar High School, KY, United States of America

SOFT051 — FASTCAT: A Predictive Neural Network Based Fire Size Classifier

- Dylan Wichman, Billings Central Catholic High School, MT, United States of America

Fourth Award of \$500

SOFT002 — A Brain-Computer Interface Application for the Assessment of Cognitive Aging

- Saraswati Sridhar, Southwestern Educational Society, Puerto Rico

SOFT013 — A Secure Implementation of Mendelian Randomization via Multi-Party Computation

- Divya Amirtharaj, Westview High School, OR, United States of America

SOFT021T — Classroom 2.0

- Jhorch Quispe Laura, Luis Alberto Sanchez, Apurimac, Peru
- Karen Huaman Quintana, Luis Alberto Sanchez, Apurimac, Peru

SOFT022T — Sign Language Translator

- Arda Mavi, Ayranci Anadolu Lisesi, Cankaya, Turkey
- Zeynep Dikle, Nazmi Arıkan Fen Bilimleri High School, Cankaya, Turkey

SOFT050T — Approximating the Weight of Sweet Corn Kernels from Digital Images Using Washer Integration

- Chanikarn Prompat, Princess Chulabhorn Science High School

Phetchaburi, Phetchaburi, Thailand

- Neeranuch Sudcharoen, Princess Chulabhorn Science High School
Phetchaburi, Phetchaburi, Thailand
- Pornchanun Mangmeethanapiboon, Princess Chulabhorn Science High
School Phetchaburi, Phetchaburi, Thailand

*SOFT054T – Creating a Technological Device that Enhances Autistic
Children's Communication Skills*

- Khadija Elmagarmid, Qatar Academy Senior School, Al-Rayyan, Qatar
- Sama Ayoub, Qatar Academy Doha, Qatar

*SOFT067 – An Adaptive, Low-Cost Device for Automated & Offline Medical
Analysis Utilizing Neural Networks with Reinforcement Learning
Optimization*

- Neil Deshmukh, Moravian Academy, PA, United States of America

TRANSLATIONAL MEDICAL SCIENCE

Intel ISEF Best of Category Award of \$5,000

*TMED027 – Sharks Take a Bite Out of Infection! An Antibacterial, Reusable
Bandage for Post-Operative Patients*

- Hannah Herbst, Florida Atlantic University High School, FL, United
States of America

First Award of \$3,000

*TMED027 – Sharks Take a Bite Out of Infection! An Antibacterial, Reusable
Bandage for Post-Operative Patients*

- Hannah Herbst, Florida Atlantic University High School, FL, United
States of America

Second Award of \$1,500

TMEDo20 — *A Novel Approach to Assessment and Classification of Pulmonary Function in Early Onset Scoliosis*

- Ananya Ganesh, The Westminster Schools, GA, United States of America

TMEDo23 — *The SMART System: Magnetic Deflection and Absorption Shielding of Treatment Contaminants to Enhance Radiotherapy Cancer Patient Outcomes by Reducing Normal Tissue Injuries*

- Macinley Butson, The Illawarra Grammar School, NSW, Australia

TMEDo42 — *EyeSpy Diagnosis: Developing a Smartphone-Based Non-Invasive Intelligent Device and Application for the Accurate and Affordable Diagnosis of Eye Fundus Anomalies via Machine Learning*

- Kabir Jolly, College Park High School, TX, United States of America

Third Award of \$1,000

TMEDo24 — *Priming the Tumor Microenvironment with Cyclophosphamide to Enhance Nanoparticle Delivery: An Imaging Study*

- Renner Kwittken, Byram Hills High School, NY, United States of America

TMEDo35 — *A Fast, Sensitive, and Non-Invasive Approach to Detecting Breast Cancer Using a Fully Convolutional Neural Network*

- Ishana Shastri, Poolesville High School, MD, United States of America

TMEDo39 — *Tuning Vaccine Physical Properties to Improve Anti-tumor Response Using Polyplexes*

- Allie Amerman, Wheaton High School, MD, United States of America

TMEDo47T — *Kanna: A Deep Learning Approach for Screening Amblyopia Using Facial Images*

- Viswesh Krishna, National Public School, Indiranagar, Karnataka, India
- Vrishab Krishna, National Public School, Indiranagar, Karnataka, India

Fourth Award of \$500

TMEDo06 — *Battling Blindness in Premature Babies: An Image Processing and Machine Learning Based Application for Early Detection and Prevention of Retinopathy of Prematurity*

- Ishaan Maitra, North Carolina School of Science and Mathematics, NC, United States of America

TMEDo31 — *Bioactive Catheter to Prevent Systemic Infection Using Cashew Nut Shell Liquid (CNSL)*

- Ekarinny Medeiros, Escola Estadual Professor Hermogenes Nogueira da Costa, Rio Grande do Norte, Brazil

TMEDo34 — *A Lung Cancer Prediction and Detection System Using Nodule Based Methods and Machine Learning Algorithms*

- Sathvik Nallamalli, Olympia High School, WA, United States of America

TMEDo45T — *TMZ+X: siRNA-based Synthetic Lethal Screening and Synergism with TMZ as a Novel Approach to Inhibition of Proliferation in GBM*

- Adarsha Pokkulandra, Dulles High School, TX, United States of America
- Arnav Garyali, Dulles High School, TX, United States of America

TMEDo48 — *DOPA Reaction with Vacuum Filtration as a New Method for Diagnosing of Circulating Melanoma Cells and Metastasis*

- Olha Kharasakhal, Mariupol Technical Lyceum, Ukraine

TMED052 — *Ultrasensitive Detection of Early-Stage Cancer Using ctDNA Sequencing with UMIs*

- Elizabeth Ding, Lexington High School, MA, United States of America