



MSEF

Massachusetts Science
+ Engineering Fair

HIGH SCHOOL FAIR 2024

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High School Award Winners

For Category Excellence and Special Awards go to page 9

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Scholarship, Summer Program, and Society for Science Sponsored Awards will be posted at

<https://scifair.com/news-opportunities/>

Sanofi Grand Award

Jia Anand

St. Mark's School

*Ginsenoside Ck and RK1 Effects on High Intensity Behavioral
Patterns of Agression in a Tauopathy Model of Alzheimers
Disease in Drosophila Melongaster*

MathWorks First Place Award

Vishnu Angiras

Misha Mishechkin

Tahanto Regional High

Impact of Surface Conditions on the Magnus Effect

First Place Awards

Avery Leonard

St. Mark's School

*The Influence of Ginger Root Extract on Female
Reproductivity in Caenorhabditis elegans*

Yanchen Lu

Groton School

*Design of a Multi-legged Robot with Extraterrestrial Terrain
Exploration and Sample Retrieval Functions*

Ananya Mathur
Gianna Nalumansi
Mariyam Patel

Billerica Memorial High
School

*Study Smarter not Harder: The Neuropsychology Behind
Studying Techniques in Correlation to Academic Performance
of Adolescents*

Timucin Erbas	Acton-Boxborough Regional High	<i>Higher Efficiency Dynamic Rocket Engine Nozzle</i>
Shuhan Luo	Worcester Academy	<i>A Novel Hadronization Model for Charm-Quark</i>
Arnav Chetty	Acton-Boxborough Regional High	<i>Using Clustering Algorithms to Predict Whether Phytochemicals are Cancerous or Anti-Cancerous.</i>
Sophia Caramanica	Massachusetts Academy of Math & Science at WPI	<i>Orthotic Hand Brace to Improve Range of Motion in Patients with Cerebral Palsy</i>
Aaron Hong Aarkarsh Tathachar Andrew Wu	Acton-Boxborough Regional High	<i>Filtering Methane from Septic Tanks</i>
Yuze Cai	Concord Academy	<i>SpinTOL: Research and Development of a Highly Efficient UAV</i>
Samhitha Bodangi	Massachusetts Academy of Math & Science at WPI	<i>Analyzing HLA sequences to Predict Organ Rejection and Find Targets for Precise Immunosuppression</i>
Yvangi Jacques	Brockton Public Library	<i>A Sound Approach to Attracting or Repelling Pollinator Insects</i>
Andrea Tang	Newton South High	<i>An Innovative Assessment of the Transgenerational Effects of Extreme Temperatures on Children's Health</i>
Ansh Hiranadani Yujiang Zhu	Westborough High	<i>Using an AI Equipped Drone for Early Detection of Fires</i>

Second Place Awards

Allison Liu	Lexington High	<i>Next-Generation Synthetic Receptor Circuits for T-Cell Therapy</i>
Devan Agrawal Simon Farruqui Ching Hei Andre Leung	Milton Adademy	<i>Words That Shape the World: A Novel Sentiment Analysis Approach to Quantifying Polarization from U.S. President Rhetoric on Immigration</i>

Husang Lee	Newton South High	<i>Inhibition of Melanin Synthesis and Anti-Inflammatory Effects of a Novel <i>Leuconostoc mesenteroides</i> subsp. Derived Exosomes Separated from <i>Camellia japonica</i> Flower</i>
Nicholas Giza	Massachusetts Academy of Math & Science at WPI	<i>A Novel Water-based Cooling Approach to Increase Solar Panel Efficiency</i>
Srilakshmi Venkatesan	Hopkinton High	<i>An Examination of the Neuromuscular Impact Induced By Hypermagnesemia Hypercalcemia in <i>Caenorhabditis Elegan</i> Mutants: A Translational Genomic Model for Paralytic Drug Testing</i>
Yiming Ding	Berkshire School	<i>Three-Pronged Approach to Investigating the Development of Novel Inhibitors Targeting KRAS G12C in Lung Cancer.</i>
Yuxian Liu	Phillips Academy	<i>A Tensegrity-Based Inchworm-Like Robot for Crawling in Pipes of Varying Diameters and Angles</i>
Alexander Teymurazyan	Wachusett Regional High	<i>The Effects of Storage Conditions on Conductivity and Oxidation of Ti3C2Tx MXene films</i>
Palak Yadav	Massachusetts Academy of Math & Science at WPI	<i>A Novel Deep Learning Pipeline to Noninvasively Detect and Treat Gynecologic Diseases Using MiRNA Expression and In Silico Modeling</i>
Anoushka Nair Dylan Striek	Hopkinton High	<i>A Novel Spectrophotometric Method of Non-Invasive Blood Glucose Monitoring for Type II Diabetes Using Correlated Electrolyte Concentrations</i>
Marko Mano	North Quincy High	<i>Synthesizing and Optimizing Biodegradable Pectin-Manuka Honey Hydrogels for Transcutaneous Electrical Nerve Stimulation (TENS) Therapy and its Applications in Tissue Engineering</i>
Huiyi Wen	Tabor Academy	<i>Sustainable and Cost-Effective Cactus-Inspired Fog Collecting Kirigami</i>
Pranamyia Keshkamat Kaizar Rangwala	Hopkinton High	<i>Autonomous Algal Bloom Control via AI-Regulated Photodynamic Therapy</i>

Anushri Pal	Acton-Boxborough Regional High	<i>Computationally Derived Average Sum of Binding Affinities of Small Molecules Identifies A Potent Inhibitor of SARS-CoV-2, MERS-CoV, and SARS Viral Proteases Validated by in Vitro Assays</i>
Kruthi Gundu	Massachusetts Academy of Math & Science at WPI	<i>Investigating Genetic Variability in Amyotrophic Lateral Sclerosis to Identify Patient-Specific Treatment with Antioxidants</i>
Angad Pannu	Shrewsbury Sr High	<i>Multi-Step Meta-Analysis of Multiple Human Genome-Wide-Association-Studies to Uncover Highest Risk SNPs Associated with Coronary Artery Disease, Type II Diabetes, and Alzheimer's Disease</i>
Haoxuan Liu	Middlesex School	<i>Assessing the Ability of Composite Molecular Sieve and Glass Fiber Material in Adsorbing Volatile Organic Compounds</i>
Aishwaryalakshmi Saravanan	Sharon High	<i>Using Machine Learning to Develop a Novel Method of Drug Discovery for Estrogen Receptor Alpha Targeted Breast Cancer Treatment, Leading to Potential Drug Alternatives</i>
Pranay Kocheta	Lexington High	<i>A Generative Multimodal Approach to Improve Detection of Lung Cancer</i>
Charuvi Singh	Massachusetts Academy of Math & Science at WPI	<i>Determining the effects of TGF-β1 on COL1A1 Expression in Hepatocellular Carcinoma</i>
Ragav Iyer	Ashland High	<i>Astro-Seismic Prognostication using Planetary Position, Historical Earthquakes and MATLAB-based Machine Learning</i>
Sarah Mattson	St. Mark's School	<i>Ashwagandha's Effect on Locomotion in a C. elegans Model of Huntington's Disease</i>
Jessica Liu	Lexington High	<i>Detecting Debris Disks Around White Dwarfs through Infrared Excesses</i>

Third Place Awards

Aanya Gupta	Shrewsbury Sr High	<i>A Novel In vitro Co-culture System of Primary Human Adipocytes and Primary Murine Cortical Neurons</i>
Evan Xie	Deerfield Academy	<i>Computational and AI-Assisted Design of Dual-Metal Single-Atom Catalyst for Oxygen Reduction Reaction</i>
Pranav Addanki	Canton High	<i>Identifying a Novel, Inexpensive, and Noninvasive Biomarker for Fibromyalgia: Using Metabolomics, Genomics, and a Drosophila melanogaster Model</i>
Juliet Findlen	Hopkinton High	<i>Algae Fertilizer: Efficiency and Biosorption of Copper by Chlorella Vulgaris</i>
Ayanna Rohil	Acton-Boxborough Regional High	<i>Fight the Fibrosis: Investigating the role of a Epigenetic Regulator Protein X in Human Embryonic Kidney (HEK293) Cells in the Development of Kidney Fibrosis</i>
Yifan Evan Ding	Boston Latin	<i>Engineering a Termination Readthrough-Based Gene Switch Enables Controllable CRISPR Gene Editing</i>
Shrila Maity Jacob Wu	Hopkinton High	<i>BiliSpectro: Building and Testing a Noninvasive Optical Sensor to Detect Bilirubin Content in Blood for Diagnosis and Monitoring of Jaundice</i>
Kais Guessab, Rishit Shekhar, David Priefer	Hopkinton High	<i>First Animal Study On Novel Drug Candidates Targeting Alzheimer's</i>
Jiachi Wang	Brooks School	<i>Emissions-Aware Energy Storage Decision Based on Deep Reinforcement Learning</i>
Hayim Sims	Maimonides School	<i>Nanoparticle Guided Synthesis of Size-Tunable Photonic Crystals</i>
Suri Hoang	Worcester Academy	<i>Social Space Assay Reveals- F1 and F2 Drosophila Exhibited Sign of Autism Caused by Daily Excessive Consumption of Copper</i>

Yuyao Wu	Thayer Academy	<i>Bionic Insect Jumping Device</i>
Nicholas Ramos	Barnstable High	<i>Investigating the Effect of Varying Pigment to Binder Ratios on Paint Performance</i>
Ethan Yan	Groton School	<i>ALlocate: A Low-Cost Automatic Artificial Intelligence System for the Real-Time Localization and Classification of Acute Myeloid Leukemia in Bone Marrow Smears</i>
Thomas Li	Weston High	<i>Analysis and Machine Learning Modeling of Spatial Data to Identify Asthma Hotspots in Massachusetts</i>
Lucas DeFilippo, Kyle Wu, Feichen Li	Weston High	<i>Modular OLED Infrared Digital Night Vision Goggles for Critical Search and Detection in Underdeveloped Countries</i>
Varun Nerella	Acton-Boxborough Regional High	<i>Tick-Tock, Let's Reverse The Clock: A Systems Biology Approach to Unravel Neurodegeneration and Aging</i>
Yuxuan Zhang	Boston Latin	<i>Heavy Metal Analysis of Lichen Samples at Lower Neponset River Reveals Previously Overlooked Contamination</i>
Jessica Tao	Acton-Boxborough Regional High	<i>Data Driven Optimization of Pt-Based Ternary Alloy Catalysts for Hydrogen Fuel Cells</i>
Kyle Denny	Brockton Public Library	<i>Biochar's Potential for Mitigating Climate Change</i>
Anna Li	North Quincy High	<i>How Does the Species of Microalgae Reduce the Effects of Carbon Dioxide in Seawater on Calcium Carbonate</i>
Agastya Sarmah	Sharon High	<i>Identification of Potential Biomarker and Survival Analysis for Hepatocellular Carcinoma Utilizing Bioinformatics Approach: An Investigation Utilizing Cancer Datasets</i>
Sasha Litvak	Wachusett Regional High	<i>The Effects of Dead Sea Mud Minerals and Herbal Additives on the Regeneration of <i>Dugesia tigrina</i>.</i>
Molly Gedutis	Dennis-Yarmouth Regional High	<i>Testing Pesticide Resistance, Avoidance, and Efficacy in Mosquito Populations on Cape Cod</i>

**Richard Chen
Megan Zhang**

Andover High

Global Navigation Satellite Systems Observations of the Ionosphere During Strong Thermal Emission Velocity Enhancement

Shaurya Patni

Massachusetts Academy of Math Science at WPI

Utilizing Methotrexate and Dimethyl fumarate on the STING Pathway Modulation to alleviate symptoms of Crohn's disease.

Honorable Mention

Zachary Chen

Boston Latin

Finding Early Dementia Predictors: Survival Analysis Utilizing Sleep Electroencephalogram and Blood-Based Biomarkers

Jahnavi Bolleddula

Lexington High

Protecting Our Moms: An Early and Effective Detection of Preeclampsia

Alyssa Kruger

Wachusett Regional High

Fungi versus Fast Fashion (The Effect of Oyster Mushrooms on the Decomposition of Different Clothing Materials)

Caroline Song

Boston Latin

Field Deployable Real Time Natural Gas Leak Detection

Elizabeth Hanechak

Pope Francis Preparatory School (Springfield)

Solving Our Planet's Plastic Problem: Developing a Biological System That Turns Toxic Waste Into Drinkable Water and Fertilizer

Kayla Vallecillo

Massachusetts Academy of Math & Science at WPI

Minimizing Fuel-Oxidizer Mixture Inhomogeneities in Rotating Detonation Engines

Eric Nie

Phillips Academy

Optimized Autonomous Caregiving Robot with Facial and Speech Recognition

Megan Ashun

Massachusetts Academy of Math & Science at WPI

Solar Powered UV-C LED Water Sterilizer

**Aaryan Arora,
Madhav Girish**

Acton-Boxborough Regional High

Predictive Analysis of Sjögren's Syndrome: A Machine Learning Approach

Jack Li, Jayson Wang	Wellesley Sr High	<i>Selection of Green and Sustainable Bio-Based Solvent by Artificial Intelligence for Pharmaceutical Research and Process Development</i>
Anika Karre	Massachusetts Academy of Math & Science at WPI	<i>Examining Enhanced Komagataeibacter hansenii Production via Unconventional Food Waste</i>
Camilla Royal	Foxborough Regional Charter School	<i>Natures Guide to Organ Preservation: How the Study of Hibernating Animals Can Lead to New Techniques of Organ Preservation</i>
Alex Kuai	Newton North High	<i>Advanced 3D Deep Transfer Learning for Multistage Alzheimer's Disease Diagnosis</i>
Sam Lizotte	Brockton High	<i>Using Machine Learning to Detect Alzheimer's Disease in MRI Scans</i>
Qinghe Zhao	Boston Latin	<i>The Effect of Fire on the Amount of Chlorophyll in Pine Tree Needles</i>
Yaniv Tausky	Wellesley Sr High	<i>Preventing Abortive Spinal Surgery using a Novel Machine Learning Classification of Posterior Thoracolumbar Instrumentation Systems</i>
Ishana Saroha	Shrewsbury Sr High	<i>Early Detection of Drug Toxicity</i>
Lola Keeney, Diya Patlolla	Winchester High School	<i>The Effects of Nature on Stress</i>
Steven Xiang	Bancroft School	<i>Comparison of Pest Resistance in Crops with Natural and Artificial Priming</i>
Tim Nguyen	Boston Latin	<i>SplattingTAPIR: Utilizing TAPIR and 3D Gaussian Splatting for Efficient Robust Reconstruction</i>
Juliette Clausen, Niyathi Srinivasan, Siya Setty	Lexington High	<i>Machine Learning Classification Using Neural Networks and Transfer Learning on CT Scans of 4 Lung Cancer Subtypes</i>
Sierra Kelch	Wachusett Regional High	<i>Comparing the Effects of BPA and BPS on the Heart Rate and Reproduction of Daphnia Magna</i>

Anika Jacob	Littleton High School	<i>A Study on the Effect of Caffeine on the Growth and Development of Zebrafish Embryos Using Automated Quantitative Assessment of Morphological Changes</i>
Lixian Zhou	Northfield Mount Hermon School	<i>A Launchable Aerial and Underwater Rotorcraft Robot</i>
Ruichen Zhu	Berkshire School	<i>Secure Code Generation with Large Language Models</i>
Avaneesh Mohan	Sharon High	<i>Filtration Capabilities of Different Chemicals for PFOAs and PFAS Molecules</i>

Category Excellence Awards

AMD Engineering Excellence Award

Yanchen Lu	Groton School	<i>Design of a Multi-legged Robot with Extraterrestrial Terrain Exploration and Sample Retrieval Functions</i>
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MITRE Computer Science & Technology Excellence Award

Ansh Hiranandani, Yujiang Zhu	Westborough High	<i>Using an AI Equipped Drone for Early Detection of Fires</i>
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Alnylam Bioscience Excellence Award

Avery Leonard	St. Mark's School	<i>The Influence of Ginger Root Extract on Female Reproductivity in <i>Caenorhabditis elegans</i></i>
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MCTA Chemistry Excellence Award

Alexander Teymurazyán	Wachusett Regional High	<i>The Effects of Storage Conditions on Conductivity and Oxidation of Ti₃C₂T_x MXene films</i>
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Special Awards

Eversource Sustainability Award

Nicholas Giza Massachusetts Academy of
Math & Science at WPI *A Novel Water-based Cooling Approach to
Increase Solar Panel Efficiency*

Massachusetts Life Science Center Trailblazer Award

Megan Ashun Massachusetts Academy
of Math & Science at WPI *Solar Powered UV-C LED Water Sterilizer*

ASM Microbiology Award

Husang Lee Newton South High *Inhibition of Melanin Synthesis and Anti-Inflammatory
Effects of a Novel *Leuconostoc mesenteroides* subsp.
Derived Exosomes Separated from *Camellia japonica*
Flower*

Regeneron Biomedical Science Award

Anushri Pal Acton-Boxborough
Regional High *Computationally Derived Average Sum of
Binding Affinities of Small Molecules Identifies A
Potent Inhibitor of SARS-CoV-2, MERS-CoV, and
SARS Viral Proteases Validated by in Vitro
Assays*

Paul Parravano Memorial Award

**Atreya Mallan,
Vivek Mehhta** Lexington High School *Your Voice Matters: Using Machine Learning to
Detect and Classify Dysphonia*

Pauline J. LaMarche Memorial Award

Anika Jacob Littleton High School *A Study on the Effect of Caffeine on the Growth and
Development of Zebrafish Embryos Using Automated
Quantitative Assessment of Morphological Changes*

Ben Eisenstadt Memorial Award

Lola Keeney,
Diya Patlolla

Winchester High School

The Effects of Nature on Stress

ISEF Delegates

Jia Anand	St. Mark's School
Sophia Caramanica	Massachusetts Academy of Math & Science at WPI
Arnav Chetty	Acton-Boxborough Regional High
Teagan Chisholm-Godshalk	Westfield High School
Timucin Erbas	Acton-Boxborough Regional High
Avery Leonard	St. Mark's School
Anna Li	North Quincy HS
Yanchen Lu	Groton School
Shuhan Luo	Worcester Academy
Ananya Mathur, Gianna Nalumansi, Mariyam Patel	Billerica Memorial High School
Misha Mishechkin, Vishnu Angiras	Tahanto Regional High
Tim Nguyen	Boston Latin
Camilla Royal	Foxborough Regional Charter School
Kayla Vallecillo	Mass Academy of Math & Science
Ethan Yan	Groton School

MSEF High School Teacher Award

Sponsored by Sanofi

Tanya Chiarella Billerica Memorial High School