

ANIMAL SCIENCES A

Third Place

AS-A 8 The Effect of Lavandula Angustifolia on the Heart Rate of Daphnia Magna

Helen Barrow, Cave Spring High School

Kensington Reynolds, Cave Spring High School

Second Place

AS-A 4 Effect of Chlorpyrifos, Dicofol, Glyphosate, and 2,4-Dichlorophenoxyacetic acid on D. rerio development and gene expression

Raghav Vasudeva, Hidden Valley High School

First Place

AS-A 7 Effect of Anxiolytics on the Growth and Development of Danio rerio

Embryos

Cole Price, Staunton River High School

ANIMAL SCIENCES B

Third Place

AS-B 4 The Effects of L-Arginine on the Heart Rate of *Daphnia Magna*

Daniel (Jackson) Bubar, Patrick Henry High School

Diol Glele, Patrick Henry High School

Second Place

AS-B 3 Effects of Perfluorooctanoic Acid on Development and Gene Expression of

Danio rerio Embryos

Benjamin Blevins, Staunton River High School

Emily Kiser, Staunton River High School

First Place

AS-B 5 The Effect of Exposure to the Pyrethroid Bifenthrin on the Behavior and Development of *Caenorhabditis elegans*

Annika Plunkett, Patrick Henry High School

First Place

AS-B 7 The Effect of Beta-carotene on Eye Pigmentation and Eyesight in

Drosophila

Emma Seidel, Patrick Henry High School

ANIMAL SCIENCES C

Third Place

AS-C 5 The Effect of Centella asiatica on the Heart Rate of Daphnia magna
Seth Caldwell, Franklin County High School

Second Place

AS-C 1 The Effect of Capsicum annum on the Heart Rate of Daphnia Magna
Seijin Campbell, Franklin County High School
Laon Sung, Franklin County High School

Second Place

AS-C 3 Variations in Learning Ability in Different C. elegans Mutants
Anna Halsdorf, Patrick Henry High School
Autumn O'Connor, Patrick Henry High School

First Place

AS-C 6 Col4: An Indicator of Vascular Formation and Pericyte Recruitment
Abhinav (Abhi) Karri, Hidden Valley High School

BEHAVIORAL AND SOCIAL SCIENCES

Third Place

BS 4 Episodic Future Thinking: How Long Does it Take for Consequences to Mean Something?

Evelyn Anderson, Cave Spring High School

Third Place

BS 8 The Effect of Episodic Future Thinking on Glycemic Variability in Prediabetes
Vy Nguyen, William Fleming High School

Second Place

BS 5 Examining Delay Discounting in Individuals Recovering from Substance Addiction

Michelle Zheng, Cave Spring High School

First Place

BS 3 An Analysis of Adolescents' Social Emotional Wellbeing and School Performance During COVID-19 Virtual Education Transitions

Taylor Frazier, Patrick Henry High School

BIOMEDICAL AND HEALTH SCIENCES

Third Place

BH 6 Investigating Vascular Abnormalities in the Placenta Due to Preeclampsia

Penelope Smith, Patrick Henry High School

Cameron Snyder, Patrick Henry High School

Second Place

BH 7 Assessment of Transplant Liver Viability Using Raman Spectroscopy and Exosome Analysis

Lacey Ngo, William Fleming High School

First Place

BH 3 A Novel Glioblastoma Prognostic Assay Using Droplet Digital Polymerase Chain Reaction

Caroline Grant, Hidden Valley High School

First Place

BH 8 Measuring the Thermic Effect of Food in Metabolic Studies

Reese Robers, Patrick Henry High School

CELLULAR AND MOLECULAR BIOLOGY

Third Place

CM 4 The Effect of RNA Interference on the Apoptosis of Small Cell Lung Carcinoma

Ella Bryant, Northside High School

Christina Okenquist, Northside High School

Second Place

CM 2 Novel Peptide Drug Limits Vascular Smooth Muscle Cell Proliferation in Disease Models

Alicia Carvalho, Cave Spring High School

Second Place

CM 5 Is it Tuna? A Comparison of DNA Degradation in Various Thunnini Preparations

Claire Dozier, Lord Botetourt High School

Anna Frittman, Lord Botetourt High School

First Place

CM 3 Circadian Rhythmicity of Cellular Healing

Eleanor Little, Patrick Henry High School

CHEMISTRY/ENERGY/MATERIALS SCIENCE

Third Place

CEM 9 The Effect of Different Organic Dyes On the Power Output of Dye-Sensitized Solar Cells

Benjamin Dye, Franklin County High School

Second Place

CEM 2 Using Food Waste to Produce Starch-based Bioplastics

Emma Batty, Patrick Henry High School

Second Place

CEM 3 The Effect of Various Sodium and Potassium Compounds on Explosive Force

Georgia Honts, James River High School

First Place

CEM 7 An Analysis of Water Maser Observations Using Next-Generation VLA
Madison Brown, Franklin County High School

First Place

CEM 10 Synthetic clarinet reeds

Nathan Sprouse, Cave Spring High School

COMPUTATIONAL BIOLOGY

Third Place

CB 1 Analysis of Differential Gene Expression in Blood Samples to Predict Alzheimer's Disease

Maggie Parkhurst, William Byrd High School

Second Place

CB 8 Using Differential Gene Expression to Diagnose Stages of Alcoholic Liver Disease

Catherine Chen, Cave Spring High School

First Place

CB 4 Examining the Mechanism of PI3K Isoform-Selective Inhibitors for Novel Glioblastoma and Related Cancer Treatments via 3D In-Silico Modeling

Rebecca Qiu, William Byrd High School

EARTH AND ENVIRONMENTAL SCIENCES

Third Place

ES 6 The Effect of Bioprinted Chlorella-based Filtration Systems on Nitrate Concentration in Water

Dhruvi Patel, Glenvar High School

Second Place

ES 8 The Development of an Interactive Urban Planning Tool for Mitigating Heat Islands in Lynchburg, VA

Cynthia Lin, Franklin County High School

First Place

ES 4 The Effect of Olivine Sand on Carbon Capture

Natalie Pham, William Fleming High School

ENGINEERING MECHANICS A

Third Place

EM-A 7 Robotic Arm Using a Writing Utensil

Parker Chapman, Franklin County High School

Forrest Moorman, Franklin County High School

Second Place

EM-A 1 Using a Robotic Arm to Move and Pour a Beaker

Tai Phan, Northside High School

Riley Wood, Franklin County High School

First Place

EM-A 2 Walk-Safe Cane 2.0

James (Ford) Beasley, Patrick Henry High School

Declan Morrill, Patrick Henry High School

First Place

EM-A 5 HitchMaster

Bakari Deskins, Franklin County High School

Savannah Peters, Franklin County High School

ENGINEERING MECHANICS B

Third Place

EM-B 5 Remote Exoskeleton Hand

Riley McReynolds, William Fleming High School

Zoie Mills, William Fleming High School

Third Place

EM-B 8 Remote Controlled Lockbox

Sarah Grace Stanley, Patrick Henry High School

Second Place

EM-B 9 Selective Robotic Arm

Chloe DeKorsey, Patrick Henry High School

Faith Kuehl, Patrick Henry High School

First Place

EM-B 1 Tennis Ball Collector

Ethan Su, Hidden Valley High School

James Voight, James River High School

ENGINEERING MECHANICS C

Third Place

EM-C 5 Robotic Arm to Open a Jar

Caroline O'Keeffe, Patrick Henry High School

Elisabeth Tershak, Patrick Henry High School

Second Place

EM-C 3 Sunlight Tracking Device

Tristan Kerr, Patrick Henry High School

Christopher (Durbin) Stevens, Patrick Henry High School

Second Place

EM-C 6 Soil Moisture and Temperature Probe

Ryan (Davis) Cooper, Lord Botetourt High School

Andres Hernandez, Lord Botetourt High School

First Place

EM-C 2 The Rotating Weekly Pill Dispenser 2.0

Sydney Vokus, Lord Botetourt High School

First Place

EM-C 10 Modular Midi Controller for DAW

Tobias (Toby) Tate, Patrick Henry High School

ENVIRONMENTAL ENGINEERING

Third Place

EE 1 The Effect of Macronutrients on the Ability of *Bacillus subtilis* to Degrade Petroleum Hydrocarbons

Courtney Monard, Hidden Valley High School

Griffin Yakob, William Byrd High School

Third Place

EE 9 The Effect of Olivine Content on the Permeability of Concrete

Sydnee Durham, Patrick Henry High School

Ruby Isbell, Patrick Henry High School

Second Place

EE 4 The Effect of *Aspergillus niger* and *Aspergillus brasiliensis* on the Decomposition Rate of Low-Density Polythene Plastic

Kathryn (Kate) Feldmann, Patrick Henry High School

Penelope Roberts, Patrick Henry High School

Second Place

EE 8 The Effect of *Lemna minor* on Arsenic Concentration in a Hydroponic System

Vineel Kavuru, Hidden Valley High School

Margaret Laflam, Hidden Valley High School

First Place

EE 2 The Application of Interpolymer Complex Hydrogels in the Removal of Heavy Metals from Aqueous Solutions

Ainsley Robertson, Cave Spring High School

First Place

EE 3 Nutrient Deficiency Notification Pot System

Merryn Isbell, Patrick Henry High School
Lillian (Libby) Jamison, Patrick Henry High School

MICROBIOLOGY A

Third Place

MI-A 5 The Antibacterial Effects of Copper on *Bacillus subtilis*
Russell (McLure) Bailey, Patrick Henry High School
Ryan Prusakowski, Patrick Henry High School

Second Place

MI-A 1 The Effect of Essential Oil of *Origanum vulgare* on Gram-positive and Gram-negative Bacteria
Kalob Daniels, Lord Botetourt High School
Kane Reczek, Lord Botetourt High School

Second Place

MI-A 4 A Comparison of Cinnamon Bark and Cinnamon Leaf Essential Oils on the Growth of *Escherichia coli*
Laila Alam, Lord Botetourt High School
Raimee Sykes, Lord Botetourt High School

First Place

MI-A 6 The Effect of Rotenone, Paraquat, and Malathion on Movement and Neuron Degeneration Associated with Parkinson's Disease in *Caenorhabditis elegans*
Abigail Hunter, Patrick Henry High School
Olivia Reichardt, Patrick Henry High School

MICROBIOLOGY B

Third Place

MI-B 4 Antimicrobial Efficacy of Sodium Fluoride, Zinc Chloride, and Cetylpyridinium Chloride on *Neisseria subflava*
Kiersten Lauer, Northside High School

Second Place

MI-B 3 A Comparison of Antibacterial Effect of Aloe Vera on *E. coli* and *S. epidermidis*
Frances Reddan, Patrick Henry High School
Jordan Wattie-Shear, Patrick Henry High School

Second Place

MI-B 6 A Comparison of Oregano Essential Oil and its Main Component Carvacrol on the Growth of *Staphylococcus Epidermidis*
John Aziz, Patrick Henry High School
John (J.B.) Clements, Patrick Henry High School

First Place

MI-B 7 The Effect of Environmental Factors on Beta-Carotene Production in Genetically Engineered Yeast
Haley Day, William Byrd High School

MICROBIOLOGY C

Third Place

MI-C 3 The Inhibiting Effect of Turkish and American Propolis on *Bacillus subtilis*
Su Gursoy, William Fleming High School

Second Place

MI-C 6 The Effect of Rosemary on the Growth of *S. epidermidis*
Cora Reid, Staunton River High School

First Place

MI-C 5 Investigating the Use of Metal Nanoparticles to Create Antimicrobial
Bioplastic
Ayden McNulty, William Fleming High School

PLANT SCIENCES A

Third Place

PS-A 2 The Allelopathic Effect of Juglone on Germination and Growth of Milk Thistle Seeds

Maddox Bary, Glenvar High School

Sean Cady, Craig County High School

Third Place

PS-A 5 Effects of Cobalt-60 Radiation and Salinity on the Growth of *Raphanus sativus*

Charlie Comer, Franklin County High School

Second Place

PS-A 3 The Effect of Salinity on DNA Methylation in *Arabidopsis*

Mary (Katelyn) Crumpacker, Salem High School

Savannah (Paige) Netting, Salem High School

First Place

PS-A 7 Hydroponic and Atmospheric Exposure of *Cladosporium* Volatiles on *Raphanus sativus*

Spencer Kearns, Staunton River High School

PLANT SCIENCES B

Third Place

PS-B 6 The Allelopathic Effect of *C. juncea* on the Germination & Growth of *T. officinale*

Mitchell Deese, Salem High School

Arden Gardner, Franklin County High School

Second Place

PS-B 8 The Allelopathic Effect of *E. cinerea* on the Germination & Growth of *A. schoenoprasum*

Katie Coles, Patrick Henry High School

Cara Wardell, Patrick Henry High School

First Place

PS-B 2 The Effect of Invasive Species on the Biodiversity of Plants and Soil Microbes

Abby Wyatt, Staunton River High School

First Place

PS-B 7 The Effect of AtUNC-93 Gene on Abiotic Stress Response in *Arabidopsis thaliana*

Thomas (Trey) Joyce, III, Salem High School

Seth Richards, Lord Botetourt High School

PLANT SCIENCES C

Third Place

PS-C 2 Transient Genetic Transformation of a Parasitic Plant Using Nanorods

Katherine Cross, Lord Botetourt High School

Sophia Schumaecker, Cave Spring High School

Third Place

PS-C 6 The Effect of Manuka Oil and Lemongrass Oil on the Germination of *Digitaria sanguinalis*, *Poa pratensis*, and *Festuca arundinacea*

Josephine (Josie) Fraticelli, Glenvar High School

Second Place

PS-C 8 The Effect of Light Wavelength on Induced Mutations in *Saintpaulia ionantha*

Grace Bowman, Franklin County High School

First Place

PS-C 7 The Synergistic Allelopathic Effect of *A. archangelica* and *F. oxysporum* on the Germination & Growth of *S. lycopersicum*

Kaeli Berry, James River High School

Brett Smith, Lord Botetourt High School

SYSTEMS SOFTWARE A

Third Place

SS-A 6 Mapping a Century of Major Earthquakes and Tsunamis with Python

Zoe Silva, Staunton River High School

Heidi Thompson, Cave Spring High School

Second Place

SS-A 4 Evaluating the Effectiveness of Machine Learning Models for Classifying Handwritten Letters

Andrew Sakamoto, Hidden Valley High School

Matthew Scarlatescu, Hidden Valley High School

First Place

SS-A 2 The Use of Python in Encryption Testing for Cybersecurity

Carter Baka-Collins, James River High School

First Place

SS-A 3 Scientific Calculator in Python

Darryl Wilson, III, William Fleming High School

SYSTEMS SOFTWARE B

Third Place

SS-B 5 OmniNet: A Brain-Based General AI System

Carson Ray, Cave Spring High School

Second Place

SS-B 3 COVID-19 Risk Map and Safety Data in Python

Troy (Andrew) Harmon, Patrick Henry High School

Micah Keyser-Rothgery, Patrick Henry High School

First Place

SS-B 2 Visualizing Exoplanetary Systems Using NASA Archive Data

Charles Meidlinger, Patrick Henry High School

