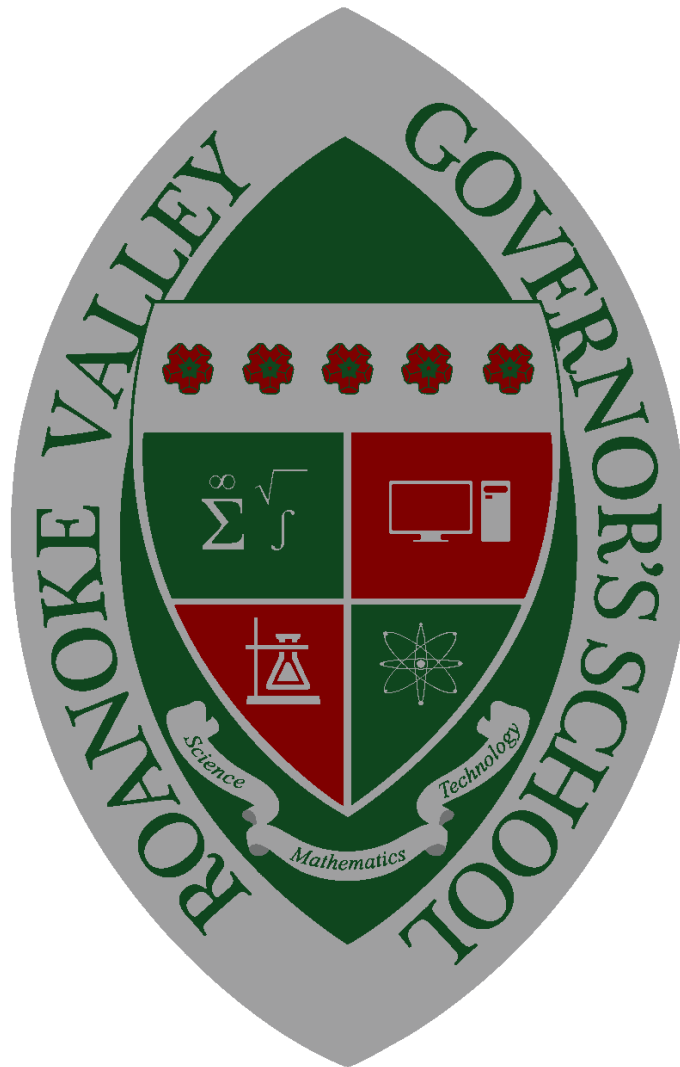


# **The Roanoke Valley Governor's School For Science and Technology 2024 Student Project Forum**



*The Roanoke Valley Governor's School for Science and Technology is supported by the Virginia Department of Education and the public school divisions of the Roanoke Valley. The RVGS Community is grateful for the support and financial commitment from our participating school districts:*

***Bedford County, Botetourt County, Craig County, Floyd County, Franklin County, Roanoke City,  
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Melissa Fisher (Chair), Matthew Browning, Doug Divers, Tracy Jenkins, Brandon Taylor, Don Wages

### **Science Faculty**

Cindy Bohland (Chair), Drew Hurst, Steve Smith, Joanne Villers, Steve Villers, Connor Wade

### **Additional Staff**

Ra Siv (Operations staff); Fred Hoffman (Adjunct Faculty/Intersession Support); Terri Janiga (Community Outreach Coordinator)

**The faculty and staff of the Roanoke Valley Governor's School wish to thank those who have supported the student research effort during this academic year.**

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Lachlan Robrecht, AS-A 4  
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Charles Rucker, PS-B 5  
Hana Sageer, AS-C 10  
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Brinna Seidel, AS-B 8  
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Alpin Singh, EM-B 1  
Parker Sisk, EM-D 3  
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Kritesh Sutar, AS-A 6  
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Ethan Yeary, SS-B 5  
Timothy Yemey, PS-B 5  
Zachary Young, EM-D 1  
Sophia Zeng, BH 7

## ANIMAL SCIENCES A

**AS-A 1** The Effect of Levodopa and Valerian Extract on Movement in a *C. elegans* Model for Parkinson's Disease

Esly Cruz-Nolasco, William Fleming High School

Caroline Reichardt, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**AS-A 2** The Ameliorative Effect of Carotenoid-Producing Yeast on the Memory of a *Drosophila* Model for Alzheimer's

Keaton Lucas, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**AS-A 3** The Effect of Curcumin on the Mobility of a *Drosophila* Model for Parkinson's Disease

Erica Gergely, Lord Botetourt High School

Ellie McClung, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**AS-A 4** The Effect of *Mentha piperita* on the Heart Rate of *Daphnia magna*

Lachlan Robrecht, Patrick Henry High School

Grady Stinson, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

**AS-A 5** The Effect of Potassium on the Heart Rate of *Daphnia magna*

Julia Landis, Staunton River High School

Caiden Perry, Liberty High School

Teacher sponsor: Mr. Don Wages

**AS-A 6** The Effect of *Curcumin* on the Heart Rate of *Daphnia magna*

Adam Doner, William Fleming High School

Kritesh Sutar, William Fleming High School

Teacher sponsor: Mr. Don Wages

**AS-A 7** The Effect of *Camellia Sinensis* on the Heart Rate of *Daphnia magna*

Kaitlin Jackson, Patrick Henry High School

Sean Powell, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

**AS-A 8** The Effect of Temperature on Plastic Bioremediation by *Galleria mellonella*

Anissa-Rosa Morfa, William Fleming High School

Tammy Phung, William Fleming High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

**AS-A 9** The Effect of *Vitis vinifera* on the Heart rate of *Daphnia magna*

Naomi Fetzer, Cave Spring High School

Avery Klahn, Cave Spring High School

Teacher sponsor: Mr. Don Wages

## **ANIMAL SCIENCES B**

### **AS-B 1** The Effect of Darkness on Long-Term Memory of Eyeless *Drosophila*

Ren Combs-Cannaday, Patrick Henry High School

Maggie Jarrett, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

### **AS-B 2** A Comparison of Pharmaceutical and Medicinal Plant Treatments on Seizures in *D. melanogaster*

Frances Reddan, Patrick Henry High School

Cara Wardell, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

### **AS-B 3** The Effect of *Panax quinquefolius* on the Heart Rate of *Daphnia magna*

Priya Patel, Glenvar High School

Heidi Wienke, William Byrd High School

Teacher sponsor: Mr. Don Wages

### **AS-B 4** The Effect of *Paullinia cupana* on the Heart Rate of *Daphnia magna*

Aeryn Thompson, William Fleming High School

Teacher sponsor: Mr. Don Wages

### **AS-B 5** The Effect of *Crataegus oxyactha* on the Heart Rate of *Daphnia magna*

Gage Allran, Cave Spring High School

Benjamin Meyer, Cave Spring High School

Teacher sponsor: Mr. Don Wages

### **AS-B 6** The Effect of *Hibbiscus sabdariffa* on the Heart Rate of *Daphnia magna*

Henry Fedak, Patrick Henry High School

Kai Warren, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

### **AS-B 7** The Effect of *Garcinia kola* on the Heart Rate of *Daphnia magna*

Lawson Fralin, Patrick Henry High School

Lachlan Thompson, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

### **AS-B 8** The Effect of Temperature on the Bleaching of *Leptoseria Coral*

Hannah Hertz, Patrick Henry High School

Brinna Seidel, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

### **AS-B 9** The absorption and effect of microplastics on *C. elegans*

Emma Baldwin, Salem High School

Dorothy Myers, Salem High School

Teacher sponsor: Mr. Steve Smith



## **ANIMAL SCIENCES C**

### **AS-C 1** Effects of Air Pollution on Fruit Flies

CC Garcia-Quiroz, Patrick Henry High School

Phoenix O'Dell, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

### **AS-C 2** Using eDNA to Detect an Invasive Crayfish (*Procambarus clarkii*) in the James River

Carter Baka-Collins, James River High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

### **AS-C 3** The Effect of *Valeriana officinalis* on the Heart Rate of *Daphnia magna*

Jack Le Roy, Floyd County High School

Elodie McClintic, Franklin County High School

Teacher sponsor: Mr. Don Wages

### **AS-C 4** The Effect of *Capsicum annuum* on the Heart Rate of *Daphnia magna*

Lera Gibson, Franklin County High School

Helena Longstreth, Franklin County High School

Teacher sponsor: Mr. Don Wages

### **AS-C 5** The Effect of Citric Acid on the Heart Rate of *Daphnia magna*

Nathan Cloutier, Franklin County High School

JT Lomax, Franklin County High School

Teacher sponsor: Mr. Don Wages

### **AS-C 6** The Effect of *Berberine* on the Heart Rate of *Daphnia magna*

Prateek Reddy, Cave Spring High School

Anish Suryapeta, Cave Spring High School

Teacher sponsor: Mr. Don Wages

### **AS-C 7** The Effect of *Hibiscus sabdariffa* on Heart Rate of *Daphnia magna*

Audrey Kelley, Patrick Henry High School

Ana Maria Rincon, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

### **AS-C 8** The Effect of Polyethylene Microplastics on *C. elegans*

Carrie Collins, Lord Botetourt High School

Mirabel Makked, Salem High School

Teacher sponsor: Mrs. Joanne Villers

### **AS-C 9** The Effect of Arsenic on *C. elegans*

Gabby Harig, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

### **AS-C 10** The effect of hydrocortisone on the cellular regeneration of *Girardia tigrina*

Hana Sageer, Hidden Valley High School

Teacher sponsor: Mr. Steve Smith

## **BEHAVIORAL AND SOCIAL SCIENCES**

**BS 1** Does Ability to Sight Read Music Affect English Reading Speed?

Sallie Boxley, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 2** Does Social Media Use Impact Attention Span in Adolescents?

Kate Feldmann, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 3** Are Loneliness and Group Involvement Associated with Substance Use Disorder Recovery?

Grace Harig, Patrick Henry High School

Kira McGinnis, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 4** The Effect of Visual and Written Counter-Stereotypical Exemplars on Implicit Gender STEM Bias

Cameron McPhee, William Fleming High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 5** A Study of Child-Caregiver Relationship Indicators for Those in Child-Centered Play Therapy

Autumn Patterson, William Fleming High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 6** A Study of Driver-Road Cyclist Interactions and Methods for Their Improvement

Annika Plunkett, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 7** The Effect of Extracurricular Participation on Sleep and Mental Health

Penelope Roberts, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

**BS 8** The Relationship Between Personality Type and Procrastination Tendencies

Aleigha Weeks, Salem High School

Teacher sponsor: Mrs. Melissa Fisher

## **BIOMEDICAL AND HEALTH SCIENCES**

**BH 1** Investigating the Associations Between Trait Neuroticism, Physiology, and the Effects of Low-Intensity Focused Ultrasound Neuromodulation

Elisabeth Tershak, Patrick Henry High School

Teacher sponsor: Mr. Brandon Taylor

**BH 2** The Impact of Aerobic Exercise on Mitochondrial Function in the Hippocampus

Emma Batty, Patrick Henry High School

Teacher sponsor: Mr. Brandon Taylor

**BH 3** Assessing the Affects of ACQUIRE Therapy for Children Using a Motor Learning Scale

Margaret Kauffman, Patrick Henry High School

Teacher sponsor: Mr. Brandon Taylor

**BH 4** Navigating Disparities in Dental Health - A Mixed-Method Investigation of Access to Dental Care in Virginia

Courtney Monard, Hidden Valley High School

Teacher sponsor: Mr. Brandon Taylor

**BH 5** The Effects of Focused Ultrasound on Various Cell Types for Glioblastoma Treatment

Mieko DeKorsey, Patrick Henry High School

Teacher sponsor: Mr. Brandon Taylor

**BH 6** The Effect of Hydrophobic Bile Acids on HCT116 Colon Cancer Cells

Sachita Baskota, Patrick Henry High School

Himangi Tiwari, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

**BH 7** Sustainable synthesis of carbon quantum dots as a fluorescence probe in medical bioimaging via a zebrafish model

Sophia Zeng, Hidden Valley High School

Teacher sponsor: Mr. Steve Smith

## **CELLULAR AND MOLECULAR BIOLOGY**

**CM 1** Dlk1 Locus and Neurogenic Niche Regulation in Developing Cortex of DiGeorge Syndrome Mouse Model

Nate Faulkner, Cave Spring High School

Teacher sponsor: Mr. Brandon Taylor

**CM 2** Detection of SARS-CoV-2 Antibodies in Fluids from Various Sources

Diya Reddy, Cave Spring High School

Teacher sponsor: Mr. Brandon Taylor

**CM 3** The UV-Protective Ability of Mycosporine-like Amino Acids on Collagen Gene Expression in Human Neonatal Fibroblasts

Raimee Sykes, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**CM 4** Investigating the Effect of L-Ascorbic Acid on the Production of Collagen in Fibroblast Cells

Su Gursoy, William Fleming High School

Ayden McNulty, William Fleming High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**CM 5** Vitamin D's Effect on *Saccharomyces cerevisiae* Biofilm Formation

Luke Sumner, Franklin County High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**CM 6** Investigating the Role of SNAI2 in the Proliferation of HCT116 Cancer Cells

Kathryn Ha, Salem High School

Claire Rawlins, Salem High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

## **COMPUTATIONAL BIOLOGY**

**CB 1** Clinically Relevant Mutations in Genes Associated with Alzheimer's Disease

Kaleb Humerickhouse, Cave Spring High School

Ayush Pinnamaraju, Cave Spring High School

Teacher sponsor: Mr. Mark Levy

**CB 2** An Analysis of the Role of DNA Methylation in Oncogenesis

Brenden Hartung, Northside High School

Teacher sponsor: Mr. Mark Levy

**CB 3** A Phylogenetic Analysis of the Origin of Neurononal Structures in Basal Holozoa

Brett Smith, Lord Botetourt High School

Teacher sponsor: Mr. Mark Levy

**CB 4** A Meta-analysis of the Genetic Basis for Lymphoma Cancer Subtypes

Jack Janiga, Hidden Valley High School

Teacher sponsor: Mr. Mark Levy

**CB 5** Analysis of a KRAS G-Quadruplex Pharmacophore for Targeted Cancer Therapy

Griffin Yakob, William Byrd High School

Teacher sponsor: Mr. Mark Levy

**CB 6** Bioinformatic Analysis of COVID-19 Mutations

Zane Ellis, Staunton River High School

Teacher sponsor: Mr. Mark Levy

## **EARTH AND ENVIRONMENTAL SCIENCE**

**ES 1** Using Zebrafish as a Bioindicator to Test the Bioremediatory Potential of *T. versicolor* on PFOA

Aidan Callis, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

**ES 2** Determining the Potential of Producing Biofuels Using Algae

Emma Pope, Glenvar High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**ES 3** The Effect of Plant Type on Soil Erosion

Mariam Abdelmalak, Salem High School

Teacher sponsor: Mrs. Joanne Villers

**ES 4** The Correlation of Arctic Cyclones and Sea Ice Loss and its Relationship to Climate Change

Chloe Herold, Hidden Valley High School

Teacher sponsor: Mrs. Joanne Villers

**ES 5** The Effect of Land Use on Stream Health

Nathan Preston, Lord Botetourt High School

Teacher sponsor: Mrs. Joanne Villers

**ES 6** The comparison of chemical cleaner vs. naturally made persimmon calyx cleaner on the reduction of *E. coli*

Kyla Wooldridge, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

**ES 7** The removal of silver nanoparticles in water using calcium bentonite

Rhiannon Stowe, Lord Botetourt High School

Teacher sponsor: Mr. Steve Smith

## **ENGINEERING MECHANICS A**

**EM-A 1** The Impact of Airfoil, Diameter, and Pitch of Propellers on the Maximized Flight Time of a Quadcopter

Austin Frantz, Salem High School

Teacher sponsor: Mr. Brandon Taylor

**EM-A 2** Drawing Robot Arm

Yasmin Shumway, Patrick Henry High School

Amira Shumway, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

**EM-A 3** EMG Controlled Prosthetic Hand

William Henderson, Franklin County High School

Chase Noel, Franklin County High School

Teacher sponsor: Mr. Connor Wade

**EM-A 4** Self-Playing Ukulele

Kaeli Berry, James River High School

Meribel Pan, Hidden Valley High School

Teacher sponsor: Mr. Connor Wade

**EM-A 5** Crop Leaf Sampling Robot

Daniel Han, Cave Spring High School

Teacher sponsor: Mr. Drew Hurst

**EM-A 6** Spotting Plane

John Aziz, Patrick Henry High School

J.B. Clements, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

**EM-A 7** Educational Coding Language and Car

Katie Coles, Patrick Henry High School

Luke Thompson, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

**EM-A 8** Automated Seed Planting Robot

Faith Kuehl, Patrick Henry High School

Caroline O'Keeffe, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

## **ENGINEERING MECHANICS B**

### **EM-B 1 Autonomous Following Suitcase**

Alpin Singh, Cave Spring High School

William Xiao, Northside High School

Teacher sponsor: Mr. Connor Wade

### **EM-B 2 Automatic Water Dispenser**

Jackson Farrar, Patrick Henry High School

Stella Gillenwater, Patrick Henry High School

Gracie Greer, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

### **EM-B 3 Weight Dependent Automatic Sorting System**

Seijin Campbell, Franklin County High School

Kalob Daniels, Lord Botetourt High School

Teacher sponsor: Mr. Connor Wade

### **EM-B 4 Handwriting Robotic Arm**

Sharmila Balaji, Cave Spring High School

Jeanne-Eugenie Picard, Cave Spring High School

Teacher sponsor: Mr. Connor Wade

### **EM-B 5 Self Leveling Car 2.0**

Jordan Wattie-Shear, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

### **EM-B 6 Water Filtration and Movement by Hydrostatic Pressure Model**

Charlie Comer, Franklin County High School

Teacher sponsor: Mr. Drew Hurst

### **EM-B 7 Automatic Pill Sorter and Dispenser**

Kensington Reynolds, Cave Spring High School

Jacob Stewart, Hidden Valley High School

Teacher sponsor: Mr. Drew Hurst

### **EM-B 8 Automatic Gutter Cleaner for Geriatric Use**

Dominic LaConte, Patrick Henry High School

Jeremiah Morgiewicz, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst



## **ENGINEERING MECHANICS C**

### **EM-C 1** Ball Throwing Arm

Archit Arora, Staunton River High School

Conlan McNulty, William Fleming High School

Teacher sponsor: Mr. Connor Wade

### **EM-C 2** Color Sorting Robot Arm

Christian Chicas-Nolasco, William Fleming High School

Ginny Matthews, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

### **EM-C 3** A Self-Tuning Electric Guitar

Matthew Love, Franklin County High School

Andrew Michie, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

### **EM-C 4** Metal Shavings Collection Arm

Sean Cady, Craig County High School

Noah Svirsky, Cave Spring High School

Teacher sponsor: Mr. Connor Wade

### **EM-C 5** TacTile: 3D Interactive Haptic Pin Display Using Novel Linear Motor Arrays

Carson Ray, Cave Spring High School

Teacher sponsor: Mr. Drew Hurst

### **EM-C 6** All Terrain Automatic Rover

Guillaume Preud'homme, Patrick Henry High School

Ben Schweitzer, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

### **EM-C 7** Braille Teaching Device

Isaac Olson, Patrick Henry High School

Ryan Prusakowski, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

### **EM-C 8** Automated Safety Paper Cutter

Kiersten Lauer, Northside High School

Cora Reid, Staunton River High School

Teacher sponsor: Mr. Drew Hurst

## **ENGINEERING MECHANICS D**

### **EM-D 1** Rock-Paper-Scissors Robot

Isaiah Butler, Patrick Henry High School

Jamal Millner, Patrick Henry High School

Zachary Young, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

### **EM-D 2** Simulating a Game of Odds and Evens

Samuel Dandridge, Patrick Henry High School

Anam Neopanay, Patrick Henry High School

Teacher sponsor: Mr. Connor Wade

### **EM-D 3** Claw & Lift

Alex Burnette, Hidden Valley High School

Parker Sisk, Hidden Valley High School

Teacher sponsor: Mr. Connor Wade

### **EM-D 4** Automatic Plant Watering System

Divya Bharati, William Fleming High School

Sophie Tisdale, Franklin County High School

Teacher sponsor: Mr. Connor Wade

### **EM-D 5** Biometric Fortress: Enhancing Security with Fingerprint and Eyescanner Technology

Sanchit Baskota, William Fleming High School

Teacher sponsor: Mr. Drew Hurst

### **EM-D 6** Automatic Roof Painting Robot to Reduce Urban Heat and Energy Costs

Chloe DeKorsey, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

### **EM-D 7** AT-CV Walker (All Terrain Combat Vehicle)

Zachary Easter, Salem High School

Diol Glele, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

### **EM-D 8** Home Security System

McLure Bailey, Patrick Henry High School

Teacher sponsor: Mr. Drew Hurst

## **ENVIRONMENTAL ENGINEERING/ENERGY**

### **EE 1** Bioremediation of Arsenic Using Different *Corynebacterium* Biofilms

Michael Aziz, Patrick Henry High School

Joshua Manning, Staunton River High School

Teacher sponsor: Mrs. Joanne Villers

### **EE 2** Bioremediation of Plastic Using *Chaetomium globosum* and *Arthrobotrys conoides*

Anna Favor, Patrick Henry High School

Lydia Goad, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

### **EE 3** The Effect of Different Substrates on the Efficiency of a Waste-Based Microbial Fuel Cell

Anika Parashar, Hidden Valley High School

Teacher sponsor: Mr. Matthew Browning

### **EE 4** The effect of iron oxide nanoparticles on lipid in *Nannocloropsis oculata*

Benjamin Ogle, Glenvar High School

Teacher sponsor: Mr. Steve Smith

### **EE 5** Comparing the efficiency of dye-sensitized solar cells made with different semiconductor nanoparticles

Charlotte Anstey, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

### **EE 6** The effect of polysaccharide-based hydrogel beads on the removal of heavy metal ions from water

Claire McCahill, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

### **EE 7** Using phytoremediation to reduce the impact of copper(II) ions on aquatic life

Parneet Gill, Salem High School

Teacher sponsor: Mr. Steve Smith

## **MATERIALS SCIENCE/CHEMISTRY**

### **MS 1** The Effect of Various Substrates on the Strength of Mycelium-based Building Blocks

Frances Livingston, Patrick Henry High School

Sarah O'brien, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

### **MS 2** Removing pollutants from water using modified sodium alginate beads

Evelyn Anderson, Cave Spring High School

Heidi Thompson, Cave Spring High School

Teacher sponsor: Mr. Steve Smith

### **MS 3** The effect of drop height, drop angle, and floor material on the pattern of blood spatter

Claire Togo, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

### **MS 4** Two chemical methods for testing lead gunshot residues from two different rounds

Elliott Wiegard, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

### **MS 5** Preparing Bio-based Aerogel and Removing Toxic Dyes from Wastewater

Zoe Silva, Staunton River High School

Teacher sponsor: Mrs. Joanne Villers

### **MS 6** Using Montmorillonite Clay to Remediate Algal Blooms

Laila Alam, Lord Botetourt High School

Emily Duncan, Lord Botetourt High School

Teacher sponsor: Mrs. Joanne Villers

## MICROBIOLOGY A

### **MI-A 1** The Stability of Bacillus Strains When Applied on Bare and Avicita Corn Seeds

Mitchell Deese, Salem High School

Teacher sponsor: Mr. Brandon Taylor

### **MI-A 2** The Effects of Synthetic Peptide, Pineapple Enzymes, and Vinegar on the Growth and Formation of *Staphylococcus epidermidis* Biofilm

Adison Mayhue, Lord Botetourt High School

Nicole Scarlatescu, Hidden Valley High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

### **MI-A 3** The Comparison of Oregano Oil, Penicillin, and Erythromycin on *E. coli* and *B. megaterium*

Aadesh Mittal, Cave Spring High School

Teacher sponsor: Mr. Matthew Browning

### **MI-A 4** The Effect of Herbs and Gentamicin on *P. fluorescens*

Julia Batty, Patrick Henry High School

Maya Olson, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

### **MI-A 5** A Comparison of Various Vinegar's Antibacterial Effect on *E. coli*

Samuel Glenn, Patrick Henry High School

Jack O'Keeffe, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

### **MI-A 6** The Effect of Citrus Juice and Essential Oil on *R. stolonifer*

Ella Dickerson, Lord Botetourt High School

Kinsley Milko, Lord Botetourt High School

Teacher sponsor: Mr. Matthew Browning

### **MI-A 7** The Effect of Streptomycin on *Streptococcus salivarius* in Different Medias

Maggie Hoover, Lord Botetourt High School

Lacey Mitchell, Franklin County High School

Teacher sponsor: Mr. Matthew Browning

### **MI-A 8** The effect of common herbal remedies on the growth of *Escherichia coli* and *Staphylococcus epidermidis*

Sydney Anderson, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

### **MI-A 9** The effects of chemicals found in fertilizer runoff on the bioluminescence of *Aliivibrio fischeri*

Daniel Owen-O'quill, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

## **MICROBIOLOGY B**

**MI-B 1** The Effect of Cocoa Flavanols on *Pseudomonas fluorescens* Biofilm Formation and Quorum Sensing

Nafisah Izzat, Cave Spring High School

Anvita Panchumarthi, Cave Spring High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**MI-B 2** Investigating the Efficacy of Mechanical, Enzymatic, and Chemical Methods of *Candida albicans* Cell Lysis with Respect to Wastewater-Based Epidemiology

Aaron Bhowansingh, Hidden Valley High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**MI-B 3** The Effect of Kombucha on *E. coli* and *S. epidermidis*

Ian Costen, Franklin County High School

Teacher sponsor: Mr. Matthew Browning

**MI-B 4** The Effect of Different Sugars on the Fermentation of Yeast

Hayston Chappell, Patrick Henry High School

Matthew Feldmann, Patrick Henry High School

Anders Plunkett, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

**MI-B 5** The Effect of Fruit Juices on *E. aerogenes* and *S. marcescens*

Brodie Eanes, Franklin County High School

Eli Harl, Franklin County High School

Teacher sponsor: Mr. Matthew Browning

**MI-B 6** The Effect of Ampicillin and Amoxicillin on *P. fluorescens* and *M. luteus*

McKenna All, Craig County High School

Claire (Liz) Morris, Craig County High School

Teacher sponsor: Mr. Matthew Browning

**MI-B 7** The effect of various nanoparticles on the inhibition of *Staphylococcus epidermidis*

Nolan Stokes, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

**MI-B 8** The effect of carbon nanotubes and heavy metals on *E. coli* and *Bacillus cereus* cultures

Keely Garri, Franklin County High School

Teacher sponsor: Mr. Steve Smith

**MI-B 9** The Effect of Fluconazole Compared to Oregano Oil on *M. hiemalis*

Charlotte Hally, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

## MICROBIOLOGY C

**MI-C 1** The Effect of Copper II Sulfate on Gene Expression and Evolution of *E. coli* B.

Riley Beasley, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

**MI-C 2** The Effect of Manuka Honey on *E. coli*

Claire Ricketts, Cave Spring High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 3** The Effect of Antimicrobial Herbs on the Growth of *E. aerogenes*

Darby Kerr, Patrick Henry High School

Izzy Mather, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 4** A Comparison of the Inhibitory Effect of Azole Antifungals vs. Oregano Essential Oil on *C. albicans*

Dylan De Meyts, Patrick Henry High School

Christopher Toner, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 5** The Effect of Apple, Lemon, and Orange Juice on *S. marcescens*

Carter Biscotte, Salem High School

Jaelin Vernon, Salem High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 6** The Effect of Lemongrass Essential Oil on *E. coli* and *S. epidermidis*

Max Mizuba, Lord Botetourt High School

Preston Vaughn, Lord Botetourt High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 7** The Effect of *S. marcescens* on *A. niger* and *C. globosum*

Hope Dolan, Staunton River High School

Teacher sponsor: Mr. Matthew Browning

**MI-C 8** The effect of titanium dioxide nanoparticles on *E. coli* growth when exposed to ultraviolet light

Molly Caroline Fitzgerald, Patrick Henry High School

Eve Foster, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

**MI-C 9** The effects of silver, copper, and nickel infused gauze on *Staphylococcus aureus*

Gabrielle Romeo, William Byrd High School

Teacher sponsor: Mr. Steve Smith

## PLANT SCIENCES A

**PS-A 1** Evaluation of Cuscuta interaction with *Arabidopsis thaliana* Expressing RUBY Reporter

Hannah Mizuba, Lord Botetourt High School

Kane Reczek, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland and Mr. Steve Villers

**PS-A 2** Mycorrhizal Pathways between *Quercus alba* and *Fagus sylvatica*

Lex Farmer, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers and Mr. Steve Villers

**PS-A 3** Determining which cryptochrome gene in *A. thaliana* exhibits the most growth in the presence of a magnetic field

Meera Raichura, William Byrd High School

Teacher sponsor: Mr. Steve Smith

**PS-A 4** Allelopathic effects of *M. oreades* on *L. perenne*

Lucy Atwood, Patrick Henry High School

Emily Dewire, Patrick Henry High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-A 5** The Allelopathic Effects of *G. tagetes* Leaf and Stem Filtrate on *B. Rapa* Germination

Lucy Laplante, Patrick Henry High School

Sadie Panko, Patrick Henry High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-A 6** The Allelopathic Effect of *Tagetes patula* Seeds on the Germination of *Triticum aestivum* L.

Eli Peters, Franklin County High School

Roy Wainwright, Franklin County High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-A 7** The Allelopathic Effect of *S. oleracea* Organs on the Germination of *S. lycopersicum*

Vivienne Eaton, Salem High School

Ryan Hubbard, Salem High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-A 8** The Allelopathic Effect of *Triticum aestivum* on the Germination of *Glycine max*

Claire Grindo, Liberty High School

Ariana Markham, Northside High School

Teacher sponsor: Mrs. Tracy Jenkins



## PLANT SCIENCES B

**PS-B 1** The Effectiveness of Biochar in Mitigating Salt Stress on Mung Beans

Jaiden Dann, Lord Botetourt High School

Teacher sponsor: Mrs. Joanne Villers

**PS-B 2** The effect of melatonin on *Rhizobium*-inoculated mung beans

Benjamin King, Northside High School

Teacher sponsor: Mr. Steve Smith

**PS-B 3** The effect of a simulated acid deposition on the germination of garden cress seeds

Savanna Johnson, Lord Botetourt High School

Teacher sponsor: Mr. Steve Smith

**PS-B 4** The Allelopathic Effect of *Camellia sinensis* on the Germination of *Raphanus sativus*

Laine Clements, Patrick Henry High School

Evanjali Wagley, Patrick Henry High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-B 5** The Allelopathic Effects of *Raphanus sativus* on *Zea mays L.*

Charles Rucker, Patrick Henry High School

Timothy Yemey, Patrick Henry High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-B 6** The Allelopathic Effect of *Tagetes patula* on the Germination of *Solanum lycopersicum*

Trey Hipes, James River High School

Tyler McCarren, Lord Botetourt High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-B 7** Allelopathic Effects of Summer Squash (*Cucurbita pepo*) on the Germination of Pumpkin (*Cucurbita pepo*)

Chloe Ferguson, Staunton River High School

Arrington Short, Staunton River High School

Teacher sponsor: Mrs. Tracy Jenkins

## PLANT SCIENCES C

**PS-C 1** Effectiveness of *Glycine max* on Microplastic Removal from Soil

Josephine Eaton, Salem High School

Teacher sponsor: Mrs. Joanne Villers

**PS-C 2** Removal of copper(II) and lead(II) ions from water with *C. demersum*

Aman Mengistu, Cave Spring High School

Teacher sponsor: Mr. Steve Smith

**PS-C 3** The Allelopathic Effects of *Helianthus annuus* on the Germination and Growth of *Lactuca Sativa*

Nathan Amos, Franklin County High School

Benjamin Grindstaff, Franklin County High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-C 4** The Effect of *Poa pratensis* (Kentucky Bluegrass) Filtrate on the Germination Rate of *Trifolium repens* (White Clover) Seeds

Kassidy Corker, Patrick Henry High School

Kylie Duke, Patrick Henry High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-C 5** The Allelopathic Effect of *Solanum Lycopersicum* on the Germination Rate of *Brassica oleracea*

Mitchell Blankenship, William Fleming High School

Joseline Hernandez, Patrick Henry High School

Kevin Ly, William Fleming High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-C 6** The Allelopathic Effects of Sunflower (*Helianthus annuus*) on Barley (*Hordeum vulgare*)

Augie Biviano, Floyd County High School

Devin Blankenship, Floyd County High School

Teacher sponsor: Mrs. Tracy Jenkins

**PS-C 7** The Allelopathic Effect of Raw *Lactuca sativa* L. on the Germination of *Cucumis sativus* L.

Alex Key, Liberty High School

Sebastian Sowards, Liberty High School

Teacher sponsor: Mrs. Tracy Jenkins

## **SYSTEMS SOFTWARE A**

### **SS-A 1** Machine Learning Enhanced Security Surveillance

Mann Patel, Glenvar High School

Caleb Wang, Hidden Valley High School

Teacher sponsor: Mr. Doug Divers

### **SS-A 2** Helping Children with Learning Disabilities Using Python

Holden Bryant, Franklin County High School

Will Jones, Franklin County High School

Teacher sponsor: Mr. Doug Divers

### **SS-A 3** Using Machine Learning and Image Recognition to Identify Plant Species

Samuel Crawford, Patrick Henry High School

Seth Perry, Patrick Henry High School

Teacher sponsor: Mr. Doug Divers

### **SS-A 4** Using Python to Identify Celestial Bodies Observed by Civilian Telescopes

Jacob Jackson, Patrick Henry High School

Lex Stratton, Patrick Henry High School

Teacher sponsor: Mr. Doug Divers

### **SS-A 5** Using Python to Escape the Comfort Zone

Miya Morton, Hidden Valley High School

Teacher sponsor: Mr. Doug Divers

### **SS-A 6** Converting English Speech to German Text Using Python

Graham Dietrich, Lord Botetourt High School

Teacher sponsor: Mr. Doug Divers

## **SYSTEMS SOFTWARE B**

### **SS-B 1** Investment Diversification and Management with Python

Rishika Sethumadhavan, Cave Spring High School

Teacher sponsor: Mr. Doug Divers

### **SS-B 2** Using Python to Identify Ghost Jobs

Nathan Bulla, Cave Spring High School

Teacher sponsor: Mr. Doug Divers

### **SS-B 3** Sentiment Analysis: A Lexicon-Based Approach

Evan Shifflett, Patrick Henry High School

Teacher sponsor: Mr. Doug Divers

### **SS-B 4** Generating Musical Melodies and Accompanying Chord Progressions Through the Use of Artificial Intelligence

Oliver Luci, Patrick Henry High School

Nikolai Morgiewicz, Patrick Henry High School

Teacher sponsor: Mr. Doug Divers

### **SS-B 5** Using Python to Check for A.I. Generated Paper

Isaac Morris, Craig County High School

Ethan Yeary, Franklin County High School

Teacher sponsor: Mr. Doug Divers

### **SS-B 6** Creating Different Types of Graphs with Python

Eyad Al-Aromah, William Fleming High School

Teacher sponsor: Mr. Doug Divers

# Category Abbreviations Key

|                                   |      |                                      |      |
|-----------------------------------|------|--------------------------------------|------|
| Animal Sciences A                 | AS-A | Engineering Mechanics D              | EM-D |
| Animal Sciences B                 | AS-B | Environmental Engineering/<br>Energy | EE   |
| Animal Sciences C                 | AS-C | Materials Science/Chemistry          | MS   |
| Behavioral & Social Sciences      | BS   | Microbiology A                       | MI-A |
| Biomedical & Health Sciences      | BH   | Microbiology B                       | MI-B |
| Cellular & Molecular Biology      | CM   | Microbiology C                       | MI-C |
| Computational Biology             | CB   | Plant Sciences A                     | PS-A |
| Earth & Environmental<br>Sciences | ES   | Plant Sciences B                     | PS-B |
| Engineering Mechanics A           | EM-A | Plant Sciences C                     | PS-C |
| Engineering Mechanics B           | EM-B | Systems Software A                   | SS-A |
| Engineering Mechanics C           | EM-C | Systems Software B                   | SS-B |

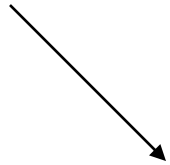
WINDOWS

|          |          |          |          |        |        |
|----------|----------|----------|----------|--------|--------|
| EM-C 1   | 2 EM-C 3 | EM-C 4   | 5 EM-C 6 | EM-C 7 | EM-C 8 |
| 1 EM-B 2 | EM-B 3   | 4 EM-B 5 | EM-B 6   | EM-B 7 | EM-B 8 |

|        |          |        |          |          |                   |          |
|--------|----------|--------|----------|----------|-------------------|----------|
| EM-D 8 | 7 EM-D 6 | EM-D 5 | 4 EM-D 3 | EM-D 2   | EM-D 1/<br>EM-A 8 | EM-A 7   |
| 3 EE 4 | EE 5     | 6 EE 7 | EM-A 1   | 2 EM-A 3 | EM-A 4            | 5 EM-A 6 |

|          |        |          |          |          |          |          |
|----------|--------|----------|----------|----------|----------|----------|
| EE 2     | EE 1   | MI-C 9   | 8 MI-C 7 | MI-C 6   | 5 MI-C 4 | MI-C 3   |
| 1 MI-B 2 | MI-B 3 | 4 MI-B 5 | MI-B 6   | 7 MI-B 8 | MI-B 9   | 1 MI-C 2 |

KITCHEN



|        |        |
|--------|--------|
| BH 1   | 1 BS 2 |
| 2 BH 3 | BS 3   |
| BH 4   | 4 BS 5 |
| 5 BH 6 | BS 6   |
| BH 7   | 7 BS 8 |

|        |          |          |          |          |          |          |          |
|--------|----------|----------|----------|----------|----------|----------|----------|
| MI-A 9 | 8 MI-A 7 | MI-A 6   | 5 MI-A 4 | MI-A 3   | 2 MI-A 1 | SS-B 6   | 5 SS-B 4 |
| 4 MS 5 | MS 6     | 1 SS-A 2 | SS-A 3   | 4 SS-A 5 | SS-A 6   | 1 SS-B 2 | SS-B 3   |

|          |        |        |        |        |        |        |        |
|----------|--------|--------|--------|--------|--------|--------|--------|
| MS 3     | 2 MS 1 | ES 7   | 6 ES 5 | ES 4   | 3 ES 2 | ES 1   | 6 CB 5 |
| 6 PS-C 7 | CM 1   | 2 CM 3 | CM 4   | 5 CM 6 | CB 1   | 2 CB 3 | CB 4   |

|          |          |                    |                   |          |          |          |          |
|----------|----------|--------------------|-------------------|----------|----------|----------|----------|
| PS-C 5   | 4 PS-C 3 | PS-C 2             | PS-C 1/<br>PS-B 7 | PS-B 6   | 5 PS-B 4 | PS-B 3   | 2 PS-B 1 |
| 7 AS-C 8 | AS-C 9   | AS-C 10/<br>PS-A 1 | PS-A 2            | 3 PS-A 4 | PS-A 5   | 6 PS-A 7 | PS-A 8   |

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| AS-C 6   | 5 AS-C 4 | AS-C 3   | 2 AS-C 1 | AS-B 9   | 8 AS-B 7 | AS-B 6   | 5 AS-B 4 |
| 1 AS-A 2 | AS-A 3   | 4 AS-A 5 | AS-A 6   | 7 AS-A 8 | AS-A 9   | 1 AS-B 2 | AS-B 3   |

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