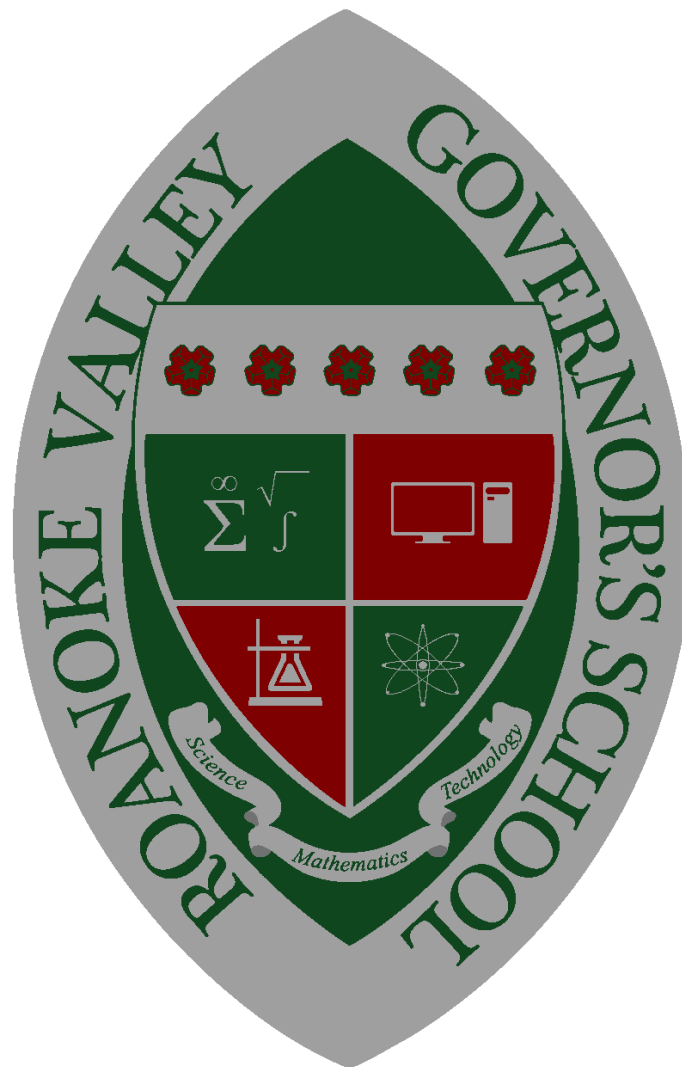


The Roanoke Valley Governor's School For Science and Technology 2020 Student Project Forum



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 seven participating school districts:

Bedford County, Botetourt County, Craig County, Franklin County, Roanoke City, Roanoke County, Salem City

SCHEDULE

- 1:30 P.M. - 3:00 P.M..... Project Forum Open House (cafeteria)
1:30 P.M. - 3:00 P.M..... Raffle and Art Show (library)
3:00 P.M. - 3:30 pm..... Remove projects
3:30 P.M. Awards Assembly (gymnasium)

ANNUAL APPEAL, RAFFLE, AND ART SHOW

Many exciting learning experiences take place at the Roanoke Valley Governor's School due to the support of our seven participating school divisions, parents, dedicated teachers, volunteers, and other organizations in our community. Such activities include student use of specialized equipment, invigorating laboratory experiences, enriching field trips, and research opportunities.

We thank the many members of the RVGS community for their generous donations toward the RVGS Annual Appeal, which have carried us in excess of our initial goal of \$25,000. This year's fundraising will support the upgrade of our Gas Chromatograph, lab equipment, and student support opportunities.

Today, the Roanoke Valley Governor's School Foundation and Annual Appeal Committee invite you to participate in buying raffle tickets to win several donated items. Raffle sales, along with the RVGS art show, and a photo slide show will take place in the library during the open house.

THE ROANOKE VALLEY GOVERNOR'S SCHOOL FACULTY AND STAFF

Office/Administrative Staff

Mark Levy, Director; Kathy Sebolt, School Counseling Coordinator; Paula Buch, School Secretary

Mathematics Faculty

Doug Divers (Chair), Matthew Browning, Melissa Fisher, Laura Roark, Brandon Taylor, Don Wages

Science Faculty

Cindy Bohland (Chair), Nancy Aldridge, Dr. Brent Holt, Steve Smith, Joanne Villers

Adjunct Faculty/Intersession Support

Fred Hoffman, Leigh McKay, Steve Villers, Bill Massart

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.

In particular, we wish to acknowledge the generous support and assistance provided by:

Parents

Roanoke Valley Governor's School Foundation

Annual Appeal Committee

Governor's School Alumni

Project Mentors from Local Businesses, Industries, and Colleges

Project Forum Judges

2020 ANNUAL APPEAL SPONSORS (as of 01/17/2020)

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Claire Wei, MI-B 2
Anna West, EM-C 2
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Grace Whitehead, AS-A 4
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James Whiting, SS-A 6
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Annelise Wolfe, CM 6
Riley Wood, SS-B 3
Walker Wright, CM 3
Abby Wyatt, PS-B 2
Michelle Zheng, ES-A 1

ANIMAL SCIENCES A

AS-A 1 The Effect of *Curcuma longa* on the Heart Rate of *Daphnia magna*

Roxanne Culley, Patrick Henry High School

Anna Halsdorf, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

AS-A 2 The Effect of Different Herbal Remedies on the Length of Epileptic Seizures

William (Alexander) Branscom, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

AS-A 3 The Effect of *Hoodia gordonii* on the Heart Rate of *Daphnia magna*

Savannah Peters, Franklin County High School

Erica Blake Sellars, Franklin County High School

Teacher sponsor: Mr. Don Wages

AS-A 4 The Effect of Polyethylene Microplastic Concentration on Ingestion by *Daphnia magna*

Anna Dandridge, Patrick Henry High School

Grace Whitehead, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

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

Savannah Cady, Craig County High School

Tyler VanDyke, Craig County High School

Teacher sponsor: Mr. Don Wages

AS-A 6 An Investigation of the Bioaccumulation of Microplastics on *Danio rerio*

Martha (Mattie Rose) Keely, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland

AS-A 7 The Effect of Bishpenols A, F, and S on the Development and Reproduction of *Caenorhabditis elegans*

London Paige, William Fleming High School

Teacher sponsor: Mrs. Joanne Villers

AS-A 8 The Effect of Vitamin B-12 on the Heart Rate of *Daphnia magna*

Julia Johansson, William Fleming High School

Zoie Mills, William Fleming High School

Teacher sponsor: Mr. Don Wages

ANIMAL SCIENCES B

AS-B 1 The Effect of Cadmium on Embryonic Development of *Danio rerio*

Sarah Spradlin, Staunton River High School

Teacher sponsor: Mrs. Joanne Villers

AS-B 2 The Effect of Melatonin on the Heart Rate of *Daphnia Magna*

Mihir Miller, Salem High School

Savannah (Paige) Netting, Salem High School

Teacher sponsor: Mr. Don Wages

AS-B 3 The Effect of Natural and Synthetic Central Nervous System Agents on Fly Models of Parkinson's Disease

Emily Overbay, Lord Botetourt High School

Ashlee Woldman, James River High School

Teacher sponsor: Ms. Cindy Bohland

AS-B 4 The Effect of Taurine on the Heart Rate of *Daphnia magna*

Maggie Parkhurst, William Byrd High School

Rebecca Qiu, William Byrd High School

Teacher sponsor: Mr. Don Wages

AS-B 5 Assessing Oxidoreductase Based Removal of Chlorpyrifos from Water Using *Daphnia magna*

Natalie Saville, William Fleming High School

Teacher sponsor: Mr. Steve Smith

AS-B 6 The Effect of Temperature on *Varroa destructor* Drop from *Apis mellifera*

Reese Robers, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

AS-B 7 The Effect of L-arginine on the Heart Rate of *Daphnia magna*

Aaron Henion, Cave Spring High School

Ainsley Robertson, Cave Spring High School

Teacher sponsor: Mr. Don Wages

AS-B 8 The Effect of CBD oil on the Development of *C. elegans*

Katherine Aziz, Patrick Henry High School

Chloe Roberts, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

AS-B 9 The Effect of Chamomile on the Heart Rate of *Daphnia magna*

Ivy Howell, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

ANIMAL SCIENCES C

AS-C 1 The Impact of Pharmaceuticals on Aquatic Life using *Danio rerio* as a Model

Simran Gill, Salem High School

Teacher sponsor: Mr. Steve Smith

AS-C 2 The Effect of *Ginkgo biloba* on the Heart Rate of *Daphnia magna*

Parker Chapman, Franklin County High School

Liam May, Franklin County High School

Teacher sponsor: Mr. Don Wages

AS-C 3 The Effects of Fullerenes on the Heart Rate and Lifespan of *Daphnia magna*

Evelyn Kepley, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

AS-C 4 The Effect of Nicotine Vaping and CBD Vaping on the Associative Learning Behavior of *C. elegans*

Alysia Sanchez-Huerta, Lord Botetourt High School

Teacher sponsor: Ms. Cindy Bohland

AS-C 5 The Effect of *Paullinia cupana* on the Heart Rate of *Daphnia magna*

Robert Berry, Patrick Henry High School

Penelope Smith, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

AS-C 6 A Behavioral Observation of Raccoons After Wildlife Rehabilitation

Chloe Johnson-Hodges, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

AS-C 7 Effect of L-theanine on the Heart Rate of *Daphnia magna*

Charles (Bass) Beasley, Jr., Patrick Henry High School

Tristan Kerr, Patrick Henry High School

Teacher sponsor: Mr. Don Wages

AS-C 8 Investigation of the Role of Gut Bacteria in Plastic Digestion by Waxworm Larvae

Tracy (Harrison) Callis, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

BIOMEDICAL AND BEHAVIORAL SCIENCES

BB 1 A Retrospective Analysis of Paranoia in Traumatic Brain Injury Patients

Martha Chen, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

BB 2 Development of a Biofilm-Resistant Bioink for Wound Repair

Maya Reddy, Salem High School

Kameron Washington-Brown, William Fleming High School

Teacher sponsor: Ms. Cindy Bohland

BB 3 An Analysis of Adolescent Traumatic Brain Injury and the Long-Term Effect on Cognition

Lilian Jones, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

BB 4 Detection of Raman Spectral Abnormalities in Urine of Humans and Dogs with Bladder Cancer

Lacey Ngo, William Fleming High School

Teacher sponsor: Mr. Steve Smith

BB 5 Oncogenix: A Computational Pipeline to Identify Novel Drug Targets and Companion Diagnostics for Cancer

Kevin Sheng, Cave Spring High School

Teacher sponsor: Ms. Cindy Bohland

BB 6 Associations Between Time Perspective, Delay Discounting, and Length of Abstinence Among Individuals with Substance Dependence

Holly Acker, Lord Botetourt High School

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BB 7 The Effect of Various Moisturizing Substances on Collagen Gelatin

Camly Tran, Northside High School

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BB 8 Understanding the Relationship Between Motivation, Future Valuation, and Relapse in Individuals in Recovery from Substance Abuse

Elyse McFalls, William Fleming High School

Teacher sponsor: Mrs. Melissa Fisher

BB 9 Real-Time QPCR Analysis on the Genetic Progression of Diabetic Cells

Abhinav (Abhi) Karri, Hidden Valley High School

Teacher sponsor: Mr. Steve Smith

CELLULAR AND MOLECULAR BIOLOGY

CM 1 The Effect of a Flt-1 Knockout on the Expression of VEGF

Ella Higgins, Patrick Henry High School
Nathalie Lemon, Patrick Henry High School
Teacher sponsor: Ms. Cindy Bohland

CM 2 A Preliminary Map of Glial Cells Within the Mouse Visual Thalamus

Mary Grace Giles, Patrick Henry High School
Teacher sponsor: Mrs. Melissa Fisher

CM 3 Temporal Response of Galactose Metabolic Genes in *Saccharomyces cerevisiae*

Walker Wright, Cave Spring High School
Teacher sponsor: Ms. Cindy Bohland

CM 4 The Effect of Vaping on Bronchial/Tracheal Epithelial Cells

Ellyn Anama, Salem High School
Teacher sponsor: Ms. Cindy Bohland

CM 5 Adenoviral Subversion of Intercellular Junctions to Facilitate Spread

David Whitacre, Hidden Valley High School
Teacher sponsor: Mr. Steve Smith

CM 6 The Effect of Flavonols on Human Breast Cancer Cell Proliferation

Lynn Park, Lord Botetourt High School
Annelise Wolfe, Lord Botetourt High School
Teacher sponsor: Ms. Cindy Bohland

CM 7 Comparative Analysis Regarding Sex of Patient and Genetic Mutations in Glioblastoma

Liala Sofi, Hidden Valley High School
Teacher sponsor: Mr. Steve Smith

CM 8 The Effect of ODDD Mutation M147T on GJA1 Internal Translation, Protein Localization, and Function

Lauren Frampton, Cave Spring High School
Teacher sponsor: Ms. Cindy Bohland

EARTH AND ENVIRONMENTAL SCIENCES A

ES-A 1 A Comparison of *Muscari neglectum* Starch to Corn and Rice Starches in Starch-Based Bioplastics

Catherine Chen, Cave Spring High School

Michelle Zheng, Cave Spring High School

Teacher sponsor: Mrs. Joanne Villers

ES-A 2 The Effect of Biodegradable Polymers on Soil Nutrient Levels

Vy Nguyen, William Fleming High School

Teacher sponsor: Mrs. Joanne Villers

ES-A 3 Assessment of Neonicotinoids in Blue Ridge Honey

Shannon Filer, James River High School

Teacher sponsor: Mr. Steve Smith

ES-A 4 The Effects of Sulfuric Acid on the Shells of Freshwater Gastropods and Bivalves

Ryan (Davis) Cooper, Lord Botetourt High School

Katherine Cross, Lord Botetourt High School

Teacher sponsor: Mrs. Joanne Villers

ES-A 5 The Effect of Water Temperature on Migration Patterns of *Balaenoptera acutorostrata* in the Gulf of Maine

David (Chase) Cumins, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

ES-A 6 The Microbial Diversity of Golf Course Fairway Soil Compared to Treated Soil and Untreated Soil

Benjamin Collier, Patrick Henry High School

Lillian Holt, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

ES-A 7 Comparison of Automated Versus Human Watershed Delineation In Headwater Streams: Effects on Important Environmental Geographic Systems Metrics

Madeleine Taylor, Patrick Henry High School

Elisabeth Taylor, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

ES-A 8 The Absorption of Xylene and Formaldehyde by *Aloe vera* and *Crassula ovata*

Sarah Hall, William Fleming High School

Teacher sponsor: Mr. Steve Smith

EARTH AND ENVIRONMENTAL SCIENCES B

ES-B 1 Phytoremediation of Lead (II) Nitrate by Mosses Collected from Roanoke, Virginia

Emma Kate Greer, Patrick Henry High School

Fiona Murphy, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

ES-B 2 Using machine learning to augment a physically based model of glacier movement

Erik Scarlatescu, Hidden Valley High School

Teacher sponsor: Ms. Cindy Bohland

ES-B 3 Using Bioprinted Algae Structures to Determine Which Algae Species is Most Effective at Removing Nitrates

Haley Day, William Byrd High School

Kendall Kelly, Patrick Henry High School

Dhruvi Patel, Glenvar High School

Teacher sponsor: Mrs. Joanne Villers

ES-B 4 The Effect of Polyethylene Microplastic Concentration on *Caenorhabditis elegans* Development

Abigail Hunter, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

ES-B 5 The Effect of Pyrolysis Temperature on the Adsorption Capacity of Rice-hull Derived Biochar in Comparison to Activated Carbon on Malachite Green Oxalate in Aqueous Solutions

Alicia Carvalho, Cave Spring High School

Caroline Grant, Hidden Valley High School

Teacher sponsor: Mrs. Joanne Villers

ES-B 6 The Comparison of Sea Level Rise Trends on Research Stations in Hampton Roads

Hudson (Cole) Stevens, Patrick Henry High School

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ES-B 7 The Effect of Pollutants on the Growth of Various Crop Plants

Natalie Overstreet, William Fleming High School

Julie Vong, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

ES-B 8 The Effect of Deforestation on Precipitation Levels in the Russian Far East

Ann Foust Bailey, Patrick Henry High School

Lillian Dorathy, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

ES-B 9 Utilization of Bacterial Cellulose as a Platform for Methylene Blue Detection and Adsorption

Adithya (Adi) Iyer, William Byrd High School

Teacher sponsor: Mr. Steve Smith

ENERGY AND ENVIRONMENTAL ENGINEERING

EE 1 The Effect of Different Carbon Sources on Water Filtration Using Pharaoh's Snakes

Grace Kahoun, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

EE 2 Bioethanol from Fruit Waste Using *Saccharomyces cerevisiae*

Reesa Devers, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

EE 3 Presenting UV Light as a Solution to Bacterial Contamination in Roanoke's Water Systems

Abigail Tershak, Patrick Henry High School

Teacher sponsor: Mrs. Melissa Fisher

EE 4 The Effect of Different Forms of Carbon on the Performance of an Aluminum-Air Battery

Garrett Kelly, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

EE 5 Effects of *Acinetobacter* and *Serratia* Bacteria on Bioremediation of Gasoline

Cecilia Fratacelli, Glenvar High School

Teacher sponsor: Mrs. Joanne Villers

EE 6 Comparison of Energy Content of Biodiesels Made from Different Vegetable Oils

Jack Ericsson, Patrick Henry High School

Alexander Martin, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

EE 7 Using 3D Printing to Create a Miniature Wind Turbine

Eliza Quesenberry, Franklin County High School

Teacher sponsor: Mr. Steve Smith

EE 8 Photocatalytic Degradation of Methylene Blue Using Titanium Dioxide

Cathryn (Rynn) Little, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

EE 9 Iron Nanoparticles Made Using Green Tea Extract for Water Purification

Cynthia Lin, Franklin County High School

Teacher sponsor: Mr. Steve Smith

EE 10 Comparison of *Pueraria montana* versus Spent Grain in the Production of Biomethane

Cole Konstance, Hidden Valley High School

Teacher sponsor: Mrs. Joanne Villers

ENGINEERING MECHANICS A

EM-A 1 The Automated Laundry Folder

Jackson Konstance, Hidden Valley High School

Jacob Tozier, Cave Spring High School

Teacher sponsor: Dr. Brent Holt

EM-A 2 Motion and Gesture-Mirroring Arm (M.A.G.M.A.)

Griffin Kauffman, Patrick Henry High School

Charles Meidlinger, Patrick Henry High School

Teacher sponsor: Mrs. Nancy Aldridge

EM-A 3 Glove Controlled Hand

Owen Himmel, Patrick Henry High School

Alex Porras, Patrick Henry High School

Teacher sponsor: Dr. Brent Holt

EM-A 4 Arduino Cereal Scooper

James (Ford) Beasley, Patrick Henry High School

Declan Morrill, Patrick Henry High School

Teacher sponsor: Mrs. Nancy Aldridge

EM-A 5 Chess Playing Robot

Andrew Gloudemans, Staunton River High School

Teacher sponsor: Dr. Brent Holt

EM-A 6 The Zipster

Ethan Fouch, Lord Botetourt High School

Evan Jennings, Lord Botetourt High School

Teacher sponsor: Mrs. Nancy Aldridge

EM-A 7 Plant Watering System with Bluetooth

Anias Clark, Patrick Henry High School

Allyson Hoosier, Patrick Henry High School

Teacher sponsor: Dr. Brent Holt

EM-A 8 Door Unlocking Mechanism

William (Maxwell) Stevens, Patrick Henry High School

Tobias (Toby) Tate, Patrick Henry High School

Teacher sponsor: Mrs. Nancy Aldridge

EM-A 9 Statistical Analysis with PIR Motion Sensors to Aid Alzheimer's Patients

Katherine (Rosie) Giles, Patrick Henry High School

Rachel Roberts, Patrick Henry High School

Teacher sponsor: Dr. Brent Holt

ENGINEERING MECHANICS B

EM-B 1 Cranial Led RC Car

Nelson Laine, Franklin County High School
Bailey McNeil, Franklin County High School
Teacher sponsor: Dr. Brent Holt

EM-B 2 The Super Scooper

Roman Ciulla, Franklin County High School
Isaac Fix, William Byrd High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-B 3 Reconnaissance Drone

Owen McKenna, Patrick Henry High School
Jonah Mroz-Roakes, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-B 4 A 3D Printed Rigid Headcast for Magnetoencephalography

Jonah Vanke, Patrick Henry High School
Teacher sponsor: Mrs. Melissa Fisher

EM-B 5 CAD-Designed Autonomous Seed-Planting Robot

Tate Berenbaum, Salem High School
Jodeci Dawson, William Fleming High School
Leah Germain, Lord Botetourt High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-B 6 Alternate Designs for Temporary Housing in Disaster Areas

Case Eshelman, Patrick Henry High School
Evan Gross, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-B 7 Robotic Arm Scooper

Troy (Andrew) Harmon, Patrick Henry High School
Micah Keyser-Rothgery, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-B 8 Automated Weekly Pill Sorter and Dispenser

Joshua Taibbi, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-B 9 Arduino Robotic Scribe

Sydnee Durham, Patrick Henry High School
Ruby Isbell, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

ENGINEERING MECHANICS C

EM-C 1 Litter-Picker-Upper

Aaliyah Dixon, William Fleming High School
Ethan Johnson, William Fleming High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-C 2 Page Turner

Delaney Smith, Patrick Henry High School
Anna West, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-C 3 Caretaker Controlled Robotic Pill Dispenser

Chloe Beasley, Lord Botetourt High School
Kierstyn Stanley, Lord Botetourt High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-C 4 Lower Body Power Multiplying Exosuit

Benjamin Anderson, Patrick Henry High School
Stephen (Frank) Andes, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-C 5 Food Spooner: Baby Edition

Sarah Grace Stanley, Patrick Henry High School
Silvia Wardell, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-C 6 Mirroring Robotic Prosthetic Arm

Dylan Tran, Northside High School
Teacher sponsor: Dr. Brent Holt

EM-C 7 Voice Activated Light Switch Controller

Matthew Scarlatescu, Hidden Valley High School
James Voight, James River High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-C 8 The Seeing Glove

Amelia Kitt, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-C 9 The Card Game Robot

Mary Membreno, Patrick Henry High School
Chase Sweeney, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

ENGINEERING MECHANICS D

EM-D 1 The Picasso Arm

Fady Abdelmalak, Salem High School
Taylor Dawson, William Byrd High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-D 2 Developing a Bluetooth Enabled Pill Dispenser

David (Luke) Arner, Hidden Valley High School
Grady Brydges, Cave Spring High School
Teacher sponsor: Dr. Brent Holt

EM-D 3 LaDy Magnet

Parker Hudson, Lord Botetourt High School
Sydney Vokus, Lord Botetourt High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-D 4 Braille Box: A Reusable Device for Deaf-Blind Communication

Reece Derrick, Northside High School
Venkata (Sujith) Panchumarthy, Cave Spring High School
Teacher sponsor: Dr. Brent Holt

EM-D 5 The Cloth Folder

Riley McReynolds, William Fleming High School
Collin Rice, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-D 6 An Analysis and Testing of Variable Truss Design

Carson Speakman, William Fleming High School
Teacher sponsor: Dr. Brent Holt

EM-D 7 The Light Lighter

Riley Kerr, Patrick Henry High School
Riley VanAken, Patrick Henry High School
Teacher sponsor: Mrs. Nancy Aldridge

EM-D 8 Weight-Based Automatic Pet Food Dispenser

Joseph Sandzimier, William Byrd High School
Teacher sponsor: Dr. Brent Holt

EM-D 9 Neuropathy Navigational Assistance Device

Hayden Gray, Patrick Henry High School
Teacher sponsor: Dr. Brent Holt

EM-D 10 Card Skimmer Detection Device

Jackson Moyer, Hidden Valley High School
Teacher sponsor: Dr. Brent Holt

MATERIALS SCIENCE/CHEMISTRY

MC 1 Physical Properties of Various Metal Foam Compositions

Merryn Isbell, Patrick Henry High School

Lillian (Libby) Jamison, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

MC 2 The Effect of Sea Urchin Shaped ZnO Nanostructures on the Photocatalytic Adsorption of Organic Dyes

Ethan Su, Hidden Valley High School

Teacher sponsor: Mr. Steve Smith

MC 3 Various Physical Properties of Simple Biodegradable Plastics

Taylor Frazier, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

MC 4 Novel Process for Polylactic Acid Synthesis From Kudzu Root

Luke Gardner, Patrick Henry High School

Ryan Rigatti, Lord Botetourt High School

Luke Suess, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

MC 5 An Arsenic Filtration Mechanism Using a 3D Bioprinted Cysteine and Silicon Carbide Model

Madison Brown, Franklin County High School

Teacher sponsor: Mrs. Joanne Villers

MC 6 AFM-based Nanoindentation Technique: A Novel Approach to Determine the Nanoscale Degradation of PET

Uyen Tran, William Fleming High School

Teacher sponsor: Mr. Steve Smith

MC 7 The Effect of the Nanomaterials on Various Properties of a Chitosan-Alginate Polymer

Jasmine Walker, William Fleming High School

Teacher sponsor: Mr. Steve Smith

MICROBIOLOGY A

MI-A 1 A Comparison of the Effects of Bacitracin and Cannabidiol on the Growth of *S. epidermidis*

Mary (Katelyn) Crumpacker, Salem High School

Caden Smith, Salem High School

Teacher sponsor: Ms. Laura Roark

MI-A 2 Optimization of Ethanol Production in Yeast Using 3-D Bioprinted Scaffolds

Noah Gettings, Patrick Henry High School

Henry Holbrook, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

MI-A 3 Evaluation of the Antimicrobial Abilities of Olive Leaf Distillate on *E. coli K-12*

Cole Price, Staunton River High School

Teacher sponsor: Ms. Laura Roark

MI-A 4 A Study on the Effects of Capsaicin and Kanamycin on *Micrococcus luteus*

Hassan Al-Qattan, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

MI-A 5 The Synergistic Effect of Tea Tree Oil and Eucalyptus Oil on *E. coli*

Trinity Breedlove, Patrick Henry High School

Cameron Snyder, Patrick Henry High School

Teacher sponsor: Ms. Laura Roark

MI-A 6 Use of Denitrifying Bacteria Isolated from the Environment on Remediation of Eutrophic Water

Megan McGinnis, Patrick Henry High School

Sarah Riddle, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

MI-A 7 The Effect of Moringa Seeds on *S. epidermidis* and *E. coli*

Bakari Deskins, Franklin County High School

Forrest Moorman, Franklin County High School

Teacher sponsor: Ms. Laura Roark

MI-A 8 The Effect of Nanoparticles on the Growth of *E. coli* and *S. epidermidis*

Claire Nichols, Hidden Valley High School

Teacher sponsor: Mr. Steve Smith

MICROBIOLOGY B

MI-B 1 The Effect of Kombucha Fermentation on Level of Peanut Allergens

Elizabeth Fedor, William Byrd High School

Jennie Pham, William Fleming High School

Teacher sponsor: Ms. Cindy Bohland

MI-B 2 The Inhibitory Effects of *Brassica nigra* Seed Distillate on *E. coli*

Sophia Schumaecker, Cave Spring High School

Claire Wei, Cave Spring High School

Teacher sponsor: Ms. Laura Roark

MI-B 3 The Effect of *Aloe vera* Extract and Tea Tree Oil on Various Bacteria

Sara Drewry, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

MI-B 4 The Synergistic Effect of Clove Bud Oil and Cinnamaldehyde on *E. coli*

Canaan (Cane) Fetzer, Cave Spring High School

Nathan Sprouse, Cave Spring High School

Teacher sponsor: Ms. Laura Roark

MI-B 5 The Analysis of Curcumin in Preventing Ultraviolet Radiation Damage to the DNA of *E. coli*

Coleman Blanton, Hidden Valley High School

Erin Wienke, William Byrd High School

Teacher sponsor: Mrs. Melissa Fisher

MI-B 6 The Effect of Thymus Oil on the Growth of *E. coli*

Christopher (Durbin) Stevens, Patrick Henry High School

Darryl Wilson, III, William Fleming High School

Teacher sponsor: Ms. Laura Roark

MI-B 7 A Survey of Antibiotic Resistant Bacteria in Smith Mountain Lake

Parker Neal, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

MI-B 8 The Effect of Hydrochloric Acid and Main Active Ingredients in an Antacid on *E. coli*

Autumn O'Connor, Patrick Henry High School

John Paul (JP) Prusakowski, Patrick Henry High School

Teacher sponsor: Ms. Laura Roark

MICROBIOLOGY C

MI-C 1 The Synergistic Effect of Clindamycin Phosphate and Tetracycline on *S. epidermidis*

Benjamin Blevins, Staunton River High School

Emily Kiser, Staunton River High School

Teacher sponsor: Ms. Laura Roark

MI-C 2 The Antibacterial Effect of Pure Metal Powder on the Growth of *Staphylococcus epidermis*

Emma Thielecke, Patrick Henry High School

Teacher sponsor: Mr. Steve Smith

MI-C 3 The Synergistic Effect of Clove Oil and Cinnamaldehyde on the Inhibition of *E. coli K-12*

Autumn Reed, Patrick Henry High School

Emma Seidel, Patrick Henry High School

Teacher sponsor: Ms. Laura Roark

MI-C 4 Bioremediation of heterocyclic dyes by Pseudomonads

Murphy Johnson, Patrick Henry High School

Richard (Jack) Shepherd, Patrick Henry High School

Teacher sponsor: Ms. Cindy Bohland

MI-C 5 The Effect of Citric Acid and Octanoic Acid on the Growth of *E. coli*

Rebecca Collier, Patrick Henry High School

Titus Counihan, Patrick Henry High School

Teacher sponsor: Ms. Laura Roark

MI-C 6 The Effect of Silver and Antibiotics on the Growth of *E. coli*

Claire Dozier, Lord Botetourt High School

Teacher sponsor: Mr. Steve Smith

MI-C 7 The Effect of Garlic Extract on *E. coli* and *S. epidermidis*

Tristen (Jack) David, Franklin County High School

Coleman Grindstaff, Franklin County High School

Teacher sponsor: Ms. Laura Roark

PLANT SCIENCES A

PS-A 1 The Allelopathic Effect of *P. pennsylvanicum* on the Germination of *C. moschata*

Alex Kurtz, Franklin County High School
Brayden Whitlow, Franklin County High School
Teacher sponsor: Mr. Matthew Browning

PS-A 2 The Allelopathic Effect of *C. latifolia* on the Germination of *C. oleracea*

Maximillian Roberson, Patrick Henry High School
Bennett (Ben) Scoville, Patrick Henry High School
Teacher sponsor: Mr. Matthew Browning

PS-A 3 The Effect of Synthetic and Organic Pesticides on the Growth and Germination of *Vigna radiata*

Anna Frittman, Lord Botetourt High School
Spencer Kearns, Staunton River High School
Teacher sponsor: Mrs. Joanne Villers

PS-A 4 The Allelopathic Effect of *T. patula* Organs on the Germination & Growth of *L. lycopersicum* and *T. repens*

Madalyn Likens, Patrick Henry High School
Eleanor Little, Patrick Henry High School
Teacher sponsor: Mr. Matthew Browning

PS-A 5 The Effect of *Manduca sexta* on the Total Phenolic Content of *Solanum Lycopersicum*

Margaret Laflam, Hidden Valley High School
Teacher sponsor: Mr. Steve Smith

PS-A 6 The Allelopathic Effect of *O. speciosa* on the Germination of *L. perenne*

Vineel Kavuru, Hidden Valley High School
Raghav Vasudeva, Hidden Valley High School
Teacher sponsor: Mr. Matthew Browning

PS-A 7 The Allelopathic Effect of *F. arundinacea* on the Germination of *G. max* and *A. retroflexus*

Josephine (Josie) Fratacelli, Glenvar High School
Nicholas Louvet, Glenvar High School
Teacher sponsor: Mr. Matthew Browning

PS-A 8 The Effect of Carbon Dioxide on *Pisum sativum* Growth

Evan Hahn, Franklin County High School
Hannah Largen, Franklin County High School
Teacher sponsor: Mrs. Joanne Villers

PS-A 9 The Allelopathic Effect of *M. spicata* Organs on the Germination of *E. vesicaria* and *T. repens*

Falan Peters, Lord Botetourt High School
Cole Stelter, Lord Botetourt High School
Teacher sponsor: Mr. Matthew Browning

PS-A 10 Pulverized Paper as an Alternative Fertilizer for Plant Growth

Andrew Sakamoto, Hidden Valley High School
Hunter Sipe, William Byrd High School
Teacher sponsor: Mr. Steve Smith

PLANT SCIENCES B

PS-B 1 The Allelopathic Effect of *R. sativus* on the Germination of *B. rapa*

Shane Cockram, Franklin County High School

Lucas Mann, Franklin County High School

Teacher sponsor: Mr. Matthew Browning

PS-B 2 The Allelopathic Effect of *R. officinalis* on the Germination and Growth of *V. radiata* and *T. aestivum*

Abby Wyatt, Staunton River High School

Teacher sponsor: Mr. Steve Smith

PS-B 3 The Allelopathic Effect of *R. reticulata* on the Germination of *C. pepo*

Mohammed (Mo) Albarakat, Patrick Henry High School

Luke Moon, Patrick Henry High School

Teacher sponsor: Mr. Matthew Browning

PS-B 4 Phytoremediation of Lead (II) Nitrate Contaminated Soil by *Brassica juncea* and *Helianthus annuus*

Clara Higgins, Patrick Henry High School

Olivia Reichardt, Patrick Henry High School

Teacher sponsor: Mrs. Joanne Villers

PS-B 5 The Allelopathic Effect of *P. drummondii* on the Germination of *P. pratensis* and *T. officinale*

Georgia Honts, James River High School

Timothy Wilson, James River High School

Teacher sponsor: Mr. Matthew Browning

PS-B 6 The Allelopathic Effect of *C. annuum* on the Germination and Growth of *R. sativus*

Kaleb Fricke, William Fleming High School

Krischal Sutar, William Fleming High School

Teacher sponsor: Mr. Matthew Browning

PS-B 7 Analyzing Sunflowers' Phytoremediation Capacities for Heavy Metal Pollutants

Kevin Cruz, William Fleming High School

Benjamin Newman, Salem High School

Teacher sponsor: Ms. Cindy Bohland

PS-B 8 The Effect of a Natural Multi-Plant Herbicide on Terrestrial and Aquatic Plants

Ryan Mollin, Franklin County High School

Teacher sponsor: Mr. Steve Smith

PS-B 9 The Allelopathic Effect of *T. erecta* Organs on the Germination of *C. sativus*

Paulo Carey, Franklin County High School

Marissa Martin, Northside High School

Teacher sponsor: Mr. Matthew Browning

SYSTEMS SOFTWARE A

SS-A 1 Language Assessment Software and Digital Assistant for Primary Progressive Aphasia Variants

Liam Heaslip, Franklin County High School

Mason McGrady, Franklin County High School

Teacher sponsor: Mr. Doug Divers

SS-A 2 Emotion Detection Using Facial Recognition

Conner Deering, Franklin County High School

James (Garett) Jetmar, Franklin County High School

Teacher sponsor: Mr. Doug Divers

SS-A 3 The Development of a Secure School Application

Jagger LaDouceur, Hidden Valley High School

Teacher sponsor: Mrs. Melissa Fisher

SS-A 4 Designing a Roller Coaster Based on Components

Alexandra (Lexie) Rhodes, Cave Spring High School

Teacher sponsor: Mr. Doug Divers

SS-A 5 Iris Flower Classification Using Machine Learning

Harrison Bui, Hidden Valley High School

Jonathan Rivers, Staunton River High School

Teacher sponsor: Mr. Doug Divers

SS-A 6 Physics Engine for Calculating Geodesics of Particles on a Lorentzian Manifold

James Whiting, William Fleming High School

Teacher sponsor: Mr. Doug Divers

SS-A 7 A Program to Assess the Efficiency and Growth of Medical Residents

Meitra Kazemi, Hidden Valley High School

Teacher sponsor: Mr. Doug Divers

SYSTEMS SOFTWARE B

SS-B 1 Python Program to Detect Problem Behaviors in Individuals

Rafid Mirza, Glenvar High School

Kaden Whitenack, Hidden Valley High School

Teacher sponsor: Mr. Doug Divers

SS-B 2 Applying Significant Figures in a Python Program

Andres Hernandez, Lord Botetourt High School

Teacher sponsor: Mr. Doug Divers

SS-B 3 Using Machine Learning to Accurately Read Handwriting

Tai Phan, Northside High School

Riley Wood, Franklin County High School

Teacher sponsor: Mr. Doug Divers

SS-B 4 Using Python and OpenCV to Create a Real Time American Sign Language Gesture Translator

Ella Bryant, Northside High School

Holly Hinchy, Cave Spring High School

Teacher sponsor: Mr. Doug Divers

SS-B 5 Cohesive Multi-Agent Reinforcement Learning Algorithm Auto-curricula for Traffic Stop Simulations

Michael Lin, Hidden Valley High School

Teacher sponsor: Mr. Doug Divers

SS-B 6 Adolescent Generalized Anxiety Disorder Reducing Program

Jamesa (Mecayla) Gray, Franklin County High School

Hannah Peters, Franklin County High School

Teacher sponsor: Mr. Doug Divers

SS-B 7 A Novel Algorithm for Cooperative GPS Navigation

Siddhartha (Sid) Lamichhane, Patrick Henry High School

Charles Murphy, Patrick Henry High School

Teacher sponsor: Mr. Doug Divers

