

## Virginia State Science and Engineering Fair (VSSEF) winners announced

May 8, 2018

More than 270 students from across the commonwealth competed in the Virginia State Science and Engineering Fair (VSSEF) April 14 in Roanoke, Virginia. The event was held at the Berglund Center and hosted by the Virginia Tech Carilion School of Medicine.

The Governor's Award and grand prize went to David Toomer from Hayfield Secondary School in the Fairfax Region for his project titled, "Augmenting Gaseous Adsorption Capabilities." His project was also first place-winner for the category, Chemistry.

The second grand prize went to Kavya Kopparapu from Thomas Jefferson High School in the Fairfax Region for her project titled, "Gliovision: Computational Analysis of Glioblastoma." Her project was also first place-winner for the category, Medical and Health Sciences.

The third grand prize went to three teams. The first third-place team was Patrick Berry and Matthew Baharmast from James Madison High School in the Fairfax Region for their project titled, "The Effect of Nanotechnology on Purifying Water Supply in the Developing World." Their project was also a first-place winner for the category, Microbiology. The second third-place team was Miamar Burgos-Rosario, Sarah Syed, and Saijai Supanklang from Hayfield Secondary School in the Fairfax Region for their project titled, "Cyanofertilization: A Comparative Analysis of Biological and Environmental Impacts." Their project was also a first-place winner for the category, Plant Sciences. Finally, the third third-place winner was Ana Humphrey from T.C. Williams High School in the NoVA Region for her project titled, "Finding Exoplanets by Assessing the Dynamical Packing of Kepler Three- and Four-Candidate Systems." Her project was also a first-place winner for the category, Physics and Astronomy.

### Category Winners

#### ***Animal Science***

- First: Tiana Horace; Roanoke Valley Governor's School/William Fleming High School, Western VA Region, "Analyzing the Hybrid Zone Between *G. firmus* and *G. pennsylvanicus* Using Three SNPs"
- Second: Skylar Brodowski; Washington-Lee High School, NoVA Region, "See the Bees Speak: Confined Direct Analysis in Real Time and MS for *B. impatiens* and *A. mellifera* Alarm Pheromone Detection."
- Third: David Griffith; Math and Science Academy at Ocean Lakes High School, Tidewater Region, "The Perfect Day to Lay an Egg: Meteorological and Oceanographic Factors Impacting Sea Turtle Nesting."
- Honorable Mention: Justin Markov Madanick; Dominion High School, Loudon Region, "Veterinary Drug Delivery via Multi-lamellar Spherical Delivery Complexes Created via Reverse Spherification."

#### ***Behavioral and Social Science***

- First: Dakota Clark; Central Virginia Governor's School/EC Glass High School, Central VA Region, "The Effect of Audio Assistance on the High Scores of Visually Impaired Video Game Players."
- Second: Collin Murphy; Godwin High School, Metro RVA Region; "The Effect of Diet on Cognition in a Rat Model."
- Third: Madison Cruz; Peninsula Catholic High School, Tidewater Region, "POC-MON: A Novel and Cost-Effective Pocket Lemon Sniff Test (PLST) for Early Detection of Major Depressive Disorder."
- Honorable Mention: Marina Pantner; Central Virginia Governor's School/EC Glass High School, Central VA Region, "The Effect of Boredom Proneness on Jury Verdicts."

### ***Biochemistry***

- First: Alexander Ahn, Eric Sun, and Anish Karapurapu; Thomas Jefferson High School, Fairfax Region, “Using the CRISPR/Cas9 System to Reverse Multi-Drug Resistance in Breast Cancer Cells.”
- Second: Nirzaree Raval and Pranavi Pallinti; Loudoun Academy of Science/Rock Ridge High School (Raval) and Loudoun Academy of Science/Dominion High School (Pallinti), Loudoun Region, “The Epigenetic Effects of Folic Acid and Vitamin K on Alzheimer’s Disease.”
- Third: Suchitra Sudarshan; George C. Marshall High School, Fairfax Region, “Phenol Red as a Novel Application for the Detection of E. coli in Water Mediums.”
- Honorable Mention: Zhiyuan Li and Rohan Parikh, Loudoun Academy of Science/Freedom High School (Li) and Loudoun Academy of Science/Riverside High School (Parikh), Loudoun Region, “Fighting Cancer and Infections: Developing a Unique Medical-Grade Honey Which Maximizes Glucose Oxidase Activity.”

### ***Cellular and Molecular Biology***

- First: Richard Qiu and Matthew Svec; Roanoke Valley Governor’s School/William Byrd High School (Qiu) and Roanoke Valley Governor’s School/Hidden Valley High School (Svec), Western VA Region, “Diabetes-Mediated Dysregulation of the Blood-Brain Barrier: Concept, Mechanism, and Implications.”
- Second: Christopher Bi and Karthik Budharaju; Thomas Jefferson High School, Fairfax Region, “Identifying Alzheimer’s-Associated Proteins as Substrates of a Novel Protein Quality Control Pathway.”
- Third: Anjali Patel; Governor’s School of Science and Technology/Windsor High School, Tidewater Region, “Interplay of Tau and alpha-synuclein on TAPP/p25.”
- Honorable Mention: Raaga Unmesha Vullikanti; Blacksburg High School, Blue Ridge Region, “Peptide Nucleic Acids as Designer Antimicrobials.”

### ***Chemistry***

- First: David Toomer (Governor’s Award and grand prize winner – See information above)
- Second: Ryan Chou; McLean High School, Fairfax Region, “The Effect of Activated Charcoal Quantity on its Absorption Ability.”
- Third: Rosa Bouchery and Sean Bouchery; Osbourn Park High School, PWM Region, “How Does Using Hydrogen as an Additive to Gasoline Affect Engine Performance?”
- Honorable Mention: Emily Cathey; Roanoke Valley Governor’s School/Patrick Henry High School, Western VA Region, “The Use of Atomic Force Microscopy to Determine Sub-Microscopic Copper Corrosion.”

### ***Computer Science***

- First: Abigail Hartless; Central Virginia Governor’s School/Amherst High School, Central VA Region, “The Effect of Various New England Dialects on Voice Recognition Accuracy Rates of Siri.”
- Second: William Peterson; Loudoun County High School, Loudoun Region, “Development of a CAD System for Mammogram Scans.”
- Third: Madden Moore; Loudoun Academy of Science/Freedom High School, Loudoun Region, “Detecting Multiple Cancers Through MicroRNA Biomarkers Using Different Machine Learning Algorithms and Statistical Analysis.”
- Honorable Mentions
  - Anders Knopse; St. Anne’s-Belfield School, Piedmont Region, “Revealing Unseen Motion: Eulerian Magnification Applied to Live Video.”
  - Nikhil Sardana and Justin Zhang; Thomas Jefferson High School, Fairfax Region, “Improving the Single Shot Detector for Real-Time Object Detection and Instance Segmentation.”

### ***Earth and Planetary Science***

- First: Joshua McCoy and Grace Cooper; Thomas A. Edison High School, Fairfax Region, “A Science-Based Approach to Volcanic Hazard Assessments.”
- Second: Julia Douvas and Adah MacDonald; Mills E. Godwin High School, Piedmont Region, “Improving Weather Forecasting by Developing a Total Lightning Detection Cellular Network.”
- Third: Ethan Schaefer; Godwin High School, Metro RVA Region, “A Study of Various Concentrations of Silver Iodide on Ice Crystal Nucleation.”
- Honorable Mentions
  - Rose Born; York High School, Tidewater Region, “The Effect of Temperature on Naturally Occurring Gamma Radiation.”
  - Kevin Duffy; Lake Braddock Secondary School, Fairfax Region, “A Study of the Urban Heat Island Effect on the Washington-Baltimore Metro Area.”

### ***Energy and Transportation***

- First: Anuraag Kaashyap and Kirthi Kumar; Thomas Jefferson High School, Fairfax Region, “Track It Safe – Implementing Drones to Redefine Train Track Safety Via Computer Vision.”
- Second: Konrad Siebor and James Li; Loudoun Academy of Science/Potomac Falls High School (Siebor) and Loudoun Academy of Science/Dominion High School (Li), Loudoun Region, “Battling the Heat Island Effect: Improving the Heat Mitigation Properties of Cool Materials by Modulating Substrate Surface Geometry.”
- Third: Varshini Babu; Thomas Jefferson High School, Fairfax Region, “Window to the Future: A Filter-Based Application of Dye-Sensitized Solar Cells.”
- Honorable Mention: Ramprasanna Chandraseker; Rock Ridge High School, Loudoun Region, “Effect of Material Composition on Immobilized Yeast Cell Ethanol Production.”

### ***Engineering: Electrical and Mechanical***

- First: Nintin Dass, Yashasvi Bolisetty, and Srinidhi Krishnamurthy; Thomas Jefferson High School, Fairfax Region, “Vitalize: A Novel Artificial Spinal Cord Framed Around Sequence-to-Sequence Learning Algorithms.”
- Second: Gwyneth Schloer; Rock Ridge High School, Loudoun Region, “Mathematically Accurate, Double-Axis Microgravity Simulator.”
- Third: Elijah Hodges, Liam Lawrence, and Siddharth Nathella; Blacksburg High School, Blue Ridge Region, “Genesis of an Isolated High Dynamic Range Video System.”
- Honorable Mention: Jacob DiGirolamo; Loudoun Valley High School, Loudoun Region, “The Designing and Prototyping of Pneumatic Tools That Are Capable of Being Produced Using Additive Manufacturing.”

### ***Engineering: Material and Bioengineering***

- First: Syed Hossain; Herndon High School, Fairfax Region, “A Novel Drop Reduction Mechanism for Optimization of Ophthalmic Drug Delivery.”
- Second: Alexander Liu and Eileen Wen; Thomas Jefferson High School, Fairfax Region, “Exploration of Chelation Materials for Treatment of Alzheimer’s Disease.”
- Third: Rachel Naidich, Kshamata Neupane and Ish Sethi; Thomas Jefferson High School, Fairfax Region, “SmartSleeve: A Novel, Wearable Joint Rehabilitation Device.”
- Honorable Mention: Reid Tenzer; Roanoke Valley Governor’s School/Patrick Henry High School, Western VA Region, “Dilatant Insert to Reduce Damage Inflicted by Peripheral Neuropathy.”

### ***Environmental Management***

- First: Wen Ip and Harin Ok; Oakton High School, Fairfax Region, "Various Eluting Agents for Optimization of Biosorbent Filtration."
- Second: Gabrielle Karam and Marwan Popal; Riverside High School, Loudoun Region, "The Effect of Iron (III) Nitrate on the Efficiency of Hydroponic Phytoremediation of *Eruca satvia*."
- Third: James Licato; Washington-Lee High School, NoVA Region, "The Effect of Pharmaceuticals on Denitrification."
- Honorable Mention: Sitara Sastry; Oakton High School, Fairfax Region, "The Effect of Different Point-of-Use Water Filtration Mechanisms on Water Quality."

### ***Environmental Sciences***

- First: Julia Hakeem and Mary Waclawski; James Madison High School, Fairfax Region, "Assessing Potential Habitats for Brook Trout Sustainability."
- Second: Sophia Goldbeck and Christopher Nguyen; Loudoun Academy of Science/Dominion High School (Goldbeck) and Loudoun Academy of Science/John Champe High School (Nguyen), Loudoun Region, "Modeling a New Coral Mucus to Prevent Coral Bleaching: Determining the Resistance of *Halomonas Halodenitrificans* Biofilm Formation to pH."
- Third: Chloe Fugle; HB Woodlawn Secondary Program, NoVA Region, "The Effect of Sea Level Rise on Marsh Grasses."
- Honorable Mention: Turner Bumbarly; Thomas Jefferson High School, Fairfax Region, "Utilizing a Network of Weather Probes to Forecast Weather in Developing Countries."

### ***Mathematical Sciences***

- First: Nicholas Bartholomew; Heritage High School, Loudoun Region, "The Properties and Applications of the Brachistochrone Curve."
- Second: Henry Kwon; Albemarle High School, Piedmont Region, "The Farey Sequence and Ford Circles: An Exploration."
- Third: Nicole Rychagov; Cape Henry Collegiate, Tidewater Region, "Mathematical Model of HIV: Immune System Dynamics."
- Honorable Mention: Kyle Gatesman; Thomas Jefferson High School, Fairfax Region, "An Algorithmic and Computational Approach to Optimize and Combat Gerrymandering."

### ***Medical and Health Sciences***

- First: Kavya Koppurapu (Second Grand Prize, see above)
- Second: Victoria Graf; Thomas Jefferson High School, Fairfax Region, "Neurological Response to Entropy and Uncertainty in Music."
- Third: Ankit Gupta, Sylesh Suresh, and George Tang; Thomas Jefferson High School, Fairfax Region, "Alternative to Echocardiography: Deep Learning Based Application to Diagnose Heart Murmurs."
- Honorable Mention: Shannen Prindle; Oakton High School, Fairfax Region, "A Novel Approach to Improving Photodynamic Therapy."

### ***Microbiology***

- First: Patrick Berry and Matthew Baharmast (Third Grand Prize, see information above categories)
- Second: Ons Bouali; South Lakes High School, Fairfax Region, "The Antibiotic Effects of Lemongrass Essential Oil and alpha/beta Citral on Bacteria."
- Third: Brittany Stiefel; Southwest Virginia Governor's School, Blue Ridge Region, "The Prevalence of Antibiotic Resistance in the Gut Flora of Stabled and Wild Horses."

- Honorable Mention: Ben McCarthy; Central Virginia Governor’s School/EC Glass High School, Central VA Region, “The Temperature-Dependent Inhibition of Pseudogymnoascus pannorum by Pseudomonas protegens.”

### ***Physics and Astronomy***

- First: Ana Humphrey (Third Grand Prize, see information above categories)
- Second: Joshua Smith; Governor’s School @ Innovation Park, PWM Region, “Quantitative Analysis of Ionization.”
- Third: Siona Prasad; Thomas Jefferson High School, Fairfax Region, “Estimating CO2 Emissions from a City with Direct and Remote Sensing on Drones.”
- Honorable Mentions
  - Rasvik Kudum; Loudoun Academy of Science/Rock Ridge High School, Loudon Region, “Modelling the Effect of Three-Body EMRI Systems on Resultant Gravitational Waveforms.”
  - Naren Kasinath; Godwin High School, Metro RVA Region, “An Analysis of Lunar Composite Material as a Means of Shielding Against Gamma Radiation During Interplanetary Travel.”

### ***Plant Sciences***

- First: Miamar Burgos-Rosario, Sarah Syed, and Saijai Supanklang (Third Grand Prize, see above)
- Second: Jai’Chaun Paige and Ana Barrios; Roanoke Valley Governor’s School/William Fleming (Paige) and Roanoke Valley Governor’s School/Patrick Henry (Barrios), Western VA Region, “The Effect of Juglone on the Expression of ARR5, a Gene Involved in the Root Growth in Arabidopsis.”
- Third: Korrina Gidwani; Thomas Jefferson High School, Fairfax Region, “The Effect of Quinine on Tobacco Mosaic Virus Growth Rate in Infected Tobacco Plants.”
- Honorable Mention: Nathan Snyder; Yorktown High School, NoVA Region, “Gravitropism in Snow Pea Plants.”

### **Special Awards**

Student participants were also eligible for a number of special awards, given by sponsors and organizations. Winners were selected based on the criteria of the award.

The American Meteorological Society awards certificates to the two-best meteorological-related projects:

- Hanwen Zhang; James Madison High School; Fairfax Region
- Nathalie Schelin; Independent School of Winchester; Shenandoah Region

The American Psychological Association awards a certificate of outstanding research in psychology in the category of Behavioral and Social Sciences.

- Victoria Graf; Thomas Jefferson High School; Fairfax Region

The Virginia Section of the American Water Works Association presents a certificate and monetary prize for three projects related to water or that address drinking water issues.

- First: Isaac Alderfer and Gabrielle DelBiondo; Massanutten Regional Governor’s School, Shenandoah Region
- Second: Sitara Sastry; Oakton High School; Fairfax Region
- Third: Maria Caballero and Amy Lee; Liberty High School; Fauquier Region

The Association for Women Geoscientists awards a certificate to a female student whose project exemplifies high standards of innovativeness and scientific excellence in the geosciences.

- Ainsley LaPlante; Southwest Virginia Governor’s School; Blue Ridge Region

The ASU Walton Sustainability Solutions Initiatives awards certificates to projects seeking innovative solutions to humanity’s most challenging problems in the environment or socio-economic prosperity.

- Rachel Naidich, Kshamata Neupane, and Ish Sethi; Thomas Jefferson High School; Fairfax Region

The International Council of System Engineers (INCOSE) awards certificates and monetary prizes for three projects that show the greatest innovation without the support of funding of professional laboratories or advisors.

- First: Corwin Warner; Loudoun County High School; Loudoun Region
- Second: Lila Hutchinson; Central Virginia Governor’s School/EC Glass High School; Central VA Region
- Third: Katherine Corbett, Zachary Bray, and Cais Thomas; Burton Center for Arts and Technology/Hidden Valley High School (Corbett and Thomas) and Burton Center for Arts and Technology/William Byrd High School (Bray); Western VA Region
- Honorable Mention: Abby Ranson; Central Virginia Governor’s School/Appomattox High School; Central VA Region

The Intel Excellence in Computer Science awards a certificate and monetary prize to the most outstanding computer science project.

- David Day; Yorktown High School; NoVA Region

The Leidos Corporation offers monetary awards in the fields of microbiology, physics/astronomy, applied science, and computational science.

- First Place (Applied): Kavya Kopparapu; Thomas Jefferson High School; Fairfax Region
- First Place (Computational): Yug Rao; Maggie L. Walker Governor’s School for Government and International Studies; Metro RVA Region
- Second Place (Applied): Srinidhi Krishnamurthy and Nithin Dass; Thomas Jefferson High School; Fairfax Region
- Second Place (Computational): Anders Knopse; St. Anne’s-Belfield School; Piedmont Region
- Third Place (Applied): Alexander Ahn and Eric Sun; Thomas Jefferson High School; Fairfax Region
- Third Place (Computational): Elijah Hodges, Liam Lawrence, and Siddharth Nethella; Blacksburg High School; Blue Ridge Region
- Honorable Mention (Applied):
  - Mriganka Mandal and Sophie Meyer; Albemarle High School; Piedmont Region
  - Patrick Berry and Matthew Baharmast; James Madison High School; Fairfax Region
- Honorable Mention (Computational):
  - Ankit Gupta, Sylesh Suresh, and George Tang; Thomas Jefferson High School; Fairfax Region
  - Nikhill Sardana and Justin Zhang; Thomas Jefferson High School; Fairfax Region
- Young Virginia Researcher: Rachel Naidich, Kshamata Neupane, and Ish Sethi; Thomas Jefferson High School; Fairfax Region

Mu Alpha Theta awards a certificate to the project that demonstrates the most challenging, original, thorough, and creative investigation of a problem involving modern mathematics.

- Henry Kwon; Albemarle High School; Piedmont Region

The NASA Earth System Science Award recognizes outstanding projects relating to earth system science, particularly one offering the greatest insight into the earth’s interconnected systems.

- Siona Prasad; Thomas Jefferson High School; Fairfax Region

The National Oceanic and Atmospheric Administration awards a project whose research emphasizes their mission of keeping citizens informed of the changing environment around them.

- David Griffith; Math and Science Academy at Ocean Lakes High School; Tidewater Region
- Nathalie Schelin; Independent School of Winchester; Shenandoah Region

The Office of Naval Research plans, executes, coordinates, and promotes science and technology for the US Navy and Marine Corps through work performed at universities, naval laboratories, and industrial research centers. The office recognizes five projects.

- Jacob DiGirolamo; Loudoun Valley High School; Loudoun Region
- James Lee; Chelsea Academy; Shenandoah Region
- Mihir Patel; Thomas Jefferson High School; Fairfax Region
- Gwyneth Schloer; Rock Ridge High School; Loudoun Region
- Shreya Tripathy; Chantilly High School; Fairfax Region

The Ricoh Sustainable Development Award recognizes one innovative project which best reflects the principles of sustainability.

- Turner Bumbarly; Thomas Jefferson High School; Fairfax Region

The Stockholm Junior Water Prize awards certificates to the top three most outstanding water-related research projects.

- James Licato; Washington-Lee High School; NoVA Region
- Isaac Alderfer and Gabrielle DelBiondo; Massanutten Regional Governor's School; Shenandoah Region
- Romina Kamrani and Caroline Scheider-Williams; James Madison High School; Fairfax Region

The US Air Force recognizes projects in math, science, and engineering that offer Air Force applicability.

- Connor Marshall; West Potomac High School; Fairfax Region
- Elizabeth Hinton; York High School; Tidewater Region
- Jack McLaughlin and LeeYung Chang; Thomas Jefferson High School; Fairfax Region
- Corwin Warner; Loudoun County High School; Loudoun Region

The US Metric Association Award recognizes a project involving significant quantitative measurement and which best uses the SI metric system.

- Jose Alvarado Alvarenga; Mount Vernon High School; Fairfax Region

The Virginia Bioscience Foundation presents prizes for projects related to biological sciences.

- First: Alexander Ahn, Eric Sun, and Anish Karpurapu; Thomas Jefferson High School; Fairfax Region
- Second: Marissa Sumathipala; Broad Run High School; Loudoun Region
- Third: Srinidhi Krishnamurthy, Nithin Dass, and Yashasvi Bolisetty; Thomas Jefferson High School; Fairfax Region

The Virginia Dental Association promotes dentistry to their communities' science-talented students.

- Bennet Malbon Grand Prize: Divya Kranthi; Hayfield Second School; Fairfax Region
- Cellular and Molecular Biology: Neha Damaraju; Thomas Jefferson High School; Fairfax Region
- Engineering: Electrical and Mechanical: Srinidhi Krishnamurthy and Nithin Dass; Thomas Jefferson High School; Fairfax Region
- Engineering: Materials and Bioengineering: George Tang, Ankit Gupta, and Sylesh Suresh; Thomas Jefferson High School; Fairfax Region

- Physics and Astronomy: Sagada Penano and Luke Mrini; Lake Braddock Secondary School; Fairfax Region

The Yale Science and Engineering Award is presented to an 11<sup>th</sup> grade student who presents the most outstanding project in the areas of computer science, engineering, physics, or chemistry.

- Katharine Schlachter; Wakefield High School; NoVA Region