THE GOVERNOR'S SCHOOL for SCIENCE AND TECHNOLOGY

New Horizons REGIONAL EDUCATION CENTERS

Spring 2014

Newsletter

NASA PARTNERS WITH GSST

NASA Langley Research Center and the Governor's School for Science and Technology have signed a space act agreement providing gifted students the opportunity for hands-on experience and guidance in science, technology, engineering and math (STEM) with the goal of inspiring future explorers, scientists and engineers. The partnership will allow next generation students the opportunity to interact with and be mentored by NASA Langley researchers on STEM projects to expand education and knowledge through mentored projects and activities. In support of NASA Langley's STEM education mission, researchers will assist students with college-level work and provide information about NASA's vision, mission, programs and projects.

Virginia Living's editorial team has named the Governor's School for Science and Technology to its **Top High Schools and Universities 2013** list. *Virginia Living*'s **Top High Schools and Universities 2013** list recognizes innovation and excellence in secondary and higher education in Virginia across five categories: Arts & Humanities; Science, Math & Technology; Capital Improvements; Co-Ops & Partnerships; and Athletics. The Governor's School will appear in the Science, Math and Technology category for its mandatory Research Methodology and Ethics curriculum.

GSST STUDENTS AWARDED $5,701,923

The Governor's School for Science and Technology Class of 2013 was awarded $5,701,923 in scholarships from numerous top tier colleges and universities!

NASA CHOOSES GSST TEAM TO DESIGN MICROGRAVITY EXPERIMENT

Students at the Governor's School for Science and Technology (GSST) had the opportunity to design microgravity experiments that might someday become permanent components of systems aboard the International Space Station (ISS).

GSST is one of 14 schools across the country picked for the opportunity as part of the High school students United with NASA to Create Hardware (HUNCH) Extreme Science program, based at NASA's Johnson Space Center in Houston.

The first step in the process was to propose a solution to a known problem aboard the ISS, then design an experiment to demonstrate the solution's viability. After the students came up with their concept and won approval from ISS operations personnel to proceed, the really exciting part began: designing and fabricating their experiment to perform in the weightless environment of space. Four GSST students flew two experiments aboard the Zero Gravity Corporation's G-Force One plane in April, successfully testing the viability and practicality of their solutions.

The local HUNCH program, run by the Engineering Directorate at NASA's Langley Research Center in Hampton, has partnered also with more than a half dozen local schools to fabricate real-world products for NASA and put students' science, technology, engineering, and mathematics (STEM) skills to good use.

STUDENTS PARTICIPATE IN BLUE CRAB BOWL

On Saturday February 1, 2014, students from the Governor's School for Science and Technology participated in the 17th Annual Blue Crab Bowl held at Old Dominion University. The Blue Crab Bowl, a cooperative effort between Old Dominion University's Department of Ocean, Earth, and Atmospheric Sciences and the Virginia Institute of Marine Science, College of William and Mary is the Virginia regional competition of the National Ocean Science Bowl (NOSB). Designed to inspire and challenge high school students, NOSB contests like the Blue Crab Bowl test the competitors' knowledge of the marine sciences, covering the breadth of oceanography and maritime disciplines. To date, the Blue Crab Bowl has involved over 1,300 of the Commonwealth's brightest science students from 52 public and private schools across Virginia. Governor's School team members include (left to right): Tribly Brush, Team Captain Ian Gordon, Kyle Heath, and Shalni Kumar.

14TH ANNUAL CNU REGIONAL HIGH SCHOOL MATHEMATICS CONTEST

On Saturday, November 9, Governor's School students participated in the Annual CNU Regional High School Mathematics Contest. The Department of Mathematics of Christopher Newport University hosts this annual mathematics competition for high school students in southeastern Virginia to cultivate interest in good mathematics. The contest is partially sponsored by MathWorks and Mu Alpha Theta. **GSST Participants:** Miriam Buscher of Williamsburg, Edward Choi of Williamsburg, Kelly Gazarik of York, Grant Gibson of Hampton, Tanya Hoatson of Williamsburg, Chan Kim of Newport News, Sam Kim of York, Shannon King of Williamsburg, Shalni Kumar of Poquoson, Alex Liang of York, Suyoung Park of York, Jacob Pomeranz of Poquoson, Jingwei Song of York, Marc Thibodeau of Poquoson, Luke Wolff of Poquoson, and Correy Xu of York.

Instructor Highlight

In November, Governor's School Physics Instructor, Dr. Rhett Woo presented the "Flipped Classroom Model" at the 60th Annual National Association for Gifted Council (NAGC) convention in Indiana. The "Flipped Classroom" is an innovative method of teaching that is turning the traditional classroom on its head. This session provides a personal reflection of an endeavor into using the "flipped method". An emphasis is placed on the technological tools that are used to help support students and increase student engagement both inside and outside the classroom.

CYBERPATRIOT VI

Governor's School students participated in the CyberPatriot VI Challenge. CyberPatriot is the premier national high school cyber defense competition created by the Air Force Association to inspire high school students toward careers in cybersecurity or other science, technology, engineering, and mathematics (STEM) disciplines critical to our nation's future.

Honorable Mention
Top 10 Highest Overall Individual Scores
Grant Gibson, Chan Kim, Suyoung Park, Jake Pomeranz, Jingwei Song and Luke Wolff

First Place
Highest Individual Scoring Junior
Shalni Kumar

Third Highest Overall Individual Score
Coery Xu

First Place, AAA Category
Chan Kim , Alex Liang, Suyoung Park and Correy Xu

Second Place, AAA Category
Grant Gibson, Jacob Pomeranz, Marc Thibodeau and Luke Wolff

CHRISTOPHER NEWPORT UNIVERSITY

MENTORSHIP INFORMATION DAY

The senior mentorship experience is the capstone of the Governor's School program. During spring semester juniors learn about mentorship opportunities and prepare to explore mentorship options.

Students develop resumes and cover letters to send to potential mentors. An information day is held during which seniors describe their mentorship locations and experiences. Juniors are able to prioritize their areas of interest to facilitate placement.

Governor's School for Science and Technology student Marc Thibodeau, Poquoson High School, attended the Shenandoah Undergraduate Mathematics and Statistics (SUMS) Conference at James Madison University in Harrisonburg, Virginia on Saturday on September 28. The SUMS Conference is an annual event to encourage original research in mathematics at the undergraduate level. Marc attended student presentations on fractal sandpiles models, optimal tear film layers, black holes, and many other topics.

This year's SUMS conference included an opening address from Dr. Robert Lang. Dr. Lang has worked for NASA's Jet Propulsion Lab, Spectra Diode Laboratories, and JDS Uniphase, researching lasers and optoelectronics. He is also a foremost authority on computational origami. His talk described the mathematics behind origami as well as its applications, from tiny blood vessel shunts to massive space telescope components.

Marc also met students from Mountain Vista and Southwest Governor's Schools and watched a demonstration in 3-D printing while at the conference.

STUDENTS PRESENT AT I/ITSEC 2014

Governor's School students Avery Bibeau and Sam Kim from Grafton High School, have been selected to attend the Interservice/ Industry Training, Simulation and Education Conference (I/ITSE) in Orlando, FL in December. The team is one of only six high school teams given the opportunity to demonstrate their simulation project at this convention; the world's largest modeling, simulation and training conference. NHREC bus traffic is the topic of their simulation which they will generalize to more situations of traffic flow. More than 10,000 are expected at the conference from more than 75 countries. Students will be experience cutting-edge technology and see demonstrations of high-tech capabilities. The Interservice/Industry Training, Simulation and Education Conference (I/ITSEC) promotes cooperation among the Armed Services, Industry, Academia and various Government agencies in pursuit of improved training and education programs, identification of common training issues and development of multiservice programs.

What GSST Students are Saying

"I was able to graduate with a Bachelor's of Science in Biochemistry in only three years largely thanks to credits earned at the Governor's School."

"Governor's School not only challenged me with college-level physics and math courses; it distinguished me, and all my peers, as the dedicated kind of student that colleges want to admit."

"Governor's School gave me a foothold on the biochemical studies that I'm now proud to say I'm getting my PhD in."

"The immense work I put into time management, studying, and being involved at Governor's School helped me adjust to college better than any program that I had available to me in high school."

"Attending the Governor's School was probably one of the best decisions that I made during my high school career. It gave me a head start on credits for college and prepared me for the rigorous atmosphere I would experience at Texas A&M."

"The mentorship experience I had at Jefferson Lab through the Governor's School was the single most valuable experience of my career. At UVA, where I majored in physics, I was able to get involved in undergraduate research during my first year thanks to the connections I made at Jefferson Lab."

"The courses that I took in the scientific programming strand at the Governor's School went above and beyond the equivalent courses at ODU."

"While the Governor's School was extremely tough, it was well worth the while. It makes the transition to college so much smoother and a lot less stressful."

"The Governor's School prepared me for the rigor of college classes, helped me jump right in to upper level classes because of dual enrollment and even helped me get an internship based on my mentorship."

"The Governor's School has put me at a large advantage when it comes to knowledge in my area of study."

"The quality of teaching (at the Governor's School) is unmatched at a high school level"

HUNCH STUDNETS SHAKE OFF THE DUST

As astronauts launch into space, they go from feeling the Earth's gravitational pull to an experience of weightlessness, also known as Zero-Gravity (Zero-G). While floating in space, astronauts get to research and conduct experiments, but in the process, they sort of become what we Earthlings call 'clean freaks' - at least when it comes to dust. The Governor's School for Science and Technology (GSST) is helping to shake off the dust.

As part of the ***High School Students United with NASA to Create Hardware*** (HUNCH) Program, Governor's School students will develop an autonomous robot that could remove dust from surfaces aboard the ISS as well as other space vehicles. Select students will fly with components of their project on board the Zero Gravity Corporation's G-Force One plane in April at Ellington Field in Houston. Before getting to fly like superman, the students prepped for their Zero-G experiment by speaking live with STS-131 Discovery astronaut Dottie Metcalf-Lindenburger, who told the class more about her experience in space and the challenges she faced.

During the live chat, Metcalf-Lindenburger gave the students new direction, re-emphasizing the importance of working on a project revolved around dust.

"The students read about the different complaints that the astronauts had and a lot of the astronauts were complaining about dust," said NASA aerospace engineer, Adam Ben Shabat. "It accumulates and can cause allergic reactions. It also requires astronauts to take time off their experiments for cleaning. When they build their robot, it will be very beneficial to NASA and its astronauts as well as for future missions into deep space."

The HUNCH team divided into three small teams to design, build and test the "CleanBot," which will serve as a labor-saving dust collector that may eventually be used by astronauts aboard the ISS. "Often, dust accumulates on critical surfaces and in internal crevices of the ship equipment, often inaccessible or otherwise difficult to clean," explained Jordan Estep, GSST communications team lead. "It will be time and energy saving to implement an alternate cleaning method."

This year's microgravity test was conducted by the first team, who is responsible for measuring preload and pull-off forces of state of the art dry adhesives to compare adhesion performance in a Zero-G environment versus a terrestrial environment. The dry adhesive, modeled after the clinging ability of Gecko feet, will attach the crawling CleanBot to the surface as it cleans.

Next year, the second team will study adhesive behaviors in microgravity by applying forces in normal and lateral directions using a prototype CleanBot. Building on the experiences from the first two teams, team three will provide conceptual designs for a fully functioning CleanBot in order to construct and test it in future years.

Each team will take what they learned from Metcalf-Lindenburger and apply it to their current HUNCH project and future careers.

"It's really great since the astronauts are the only people that get to go in Zero-G, and we are making something for Zero-G".. "Getting feedback from someone who is actually in that environment instead of just guessing or estimating what it's like is much better." Grant Gibson, GSST Senior

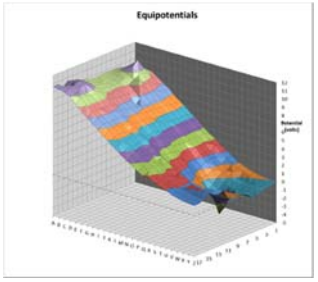
View the Governor's School NASA HEXS video on our website, www.nhrec.org/governorsschool/announcements.php.

STUDNETS HAVE AN ELECTRYING TIME

Student Tanya Hoatson from WJCC places her hand on a Van de Graff generator with a "shocking" result.

Students in Dr. Woo's Engineering Physics class have had an electrifying time learning about the properties and behavior of charges.

The spring semester of the course develops the concepts and uses of the electromagnetic force. A field theoretical model of the force is derived and practical applications of electromagnetism are explored. Students explore through hands on activities, the practical implications of the forces between charges as well as measure and map those forces. Once a basic model for the forces between charges are developed, they will extend those ideas to systems of charges. Later they explore applications of charges as they are used in circuits and circuit components. Their exploration of electricity is culminated by a group project where they design and build an electric house. This summative project allows them to test their understanding of the concepts they have learned with a real world application.



Students map the electric field of a system of charges and compare against their derived results.

For more information on the Governor's School for Science and Technology call 757-766-0000 or visit us on the web, www.nhrec.org/governorsschool/.

STUDENTS DEFY GRAVITY

Governor's School students' Christopher Feigh, Gloucester High; Matthew DiMarcantonio, Lafayette High; Bethany Wissmann, Warwick High; and William Archer, Windsor High, recently learned what it's like to defy gravity. With help from NASA, the students experienced weightlessness and, at the same time, got the chance to conduct science experiments that could one day improve life aboard the International Space Station (ISS). In early April, the four students traveled to Houston, home of NASA's Johnson Space Center. Thanks to the HUNCH program, they flew aboard the Zero Gravity Corporation's G-Force One plane. That aircraft soars along a parabolic path that allows passengers to experience microgravity. The students, along with others from across the nation, got a quick taste of what space travel feels like and what it's like to do research projects in space. Click here to read more.

The Governor's School for Science and Technology Class of 2014 was awarded $4,299,354 in scholarships from numerous top tier colleges and universities!

VERIZON AWARDS GSST $18,500

Verizons awards an $18,500 grant to the Governor's School for STEM related instruction. The grant will be used for the **Governor's School Capstone STEM Project focusing on Engineering Design.** The project will include: needs analysis; problem or opportunity identification; design alternatives creation, impact analyses, and final design selection; **modeling and simulation.**

GREAT COMPUTER CHALLENGE

Five teams from the Governor's School competed in the Great Computer Challenge at ODU on March 8. Michael Bibeau of Grafton High, Robert Livengood of Smithfield High and James Lyons of Grafton High placed First in Scientific Programming; Jacob Pomeranz and Luke Wolff of Poquoson High placed Second in Scientific Programming; Seare Farhat and Robert Peabody of Kecoughtan High placed First in Music Composition; and Lucy Jin of Tabb High, Vanessa Smart of Lafayette High, and Radha Venkatesan of Grafton High placed Second in Graphic Arts.

SCIENCE AND ENGINEERING FAIR

Governor's School students Austin Meier, Windsor High; Courtney King, Kelly Gazarik, Trace Goulter, and Nick Anselmo, Tabb High; and Pat Shorter, Gloucester High all participated in the Virginia State Science & Engineering Fair at VMI on March 29. Austin earned first place in the Energy & Transportation category with his project on converting an automobile to use Hydrogen fuel to diminish dependence on gasoline!

TEAM ARES WINS DESIGN CHALLENGE

Team Ares from the Governor's School was announced winners of the NASA Exploration Design Challenge! The team won the challenge with their radiation shield design, which will be built and flown aboard the Orion/EFT-1. The award was announced at the USA Science & Engineering Festival on April 25, 2014 at the Washington Convention Center. Click here to visit the team's Facebook page.

VCU PROGRAMMING CONTEST

Two teams from the Governor's School competed in the 2014 VCU High School Programming Contest on March 7. With a total of 21 teams competing, Governor's School teams placed fifth and eleventh. Team members included Robert Peabody, Kecoughtan High; Jacob Pomeranz, Marc Thibodeau, and Luke Wolff, Poquoson High; Michael Bibeau, and James Lyons, Grafton High; Robert Livengood, Smithfield High; and Mac Toole, Tabb High.

STEM ESSAY CONTEST

On May 7, First Lady Dorothy McAuliffe and the Virginia Council on Women, in collaboration with the Science Museum of Virginia, announced the winners of the 3rd annual STEM (Science, Technology, Engineering, and Math) Essay Contest for high school junior and senior girls. The Council awarded five scholarships to female juniors and seniors pursuing STEM careers at institutions of higher education. 270 young women from across the Commonwealth submitted essays focusing on the student's vision for a future STEM. Governor's School student, Kaela Frazier, Bruton High, placed Fourth and received a 2,500 scholarship award.

NATIONAL JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

Governor's School student, Tanya Hoatson, Lafayette High, presented her research findings at the National Junior Science and Humanities Symposium (JSHS). Presenting her project, *Measuring the Visible Luminosity of Stars at Known Distances Using Matlab*, Tanya placed fifth overall in the poster session. Progressing from the regional symposium at JMU, Tanya was one of 230 students who presented their research in Washington, D.C. JSHS is a collaborative effort between the research offices of the United States Departments of the Army, Navy, and Air Force, the Academy of Applied Science, and leading research universities throughout the nation.