The George Washington University
Virginia Science & Technology Campus

8th Annual

SCIENCE, TECHNOLOGY & ENGINEERING DAY

GW will host the 8th Annual Science, Technology & Engineering Day on Thursday, April 24, 2014, 9 a.m. to 3:30 p.m.

The event is designed for Loudoun County Public School students in grades ten through twelve. Enrollment is limited. Online registration is coordinated by the science teachers in each high school.

2014 WORKSHOP CHOICES INCLUDE:

- Car Crashes & Injuries
- Genetics and the Key to Personalized Medicine
- Greater than the Sum of its Parts: Integrating a Robotic System
- Herbal Medicinal Compounding
- Hollywood Magic versus Digital Forensic Reality
- Quadrotor Dynamics and Flight
- Saving Lives: How Cutting-Edge Vehicle Instrumentation Will Create a Safer Driving Environment
- Technology and the World of Nursing
- The Flight of a Ping Pong Ball
- The Science of Accident Investigation
- The Science of Training an Elite Athlete
- Using Sunlight to Remove Carbon Dioxide from the Atmosphere

REGISTER ONLINE BY *Friday, April 11, 2014*

http://virginia.gwu.edu/steday/

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Car Crashes & Injuries: How Accident Analyses and Computer Simulation is Used to Design Safer Cars

GW School of Engineering and Applied Science, Dept. of Civil and Environmental Engineering

Gain an understanding of vehicular crash safety and the multi-disciplinary fields needed to address this rising problem. Learn how to analyze accident reports to discover typical injuries in head-on or side impact crashes in cars. Review crash tests that simulate common crash scenarios and learn how computer simulations can be used as a tool to study occupant kinematics and assess injuries. You will work in teams to study a set of accident reports and then assess how crash injuries and occupant behavior occur. You will be challenged to determine the causes for the accidents. The teams will propose safety features that could be implemented into the design of new cars. You will then propose new test conditions that could be implemented in new safety standards based on your own analyses!

Genetics and the Key to Personalized Medicine

GW School of Medicine and Health Sciences

Genetic testing has received much attention in the forensic and medical areas. Pharmacogenomics is the future of personalized health care, enabling physicians to tailor a medication therapy to the needs of an individual based on their specific genetic makeup. You will gain hands-on experience manipulating and analyzing DNA and learn basic techniques used in DNA fingerprinting, sequencing and genetic analysis. You will also learn about the genetic techniques shown on popular TV shows such as CSI and how they are being used in the medical field to improve patient care. This workshop is highly recommended for students interested in pursuing a career in the biological sciences, medicine or pharmacy.

Greater than the Sum of its Parts: Integrating a Robotic System

GW School of Engineering and Applied Science, Dept. of Mechanical & Aerospace Engineering

As the boundaries between technical disciplines continue to blur, scientists and engineers are increasingly relied upon to look outside their specialties into other fields for inspiration and assistance in solving problems. Robotics has long been at the forefront of this trend, integrating mechanical, electrical and computer systems for various purposes. In recent years, the field has further evolved, looking to biological systems for novel system designs, from analyzing how a cockroach crawls over obstacles twice its height to mimicking the way in which an octopus is able to continuously deform its arms to wrap around and grasp objects of varying size and shape. In this workshop, you'll learn how mechanical and electrical components are integrated with software through a controller to operate robots in real-time. You will also learn how to interface different types of sensors and actuators to a tiny computer board known as a microcontroller, how to program it and how to build a mobile robot capable of following curved lines and avoiding obstacles.

Herbal Medicinal Compounding

Shenandoah University, Bernard J. Dunn School of Pharmacy

For over 5,000 years herbs and other natural products have been principal sources of pharmacologically active compounds. Current prescription-based treatments for diabetes, cardiovascular disease and cancer find their origins in plants such as galega ("goat's rue"), willow bark and the bark of the Pacific yew tree. For some patients, however, because of their age, allergies or failure of a standard treatment, physicians need to prescribe a compound medication which is customized to an individual person—or animal's—needs. In this interactive lab experience, learn about and experiment with medicinal plant compounding. Discover how household items and plants from your garden are commonly used to create topical medicinal therapies for wound healing, pain relief, bacteria control and skin regeneration.

Hollywood Magic versus Digital Forensic Reality

The College of Professional Studies, Safety & Security Leadership and CyTech Services, Inc.

Television shows such as CSI and NCIS focus heavily on crime scene investigations, depicting the investigators as walking encyclopedias who can solve complex cases in under an hour using sophisticated technology. These investigators possess an amazing technical ability to recover or decode useful information from almost any electronic device regardless of its condition. Digital Forensics is an exciting and rewarding career, but how does the real job stack up to Hollywood's depictions? In this session you will do a point-by-point comparison of entertainment versus real life and see if you can figure out which part of the digital forensic science depicted in these shows is actually possible, and which part is Hollywood magic.

Quadrotor Dynamics and Flight

School of Engineering and Applied Science, Dept. of Mechanical and Aerospace Engineering

Unmanned Aerial Vehicles (UAVs) have a wide variety of applications including drone flights in the military, assisting in civilian search and rescue, and aerial mapping and surveillance. Quadrotors, a newer type of micro-air vehicle, are pushing the boundaries in multi-craft communication, environmental exploration and maneuverability. In this workshop witness a quadrotor in action and learn the unique dynamics required for its control systems. You will test your own control strategies on an inverted pendulum and then maneuver the quadrotor over a given trajectory and test its response rate. Now think how would you control multiple quadrotors and fly them over various terrains with unpredictable conditions? Learn firsthand how scientists are improving multi-vehicle quadrotor controls by understanding the environmental impact of turbulence such as wind and waves.

Saving Lives: How Cutting-Edge Vehicle Instrumentation Will Create a Safer Driving Environment

GW School of Engineering and Applied Science, Dept. of Civil and Environmental Engineering

Automobile manufacturers are developing the next generation of predictive warning systems, such as cameras, signals and autonomous systems that help keep a car under control and prevent an accident. But did you know that 95% of automobile accidents are caused by human error? Those at highest risk for collision are the young or inexperienced drivers because they have not yet learned how to identify and avoid traffic hazards. How can we create a new model that will increase both the driver's responsiveness and provide a safer driving environment for these younger drivers? In this workshop you will explore a vehicle that has been outfitted with special instrumentation to detect its surroundings and learn how collected trajectory data is used to create a model for improving driver behavior while providing a safer driving environment.

Technology and the World of Nursing

GW School of Nursing

In a new era of health-care, technology plays a pivotal role in educating tomorrow's clinical leaders. The GW School of Nursing Skills and Simulation Laboratory is a sophisticated and innovative learning environment. The lab is home to a variety of simulated (mannequin) patients ranging in age from infant to adult. The mannequins—many of whom are controlled by sophisticated computer programs—have names, personal histories, and lifelike features such as a pulse, voice, blinking eyes and spurting blood and can display physiologically accurate responses to the care provided by students. Additional equipment such as IV

pumps, EKG monitors, work stations on wheels, crash carts and isolation carts add to the reality of the learning space. In the GW Nursing Skills and Simulation Laboratory you will experience the world of simulation hands-on!

The Flight of a Ping Pong Ball

School of Engineering and Applied Science, Dept. of Mechanical and Aerospace Engineering

How does an NBA center make that game winning three-point shot? How does the military accurately deliver supplies from an air cargo plane in the field? How does a toy manufacturer allow you to have the ultimate Nerf™ gun battle with your friends? They all have to understand the physics of projectiles and projectile motion! Experiment with the elements of projectile motion and learn about the dynamics of a particle as it flies through the air under only the force of gravity. Work in a team to build a projectile launcher and test your skills on determining launch angle, flight distance and launch velocity. Will your team have what it takes to create the winning launch vehicle?

The Science of Accident Investigation: NTSB and TWA Flight 800

National Transportation Safety Board (NTSB) Training Center

In July, 1996, TWA Flight 800, a Boeing 747 bound for Paris, exploded and crashed into the Atlantic Ocean off the Long Island coast shortly after taking off from NY's Kennedy International Airport. All 230 people on board were killed. Early reports of the crash speculated that the plane was destroyed by a missile or a bomb. Was the crash due to a major structural failure? Could a design flaw have contributed to the accident? The incident turned into the most intensive and complex crash investigation in civil aviation history. The 93-foot reconstruction of the TWA 800 fuselage is used for training purposes at the NTSB Training Center located on the GW Virginia Science and Technology Campus. Apply scientific research and techniques to aviation accident investigations using TWA Flight 800 as a case study. Follow the fact-finding process, review the final analysis of the results, and compare that with the physical evidence of the actual reconstructed fuselage.

The Science of Training an Elite Athlete

Milken Institute School of Public Health Department of Exercise Science

When properly trained, the human body is capable of astounding feats. Like all high performance machines, elite athletes undergo rigorous testing to ensure that they are operating at the highest levels possible. In this workshop you will run an athlete through a battery of highly advanced tests and measurements, available only to the world's most elite athletes. Learn how x-rays and electricity are used to measure bone density, fat and muscle and how oxygen is burned in the body to create energy. Understand how that energy is measured during exercise and learn how blood samples taken during exercise are used to measure blood acidity. See if you have what it takes to be the next elite athlete.

Using Sunlight to Remove Carbon Dioxide from the Atmosphere

Columbian College of Arts and Sciences Department of Chemistry

In 2010 the National Research Council stated that atmospheric CO2 concentrations had increased by almost 40% since the early 18th century and the current CO2 level is higher than it has been in at least 800,000 years. Imagine, if you will, a new and revolutionary solar energy process which efficiently removes CO2 from the atmosphere and generates the staples we need such as fuels, metals, bleach and construction materials like cement. All of these things could be generated at a high solar efficiency and without CO2 generation. Learn how a unique group of scientists has taken on the challenge of a comprehensive solution to climate change. See first-hand how they are working towards changing today's fossil fuel based economy to one of renewable chemicals—a new economy and environment where the largest greenhouse gas emitters such as iron and fuel production, are replaced by new, inexpensive, solar generated and CO2-free, chemistries.