10th Annual

SCIENCE, TECHNOLOGY & ENGINEERING DAY

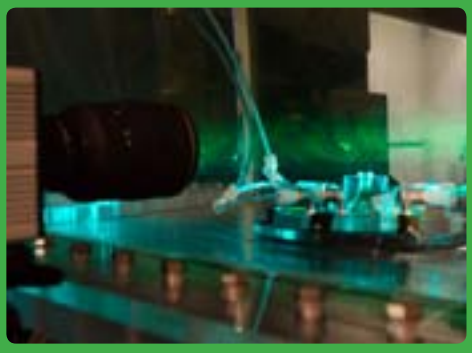
Thursday, March 31, 2016












The George Washington University
Virginia Science & Technology Campus

STE DAY 2016 | WORKSHOP DESCRIPTIONS

GW will host the 10th Annual Science, Technology & Engineering Day on Thursday, March 31, 2016, 9:00 a.m. to 3:30 p.m.

2016 WORKSHOP CHOICES INCLUDE:

- Cutting-Edge Vehicle Instrumentation & a Safer Driving Environment
- Cyber Crime in the Digital Age
- Experimental Fluid Dynamics
- Genetics and the Key to Personalized Medicine
- Herbal Medicinal Compounding
- Hypothesis Testing: Will You Be a Winner?
- Quadrotor Dynamics and Flight
- 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
- The Truth About Disease Diagnosis: The Role of the Medical Laboratory Scientist
- Using Sunlight to Remove Carbon Dioxide from the Atmosphere

REGISTRATION INSTRUCTIONS:

- The event is designed for Loudoun County Public School students in grades nine through twelve. Enrollment is limited. Students are selected and registered by their teachers at each of the 15 high schools in Loudoun County.

REGISTER ONLINE BY *Tuesday, March 15, 2016*

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

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STE DAY 2016 | WORKSHOP DESCRIPTIONS

Cutting-Edge Vehicle Instrumentation and 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.

Cyber Crime in the Digital Age

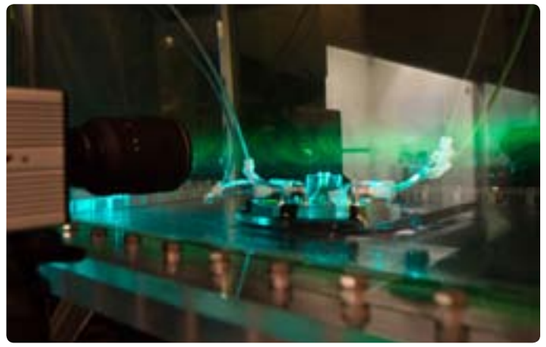
College of Professional Studies

The Internet has a lot of benefits—especially for a techno-savvy criminal. Social networking sites, spear phishing techniques and various types of technology can help criminals gain full access to computers and commit real world crimes. Online persona like sock puppets and avatars have become the perfect disguise for criminal activities. In this workshop you will examine the world of cybercrime and will learn some ways that you can protect yourselves from cyber criminals. As cybersecurity experts guide you through the challenges of security in our cyber world, you will have the chance to hear about how real world cybercrimes are discovered and will step behind the computer to test some of the tools out yourselves.

Experimental Fluid Dynamics

School of Engineering and Applied Sciences Dept. of Mechanical and Aerospace Engineering

The evolution of high speed cameras have impacted numerous aspects of everyday life. Have you ever been curious about the science behind slow motion replays in professional baseball, or a scene in a movie where actors appear to be dodging high-velocity projectiles? These cameras also have applications in scientific research. They can be paired with high powered lasers to understand complex fluid flows. This allows scientists to study things like: global warming; improving combustion in engines; or the behavior of a nuclear reactor core during earthquakes. In this workshop you will learn first-hand how these optical techniques are applied. You will set up your own experiment and work with the high-speed cameras that are used for this research. Learn about the parameters needed to make a slow motion movie and how to extract meaningful research data.



Genetics and the Key to Personalized Medicine

GW School of Medicine and Health Sciences, Department of Health Care 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 isolating your own DNA and learn basic techniques used in DNA fingerprinting, sequencing and genetic analysis, techniques shown on popular TV shows such as CSI, and how they are being used in the medical field to improve patient care. You will also learn valuable information about your own genetic make-up through the oldest genetic 'test' around –the family tree or pedigree. This workshop is highly recommended for students interested in pursuing a career in the biological sciences, medicine or pharmacy.

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.

Hypothesis Testing: Will You Be A Winner?

Columbian Collge of Arts and Sciences
Department of Physics

Everyone wants to win at *Who Wants to Be a Millionaire* or *The Price is Right*. What is your strategy? How do you hypothesize the odds of winning and the choices to make? Do you really need a lifeline? Do you know where the most valuable prize is hidden? As scientists, we often make hypotheses about physical phenomena, and then we have to test those hypotheses by taking experimental data and comparing the results with our expectation. Sometimes our experiments confirm the hypotheses, and other times our theories need modification. How do we know which situation we are in? We will explore this question by examining two particular cases—one rather familiar, and another that is more obscure. Will the results be as you expected or will they be quite surprising? Will you be the winner? Come find out for yourselves...

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.

STE DAY 2016 | WORKSHOP DESCRIPTIONS

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 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.

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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.

The Truth About Disease Diagnosis: The Role of the Medical Laboratory Scientist

School of Medicine and Health Sciences,
Department of Clinical Research & Leadership

Medical Laboratory Science (MLS) is a challenging and rewarding health care profession that has a profound impact on patient care. Medical laboratory scientists are essential members of the health care team who perform manual, automated and molecular-based testing on patient samples in four major areas: Microbiology, Hematology, Chemistry and Immunohematology, with the ultimate goal of providing vital information about the status and function of the body and its systems. The data obtained by medical laboratory scientists are utilized in the diagnosis, treatment and prevention of disease. Have you ever wondered exactly how various human diseases are diagnosed? Do you know what the various cells in your body do and what they look like? Have you ever seen a parasite? Do you know the differences between various bacterial cells based on their microscopic and macroscopic morphologies and what diseases they cause? In this session, you will gain hands-on experience visualizing and performing several diagnostic techniques common to the medical laboratory.

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 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.