

# STEM Programs Summer 2012

*The STEM Programs offered in Summer 2012 were a complete success! In June students came from all over the country, and participated in engaging, hands-on modules. Later in the summer, teachers came from around the world to be trained in the innovative teaching methods of the USNA STEM Office. Please browse through our Summer 2012 "year-book", and look for our next regular newsletter due in September!*



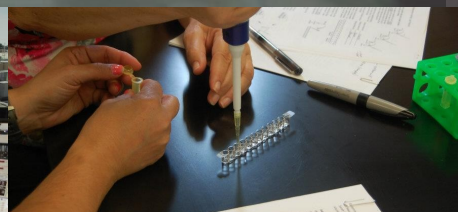


# SET SAIL TEACHER TRAINING 2012

Teachers from across the country and around the world attended the Stem Educator Training (SET) SAIL annual workshops, hosted at USNA by the STEM Office, the National Defense Education Program, MD Space Grant Consortium, and the Office of Naval Research. Teachers came from Oklahoma, Florida, New Jersey, Kentucky, Oregon, California, and Alabama, as well as a number from the Department of Defense Education Activity (DoDEA) schools in Korea, Italy, and Turkey. Local teachers from Baltimore County, Prince Georges County, Montgomery County, and Anne Arundel County also participated.



Teachers attended workshops focusing on the use of project based learning in design, chemistry, physics, math, simulation, biology, and engineering. These workshops offered teachers an opportunity to engage more fully in their educational fields by exploring and testing ideas in a creative and hands-on environment. Experiments and learning assessments were led by faculty and staff members from a number of STEM departments. Teachers were encouraged to share best practices and application methods.



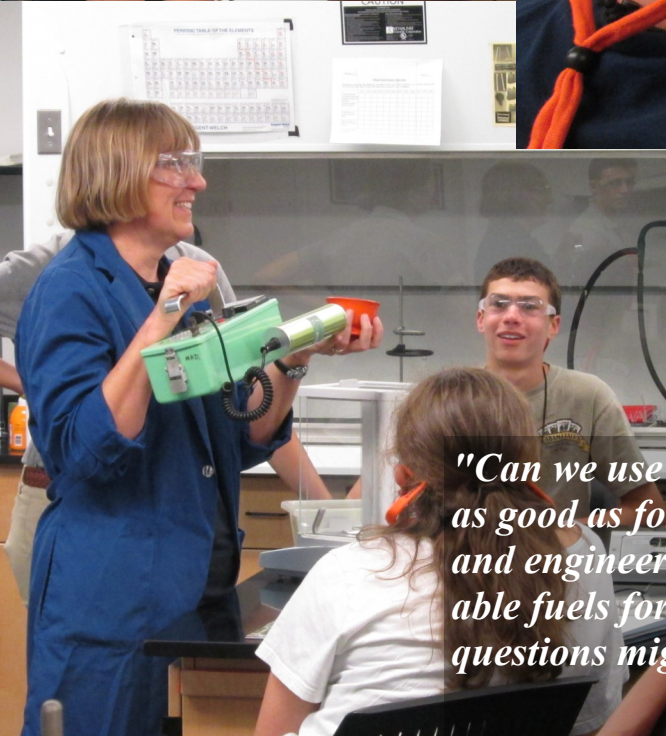
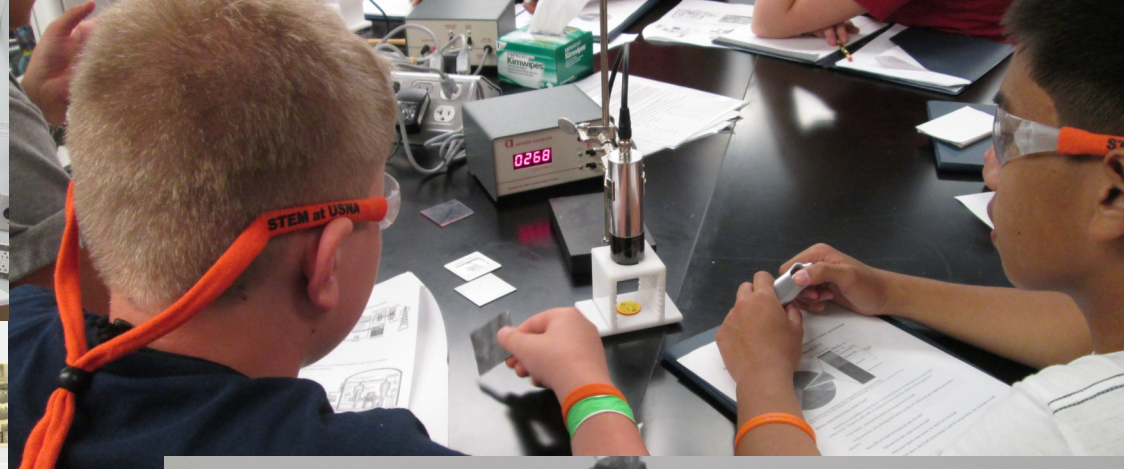


# Aquaculture Engineering

Louise Wallendorf and Cecily Steppe

*The Aquaculture module provides students the opportunity to design, build, and test the durability of structures to contain sea life while withstanding waves and currents found in their environment. Students also collect and identify many of the small aquatic organisms that live in the Severn River.*

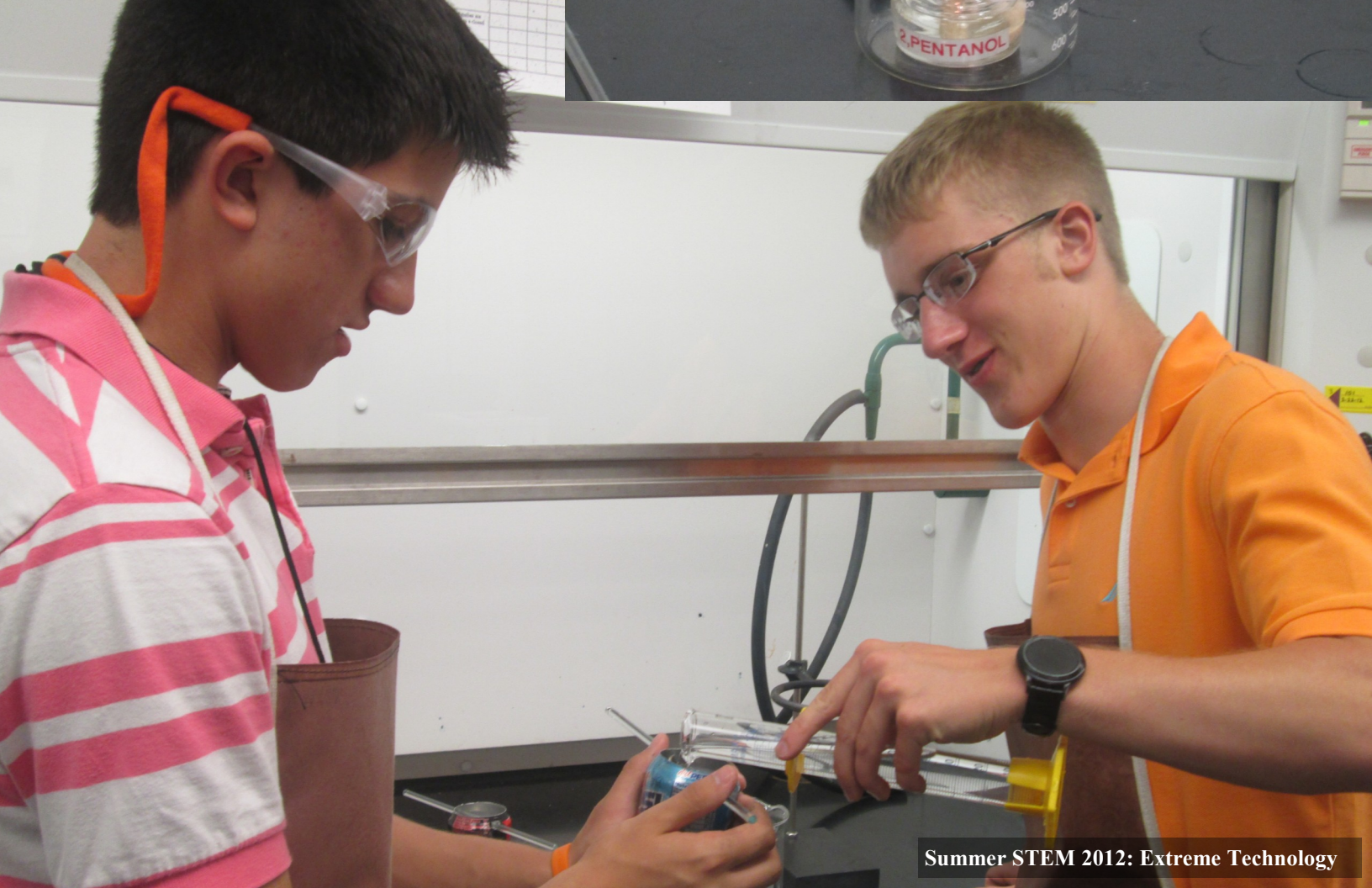
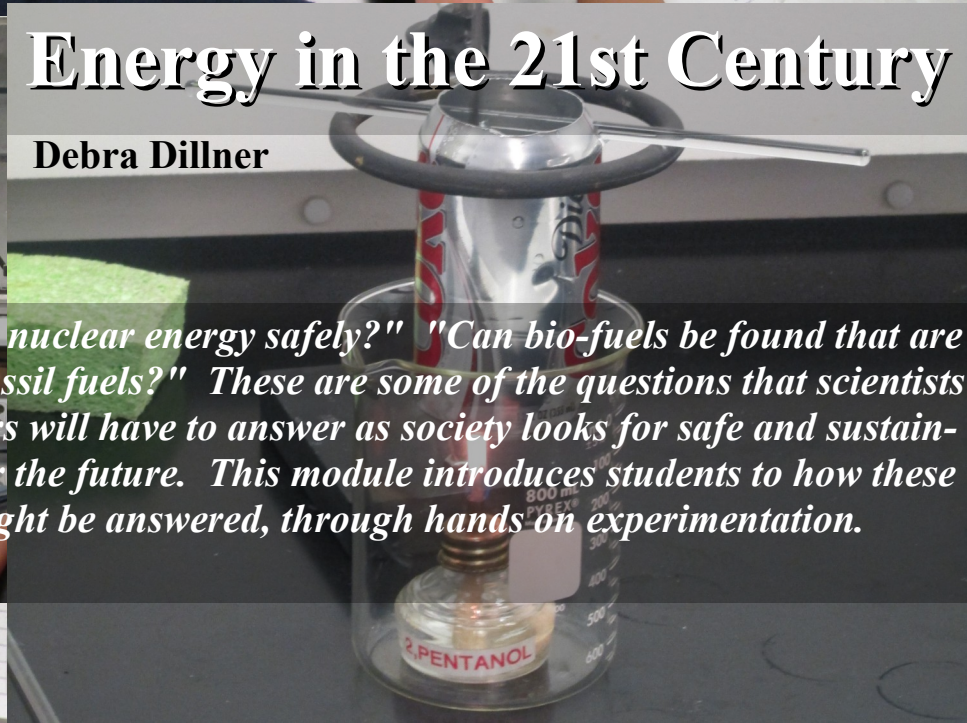


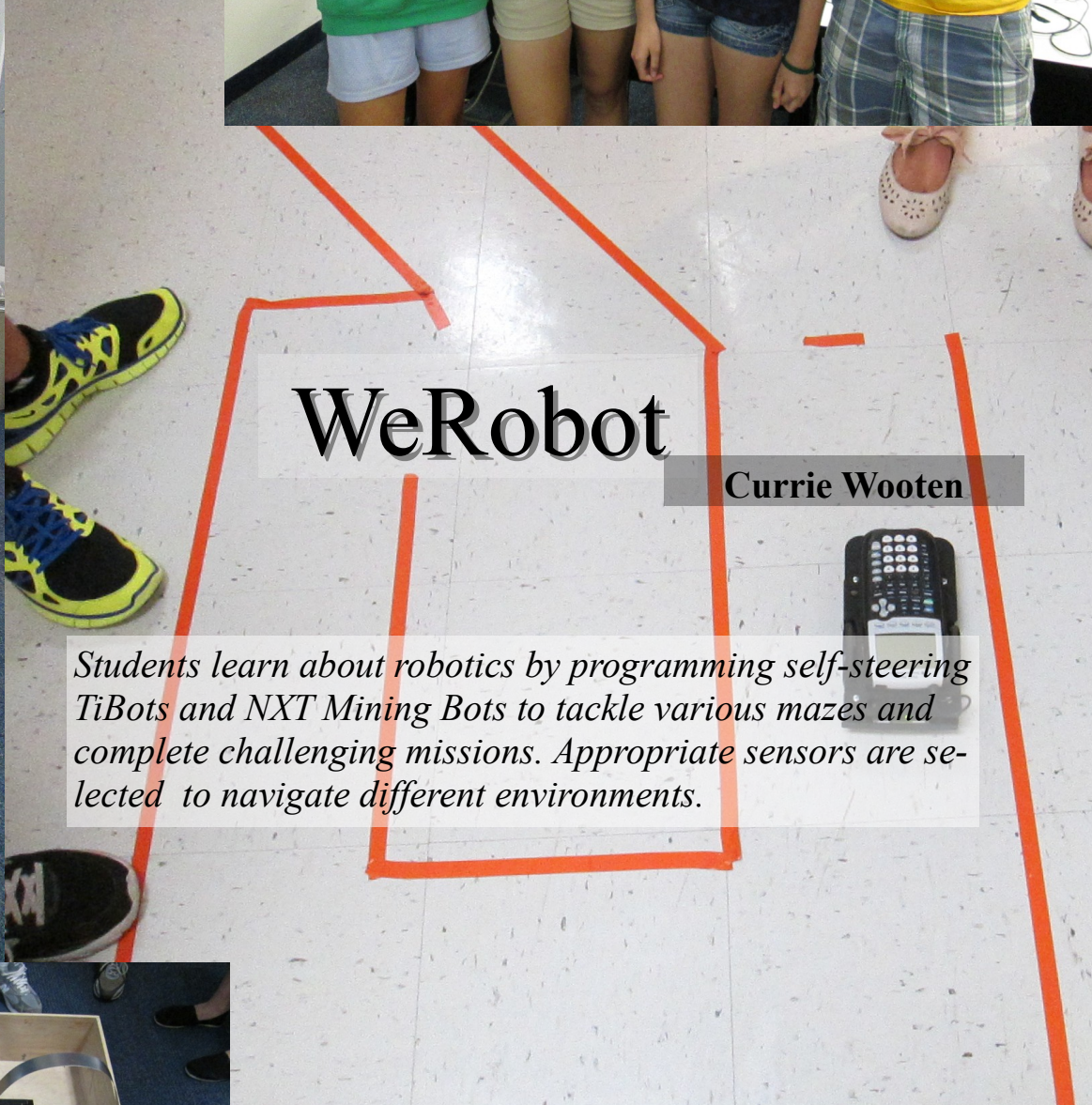


# Energy in the 21st Century

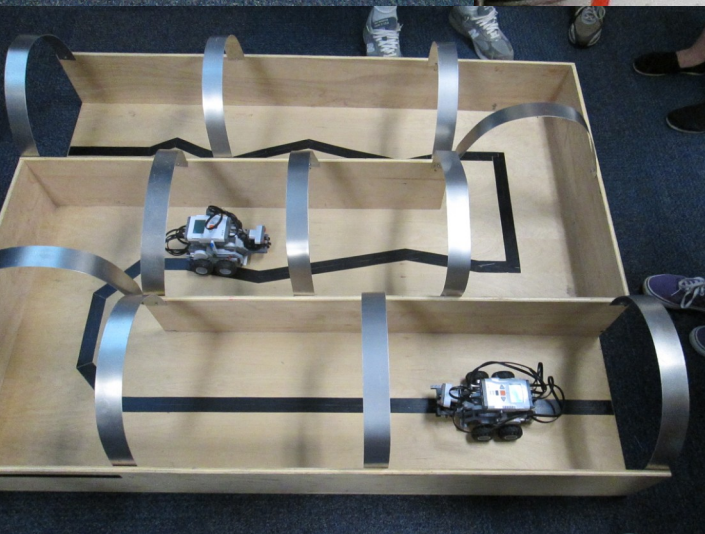
Debra Dillner

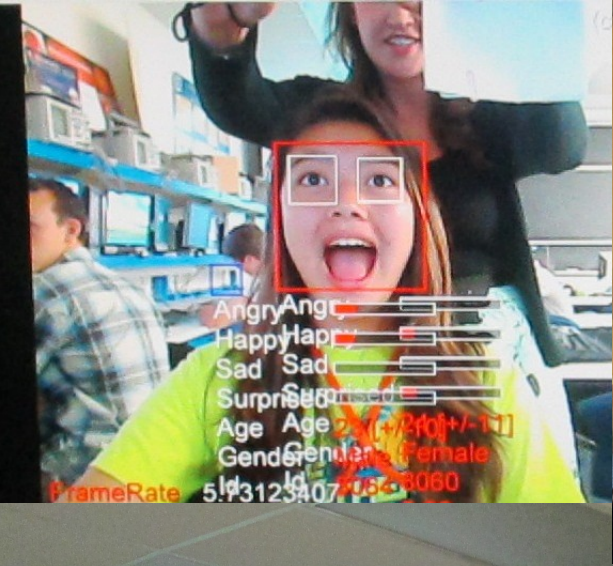
*"Can we use nuclear energy safely?" "Can bio-fuels be found that are as good as fossil fuels?" These are some of the questions that scientists and engineers will have to answer as society looks for safe and sustainable fuels for the future. This module introduces students to how these questions might be answered, through hands on experimentation.*





*Students learn about robotics by programming self-steering TiBots and NXT Mining Bots to tackle various mazes and complete challenging missions. Appropriate sensors are selected to navigate different environments.*

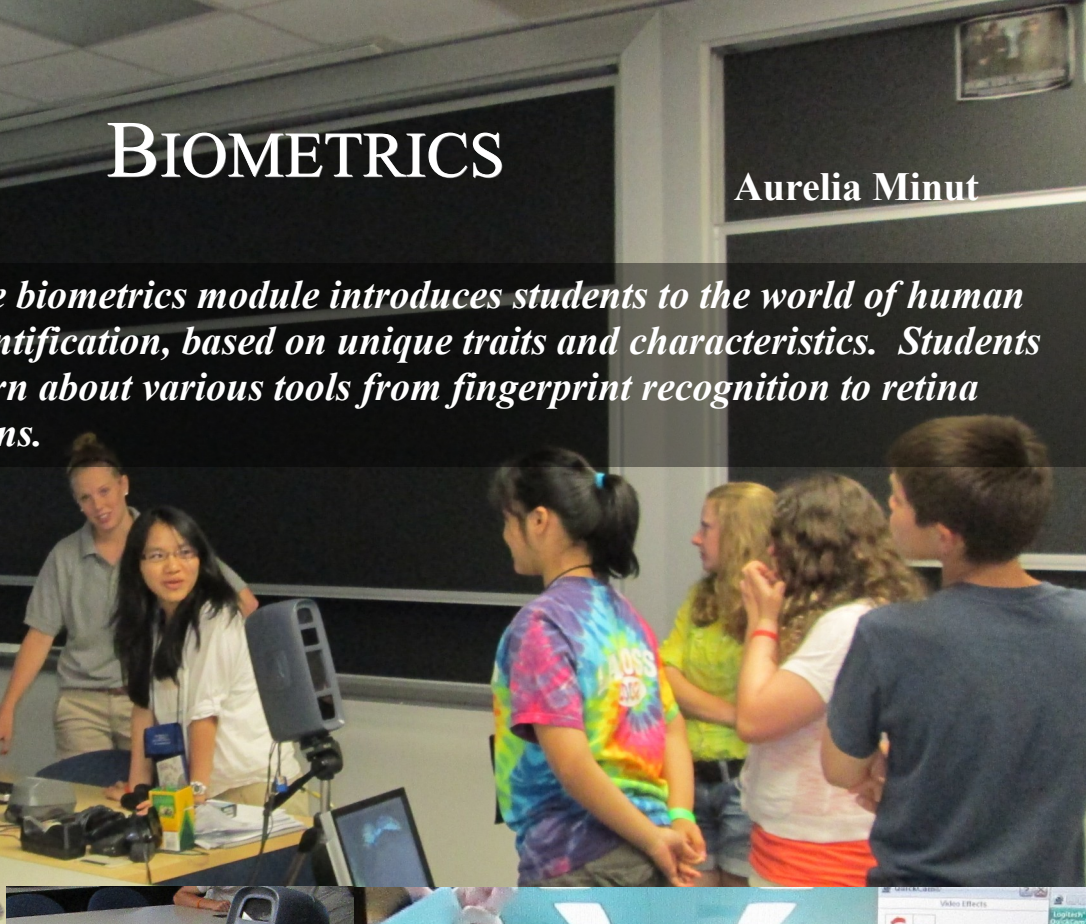
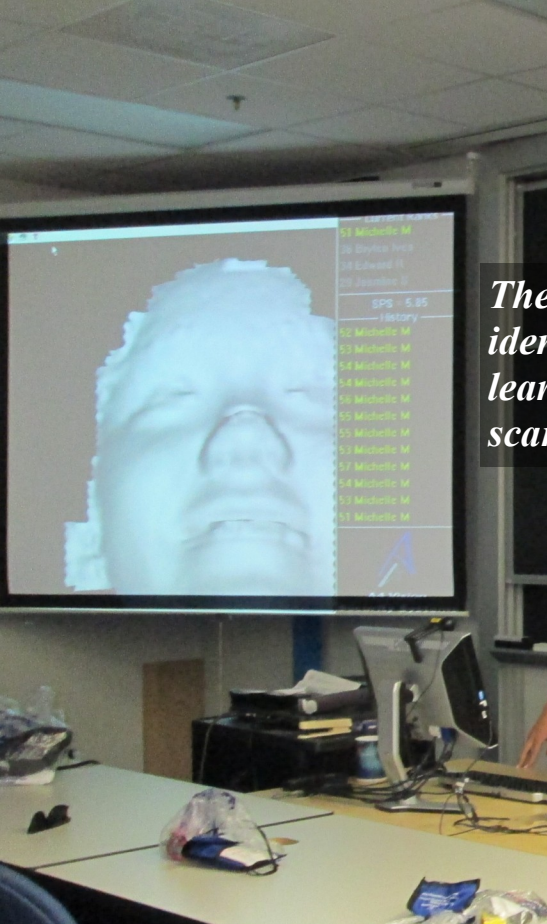




# BIOMETRICS

Aurelia Minut

*The biometrics module introduces students to the world of human identification, based on unique traits and characteristics. Students learn about various tools from fingerprint recognition to retina scans.*

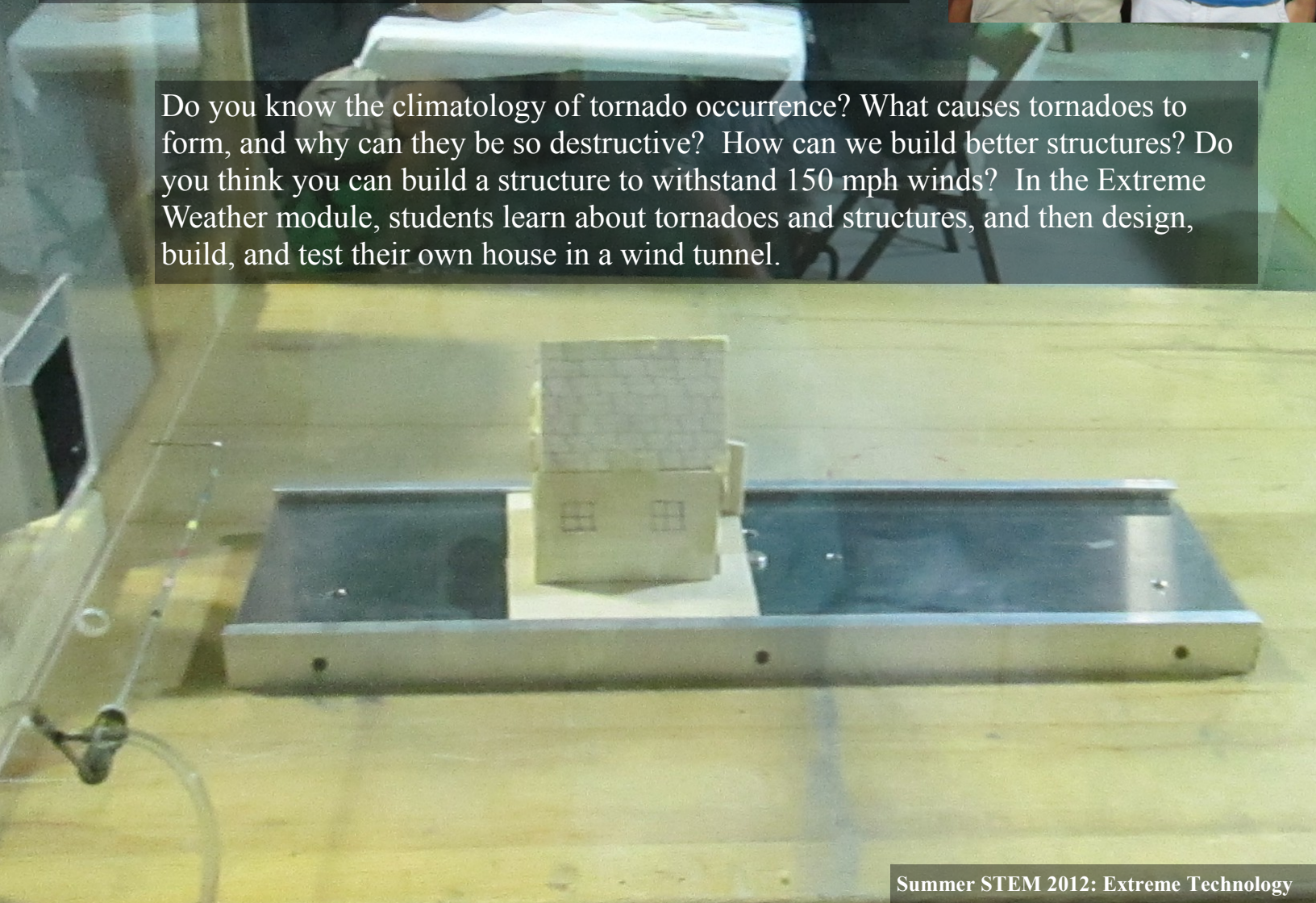




# Extreme Weather Watch

Bradford Barrett and John Woods

Do you know the climatology of tornado occurrence? What causes tornadoes to form, and why can they be so destructive? How can we build better structures? Do you think you can build a structure to withstand 150 mph winds? In the Extreme Weather module, students learn about tornadoes and structures, and then design, build, and test their own house in a wind tunnel.





# Bioterrorism

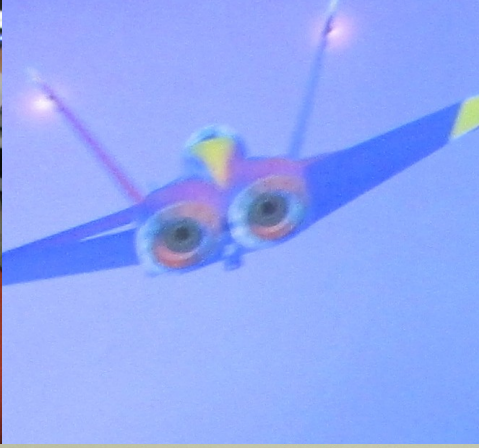
Sarah Durkin



**The Scenario: Students on the metro while on a field trip may have been exposed to smallpox as part of a terrorist attack. To determine who has been exposed, students conduct immunoassay to test for the presence of small pox .**







# The Need For Speed

Brian Sinclair and Jeremy Bryson

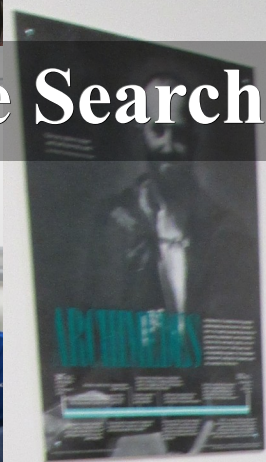


*The "Need for Speed" module gives students an introductory lesson in stability and maneuverability of some of today's most advanced aircraft while also providing an entertaining opportunity to fly via simulator anything from an F/A-18 Super Hornet to an Airbus A-380.*

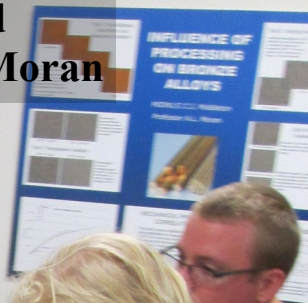




## The Search For Unobtainium



**Joel Schubbe  
and  
Angela Moran**



*As they explore the relevance of material properties used in materials selection for engineering design, students "Search for Unobtainium" by conducting strength and impact testing on metallic and composite materials. The latest magnetic and shape memory materials are evaluated and incorporated into student design investigations.*



# Example: Breaking Substitution Ciphers

Plugging in our guesses, the message is now:

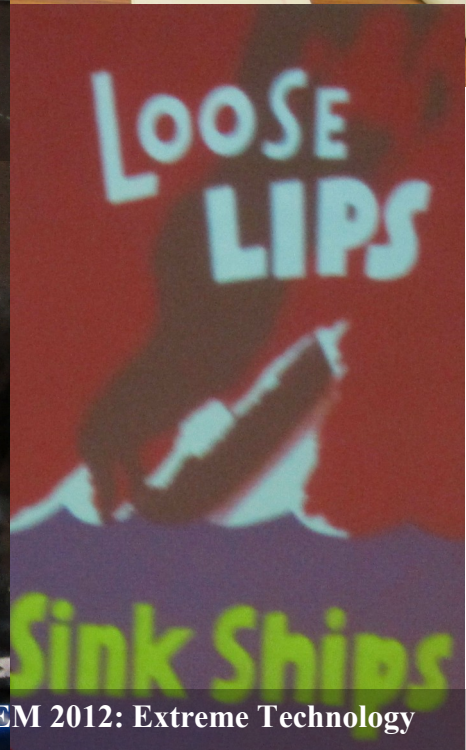
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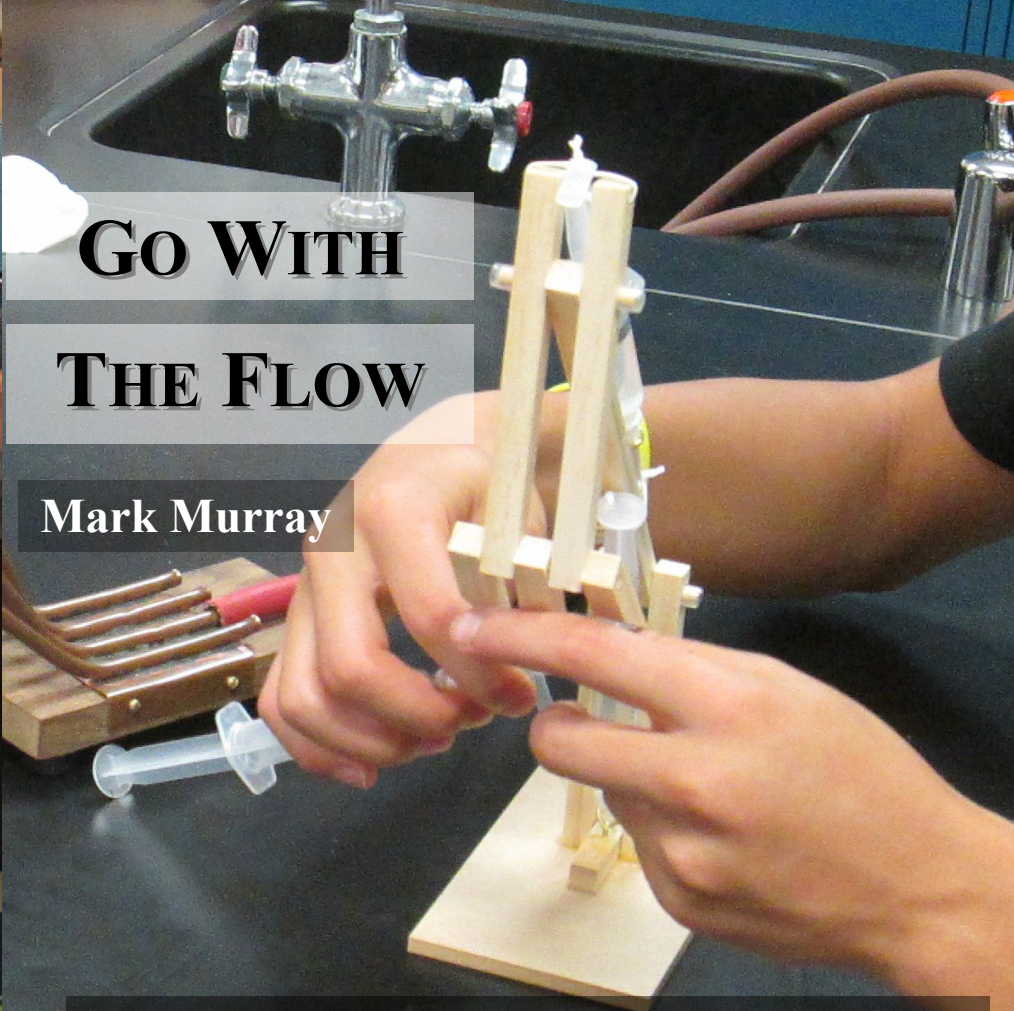
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# Ciphers, Codes, and Cryptography



*Codes and ciphers have played a vital role in military security throughout history and into modern times. In this module, students learn to write and break a variety of codes, from shift to substitution to vigenère, and from the simplest to the most complex.*





# GO WITH THE FLOW

Mark Murray



*In this module students participate in fluid dynamics demonstrations and activities that include the effects of pressure and flow on bodies utilizing a range of apparatus from vacuum chambers to smoke generators.*



# Bioloids

John Schedel and Raphaela Cassandra

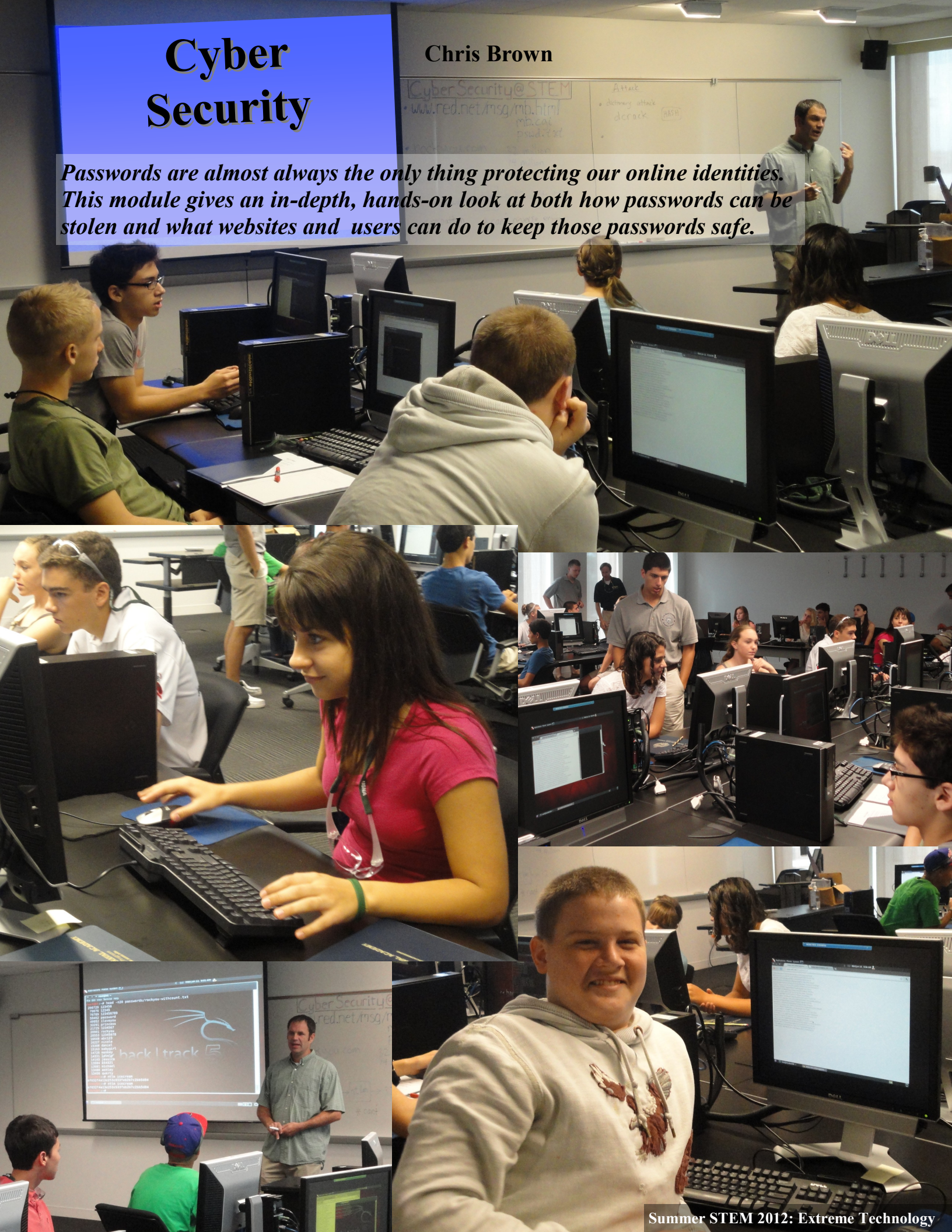
*In this introduction to complex robotics, students experience several different facets of robotics design. They learn the math behind gear motion, the optics of IR sensors, simple graphic based programming, task driven design, and, as a group, they build a working robot.*



# Cyber Security

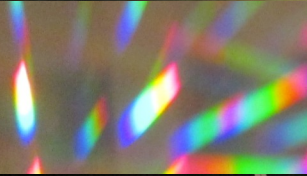
Chris Brown

*Passwords are almost always the only thing protecting our online identities. This module gives an in-depth, hands-on look at both how passwords can be stolen and what websites and users can do to keep those passwords safe.*

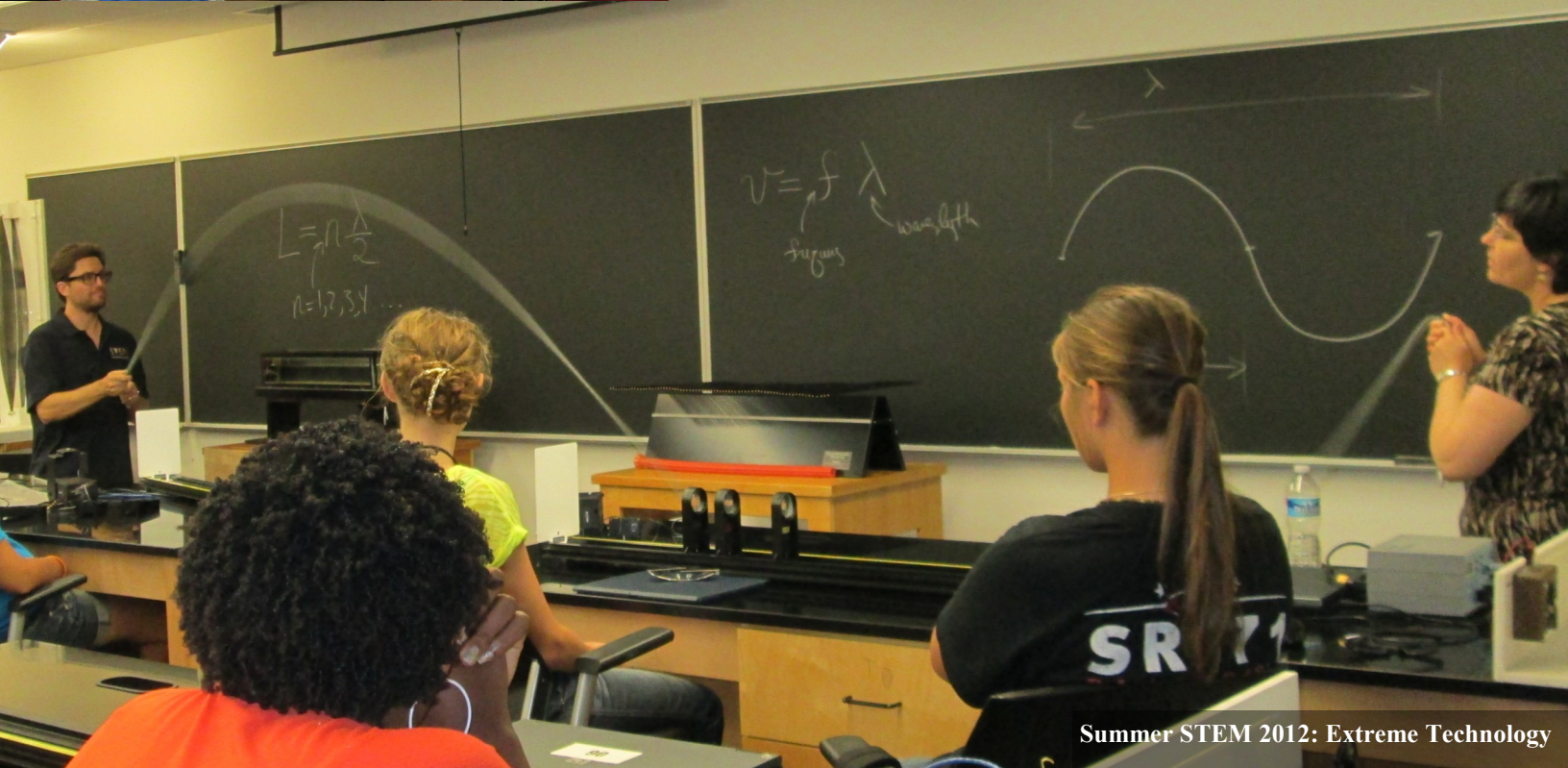
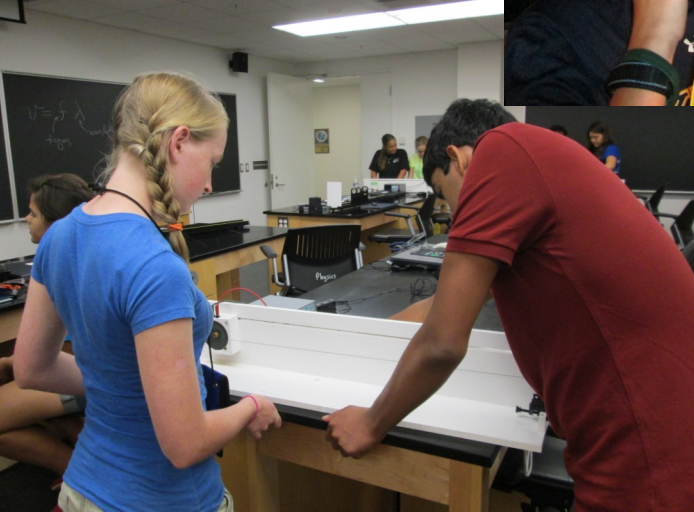


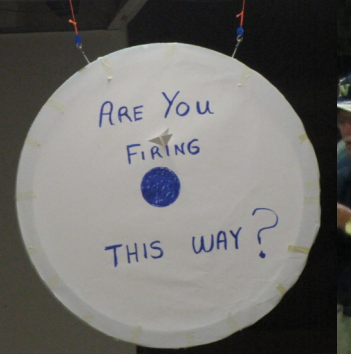
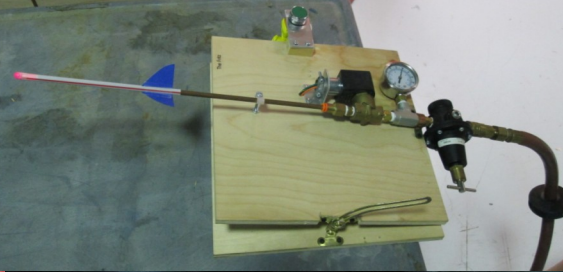
# Extreme Physics

Elena Cimpoiasu and Paul Mikulski



*This module takes students through a tour of the physics of waves and light. A connected story threads through demonstrations and investigations addressing a variety of topics including sound waves, mechanical waves, standing waves, light and the index of refraction. Lasers, geometrical optics, interference and diffraction, and atomic spectroscopy are explored.*

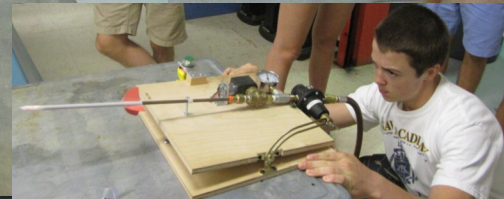
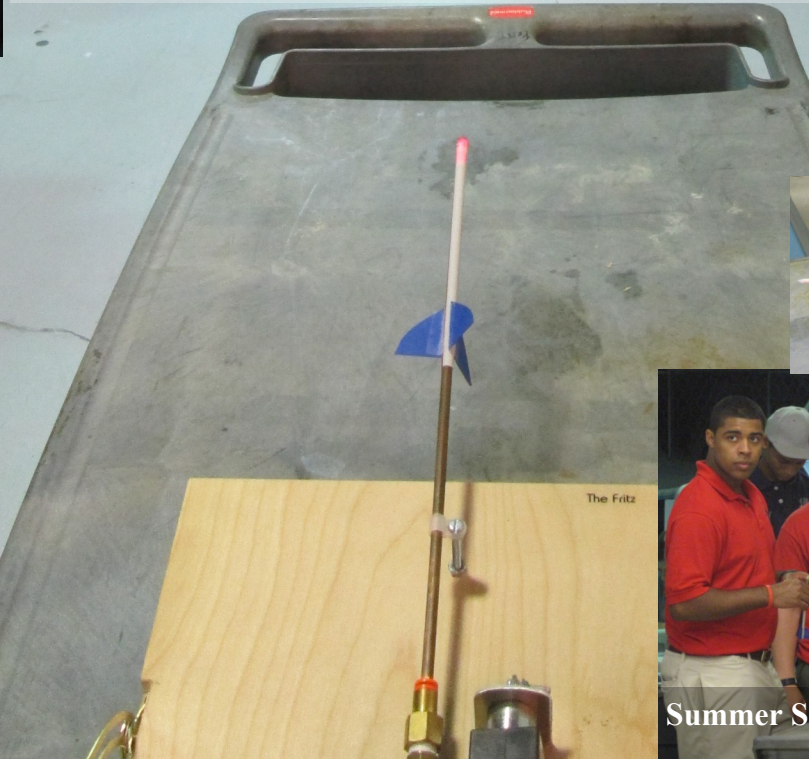




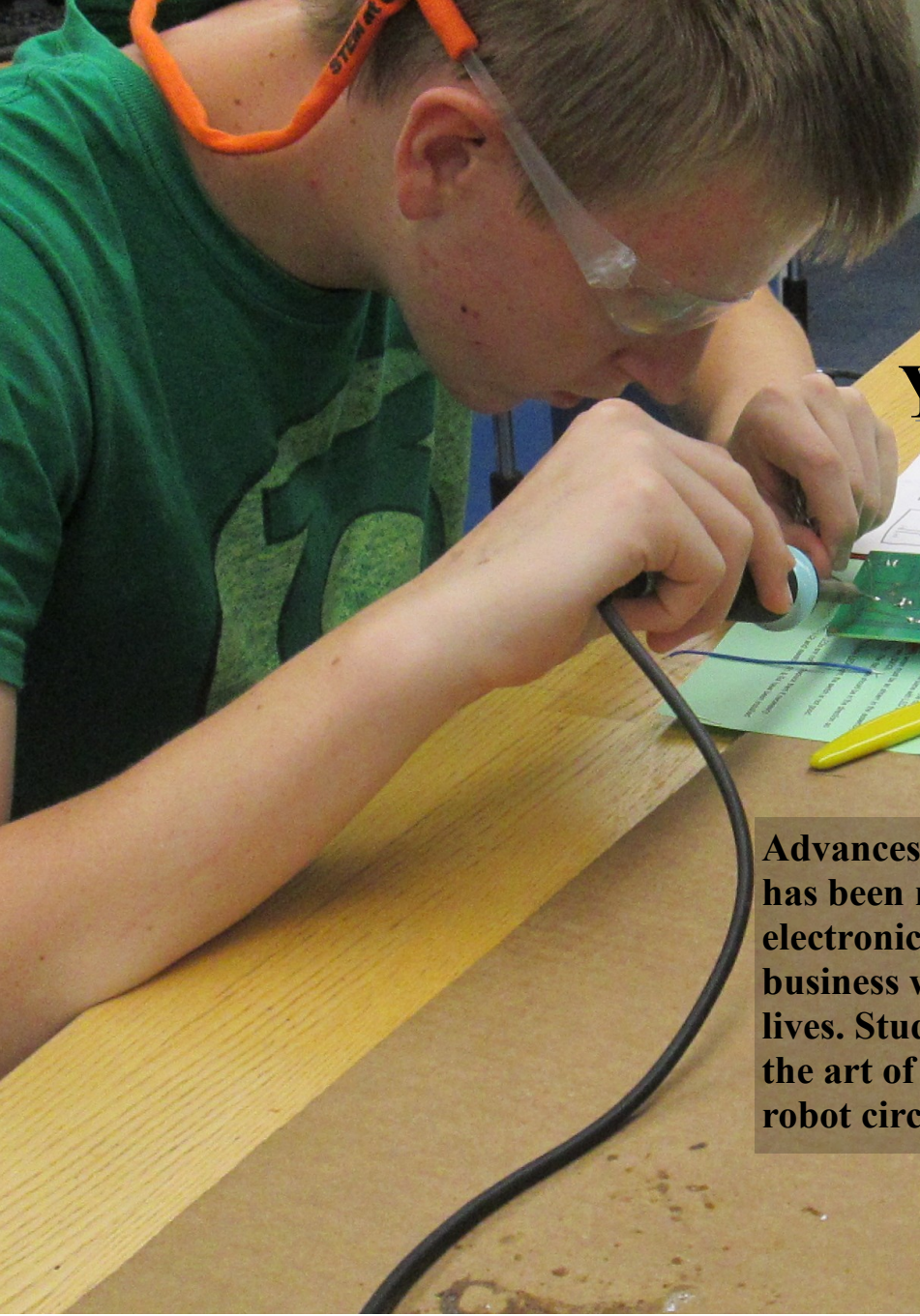
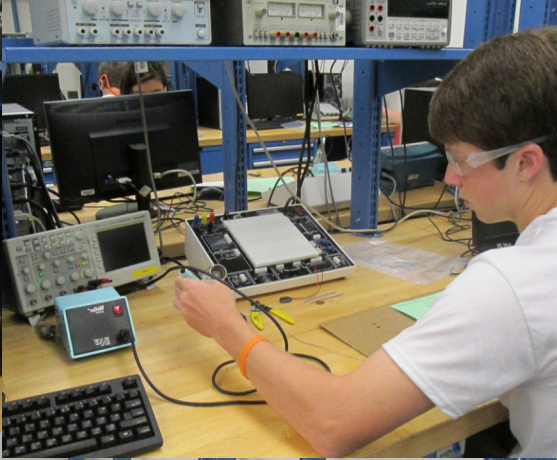
# Countdown To Launch

Louise Becnel

Lift, drag, thrust? Chamber length, fin orientation? What makes your rocket reach the target? In this module students design and redesign the optimum rocket based on aerodynamic principles.



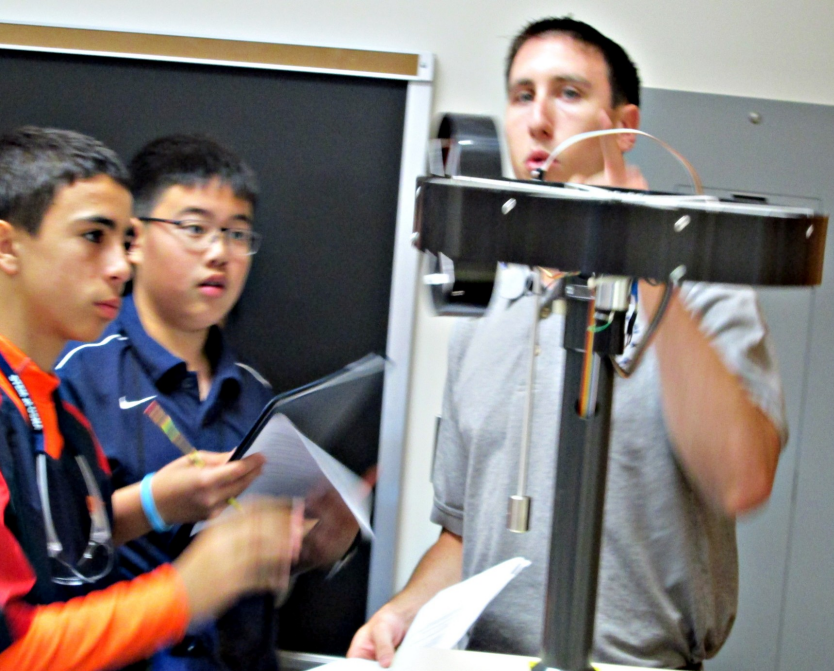




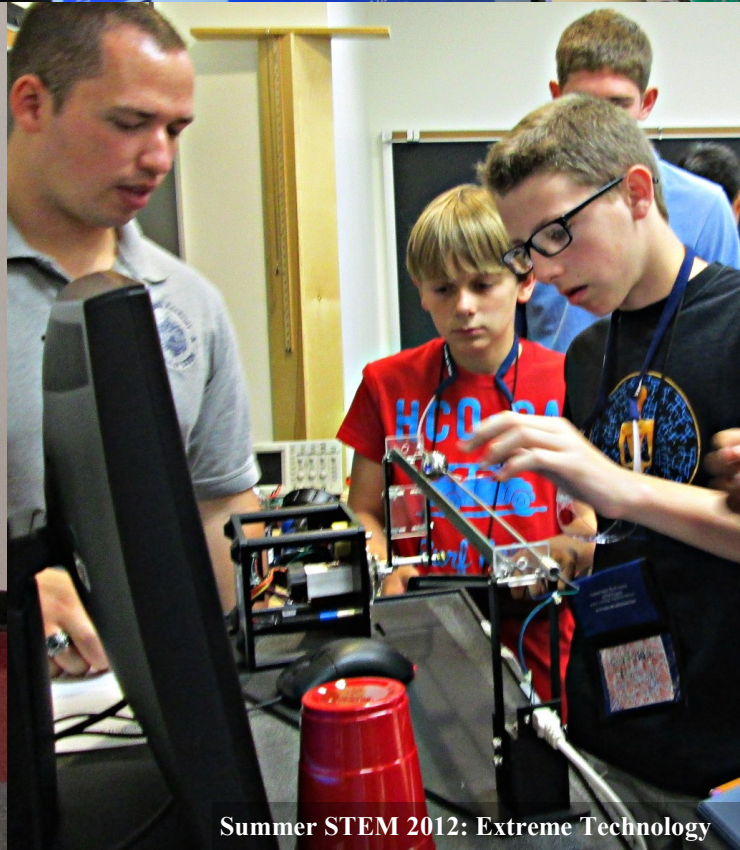
## Build Your Own

Angela Moran

Advances in electronics and electronic circuitry has been monumental in the last 20 years as electronic devices have become critical to the business world, the military, and our personal lives. Students learn basic circuitry and master the art of soldering as they "Build Their Own" robot circuit board.



*What is a control system? Students learn about the world of automation through Quansar demonstrations of twin rotors, inverted pendulums and satellite balancers and put their knowledge to test by practicing their new found skills on a Segway.*



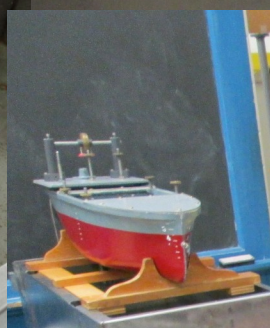
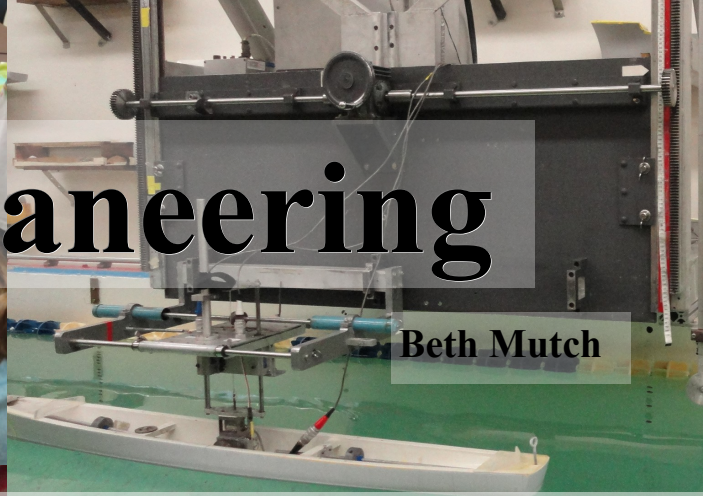
# In Control

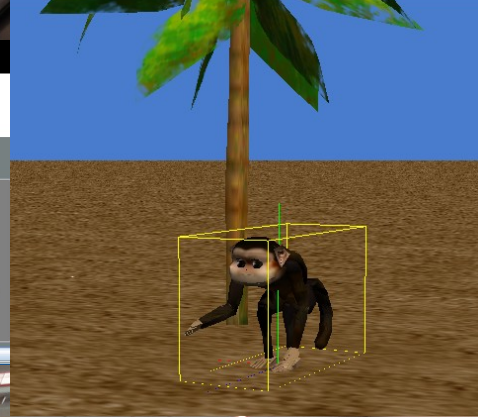
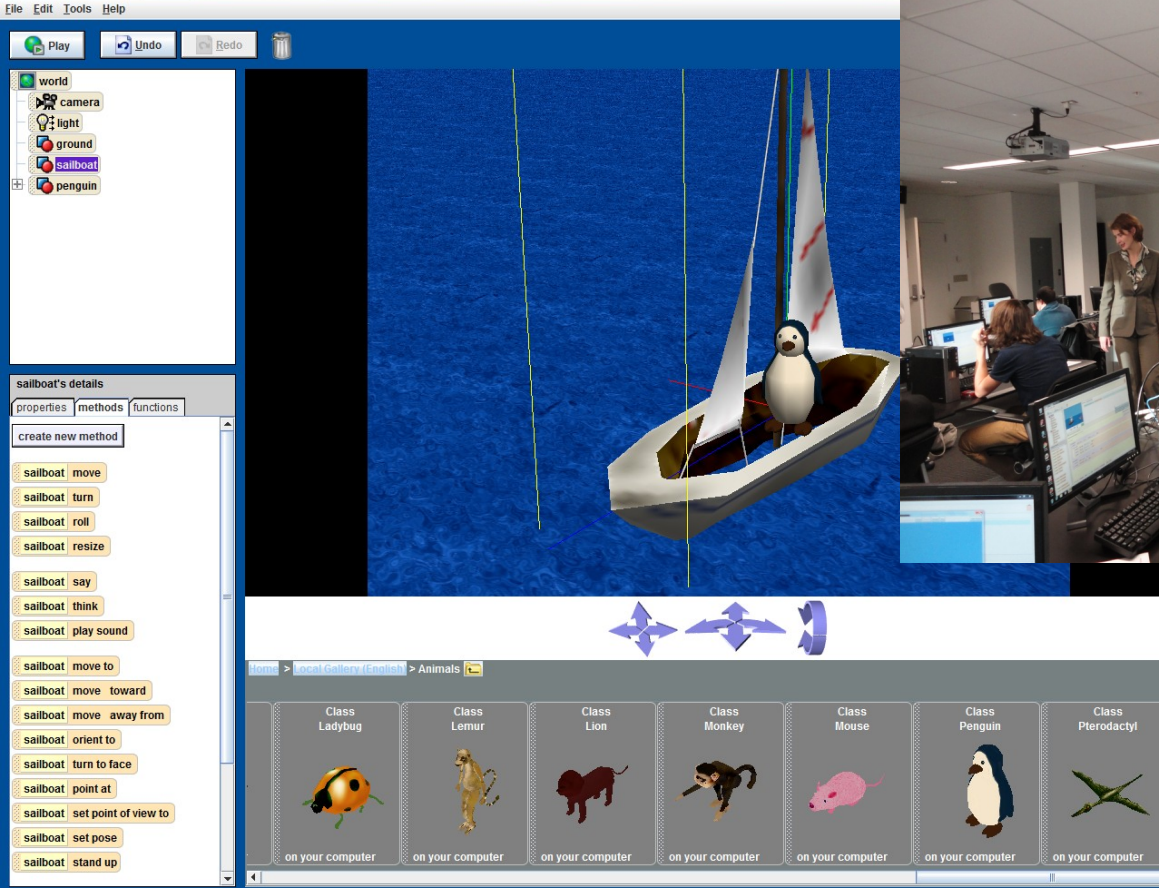
Gwen Gray

# Oceaneering

Beth Mutch

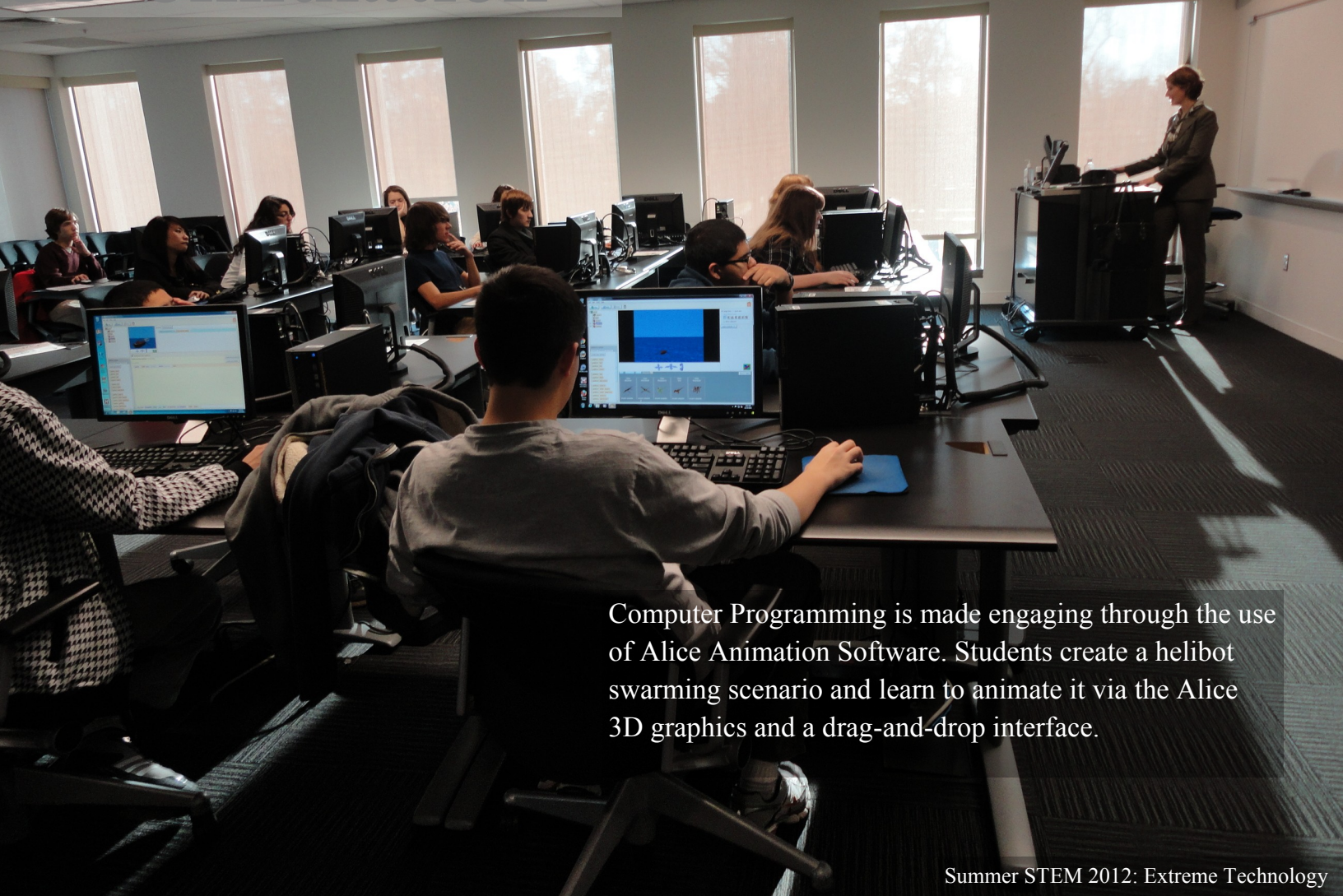
How do ships float? In this module, students explore Archimedes' Principle and hull design with hands on experiments involving Navy ship models, tow tanks and lots of water!





# 3D Simulation

Adina Crainiceanu



Computer Programming is made engaging through the use of Alice Animation Software. Students create a helibot swarming scenario and learn to animate it via the Alice 3D graphics and a drag-and-drop interface.