



A Schmahl Science Workshop
Physics Workshops Catalogue

- Agilent Afterschool Deep Sea Divers** The principles of flotation, air pressure and density are introduced in this activity. Students build their divers using balloons, paper clips, and weights and place them in a one-liter bottle for 'deep sea diving'. The session includes some measurement and data collection and produces great many questions for the students to take away with them.
- Agilent Afterschool Thumb Pianos** Students explore the fundamentals of sound through the vibration of metal and wood. Each student builds their own thumb piano and has the opportunity to discover the concepts of vibration, frequency and pitch. Sheet music is provided near the end of the session to allow the students to begin to master their new musical instruments.
- Agilent Afterschool: Invisible Forces - Magnets** Invisible Forces begins with a series of experiments that help students discover the invisible forces of magnetism and electromagnetism. During these experiments, students observe and analyze compasses, magnetic influences on various objects, and the magnetic fields created by electricity. In the second half of the session, students build their own electromagnetic motor, combining the magnetic forces caused by their magnets and the electricity flowing through a coil of wire.
- Agilent Afterschool: Periscopes** Our Agilent Periscope project introduces students to the basic properties of reflection. They experiment with mirrors, reflecting geometric shapes and symmetrical words and images. The children will construct their own periscope and have a great time finding ways to apply the tool.
- Agilent Lighthouse - reflection and refraction** Students assemble both house and lamp assemblies. With rays of light emerging from the sides of their houses, the children will set up experiments to discover properties of light including reflection, refraction, and conversion of light rays.
- Air Pressure: Building A Siphon Pump** Students learn the basic types of pumps and how they work in terms of pressure, velocity, and elevation differences and then build a gravity-driven water pump to perform a simple action. Using an interactive activity students "solve a mystery" using their knowledge of pressures and pumps.
- Anamorphic Art** An Anamorphic image is an extreme case of perspective, where the image is stretched beyond recognition and only appears normal when viewed from a certain point. In the sixteenth and seventeenth centuries artists used anamorphosis to conceal spiritual or political meanings in their paintings. Viewing the painting from head-on (as you normally would) would not reveal the message but viewing the painting from its side would magically transform the anamorphic image to something recognizable. The first known example of Anamorphosis was found in Leonardo da Vinci: Codex Atlanticus c. 1485. In this unique interdisciplinary activity, students use science, math, and art skills to create an image on a curved grid. The resulting image appears distorted and may be

difficult to recognize... until it is viewed with a cylindrical mirror! The image that “magically” appears is just science, math, and art all mixed together with a mirror.

- **Balance and Motion - Roller Coaster Science** Students work in groups to make a roller coaster with split foam tubes, marbles and tape. They discover amazing ways to get as many energy conversions as possible. This relates to potential and kinetic energy, friction, and inertia.
- **Balance and Motion - Rolling Cups** Students roll paper cups down ramps, observe the way cups roll, and use the predictable curved cup rolling path to meet challenges. Students put cups together to make the cups roll straight, and weigh the cups in various ways to see how weight affects rolling.
- **Balance and Motion - Rolling Spheres- Marble Works** Students investigate a rolling-sphere system. Students design a marble runway so the rolling marble can do tricks and, as a culminating class experience, help to design a marble works through which the marble can roll nonstop. Students predict and describe the effect of the runway design on the rolling motion of the marble.
- **Balance and Motion - Rolling Wheels** Students set up cardboard ramps down which they will roll wheel-and-axle systems. They insert slim white straws into plastic disks to make the wheel-and-axle systems. They try all kinds of configurations of wheel size and axle position to get their rolling wheel-and-axle systems to perform a variety of tricks.
- **Balance and Motion - Spinners: Tops** Tops and spinners have been popular as children's toys throughout history, and they can be found in cultures throughout the world. Children learn about motion by observing behavior of their toys, learning principles of physics without even knowing that they are learning. Students make a top, observe its behavior, and then modify the design to see how the modification affected the top.
- **Balance and Motion - Spinners: Zoomers** Zoomers are traditional toys made from a button and a piece of string. The string is passed through one button hole and back through the other and tied to make a loop. With the button in the middle, the string is looped around a person's thumbs. After the button has been twirled around to put some twist in the string, the string is pulled tight and the strings unwinds, causing the button to spin. The momentum of the rotating button winds the string the other way. Pulling the string tight again spins the button in the opposite direction. Once the rhythm is established, the spinning can go on indefinitely. The simple zoomer, assembled from a plastic disk and string, is a spinning diversion in countless cultures. When students master the rhythm of this soothing toy, they will be joining a fine tradition of spinning toy makers to time immemorial.

- Balance and Motion -Spinners: Twirlers**

Students make twirlers (flying spinners) that rotate by air resistance, first modifying soda straws with wings, and then making twirly birds from paper and paper clips, and investigate the variables that influenced their spinning.
- Balance and Motion: As The World Turns - Gyroscopes**

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- Balance and Motion: Mobiles**

If a force is applied to a stable or balanced body or system, The net imbalance in force might cause The body to change position. If The system recovers and returns to its starting position, The system is stable. Students grapple with kind of stability in as they balance pencils on their points using counterweighting, and build mobiles that always return to their balanced positions
- Balance and Motion: The Pencil Trick**

If a force is applied to a stable or balanced body or system, The net imbalance in force might cause The body to change position. If The system recovers and returns to its starting position, The system is stable. Students grapple with kind of stability in as they balance pencils on their points using counterweighting, and build mobiles that always return to their balanced positions.
- Balance and Motion: Toys in Space**

Students experiment with the toys, study about microgravity, and predict what the toys would do in space. The astronauts on those flights experimented with the toys and videotaped their results. Students compare their results to what actually happened in space. This will allow elementary school children to learn some fundamentals about physics and microgravity research.
- Balance and Motion: Triangle and Arch**

Balance is the everyday word used to describe a state of equilibrium. Students know when something is in balance, because it doesn't fall over. A physicist would say that a state of equilibrium is reached when the net force acting on a body or system is zero. If there is a strong force pushing one way that is balanced by an equally strong force pushing in the opposite direction, the net force is zero, and a state of equilibrium is achieved. During our workshop, students discover numerous ways to balance two-dimensional shapes made out of tag board.
- Balance and Motion: Trick Crayfish**

Students investigate cause and effect, center of mass, balance, and stable equilibrium while they create this fascinating, scientific toy!
- Balance: YoYos**

Learn about the 'Science of Spin!'. The Yo-Yo will help children to learn about gyroscopic forces, and energy.

- **Balancing Structures: Giant Jenga** Your aim is to try and make the tallest tower using the blocks. Remove blocks from lower down the tower and place them on the top. And see how long can you keep the tower balanced.
- **Balloon Rockets** Students learn that air takes up space; the relationship between temperature, pressure, and volume (Boyle's / Charles' laws). Students learn that air moves (the Bernoulli principal) and that air has weight. Students will create an air-powered rocket that will travel the greatest distance.
- **Bottle Blasters Design Challenge** Students build a device that will launch a ball to knock over bottles.
- **Bubble Makers** We help students build their own bubble makers! There are lots of things around you which can be used to make bubbles. String formed into a loop, the plastic which holds a six-pack of pop together, cookie sheets, aluminum oven pans, plastic bowls, empty milk containers, buckets, old pieces of hose, garbage can lids, even just your hands held in the right position... well, you get the idea.
- **Bubbles** What is so fascinating about bubbles...The precise spherical shape, the incredibly fragile nature of the microscopically thin soap film, the beautiful colors that swirl and shimmer, or most likely, a combination of all these phenomena? Why does a bubble form a sphere at all? Why not a cube, tetrahedron, or other geometrical figure? Students look at the forces that mold bubbles.
- **Camera Obscura** "...Here the figures, here the colors, here all the images of every part of the universe are contracted to a point. O what a point is so marvelous!"-In 1490, da Vinci wrote the first detailed description of camera obscura in his "Atlantic Codex," a 1,286 page collection of drawings and writings. The principle of camera obscura is simple, punch a hole in a dark box and put a piece of light-sensitive material on the other side and, voilà, you have a photograph.
- **Color of Pigments** Students learn that the primary pigment colors are magenta, cyan and yellow.
- **Color Science** Teasing a rainbow from a light bulb. Decoding messages from abstract art. Unveiling the answer to why an apple looks red. Through these activities and others in this unit, students are immediately and physically involved in investigations of light, color, and the wonders of how our eyes work. Students investigate light and color, experimenting with diffraction gratings and color filters.
- **Comparing Wave Makers** Our workshop activities deepen student understanding of the electromagnetic spectrum, enabling students to detect and consider wavelengths other than visible light. Activities feature energy stations, including infrared (TV remote); microwave (pager); ultraviolet (black light) and other devices. Students come up with their own tests to see what blocks each wavelength, and what does not. They learn how these other wavelengths can be used to "see" things we cannot see with our eyes-allowing space scientists to detect and image objects, phenomena, and sources of energy far

off in space.

- **Conservation of Momentum & Angular Momentum** If The Mechanical Universe is a perpetual clock, what keeps it ticking away till the end of time? Taking a cue from Descartes, momentum—the product of mass and velocity —is always conserved. Newton's laws embody the concept of conservation and momentum. This law provides a powerful principle for analyzing collisions, even at the local pool hall.
- **Dry Ice Air Hockey** Students will learn about Newton's First Law of Motion while playing air hockey using dry ice.
- **Dry Ice Rockets** A fun (and often wild) activity vividly demonstrates the sublimation process. Place a piece of dry ice into a plastic 35mm film container - the kind that has the snap - on cap. Then wait. The cap will pop off, and sometimes fly several meters.
- **Electricity - Enlightening Electrical Circuits** This is a good, simple introduction to electricity. The student learns about: current (electron) flow; potential (voltage) that produces the current flow; charge (coulombs); conductors to carry the current flow; and simple switches and lamps (including LEDs). In the hands-on sessions, the student builds a battery-operated system including two switches, two lamps, an audio sounder, and a pair of batteries.
- **Electricity - Static: Sparks and Shocks** Students learn about thunder, lightning, and electrons. They discover how to separate a mixture of salt and pepper, lightning safety, and with one hair-raising experience, they discover the nature of static electricity. This relates to weather, lightning safety, electrons, positive and negative charges, voltage, lightning bolts, and cloud formation. This workshop answers questions and explain how static electricity works. Students make their own static electricity generator to take home!
- **Electricity: Agile Matching Game** Students explore the fundamentals of electricity. They build an electronic circuit that includes an energy source, a resistor, and LED lights. The completed assembly is an electronic game that will enhance our student's knowledge of circuits and electrical flows. Each student has the opportunity to construct their own game, which serves as an electronic checker for matching correct questions and answers. The students create their own sets of Q & A for challenging family and friends.
- **Electricity: Agile Steady Hand Game** Students explore the fundamentals of electricity. They build an electrical circuit that includes an energy source, resistance, a light and a switch. The completed assembly is also a steady hand game that students have fun playing and demonstrating to family and friends.
- **Electricity: More Fun with Circuits - Aluminum Foil Wires** You'll get a positive charge out of the electricity workshop! Demystify the shocking possibilities of electricity. Participants learn electrical basics while building and redesigning circuits with "D" cells,

wire, paper clips, and Christmas tree mini-lights. We guarantee this workshop will be enlightening!

- **Electricity: Static and Circuits**
The essential parts of a circuit are the conducting path, the electrical load, the power source, and a switch. The conducting path can be made from any material that conducts electricity. A switch can be made using a simple paper clip and small metal tabs. For this workshop, you will be using some unusual parts to create your circuits.
- **Electromagnetic Spectrum**
Light is just the visible portion of the electromagnetic spectrum that consists of a wide variety of waves, from radio waves to cosmic rays. The use of concave and convex mirrors and lenses is explained, as are the concepts of diffraction and polarization. Students realize the importance of observing celestial objects from outer space and gain knowledge of the entire electromagnetic spectrum. Also included is a review of the Hubble Space Telescope performance and hands-on activities related to the latest data and resulting images.
- **Electromagnetism/Build Day - Motors**
Have fun while learning about magnetism! Students discover magnetism and induction, gaining an understanding of magnetic effects and principles. Students learn about the history of magnetism and explore modern theories and applications that underlie electric power generation and magnetic material physics. Class projects include the construction of an electric motor and a magnet.
- **Exponential Domino Fall**
Students design and build cars that can be used to experience and to explore the science of motion. The low friction wheel and axle combination, one of the six simple machines, can be used with an inclined plane to collect data on the distances traveled by the car. Use different materials to cover the inclined plane or vary the weight in the cars to serve as variables for the experiments.
- **FOSS: Heating The Earth**
Students set up experiments to find out what happens when the Sun shines on four earth materials: water, sand, dry soil, and wet soil. They relate the differences in temperature change to the properties of the materials.
- **Friction and Fluid Dynamics**
How things slip, slid, move, flow and behave. Learn about drag, friction, slipperiness, turbulence, streamlining, aero- & hydrodynamics. What makes a car, boat or plane faster/more efficient?
- **Fun with Buoyancy - Boats!**
It's 2020 and fossil fuels have reached an all-time low! Schmahl Science is trying to do its part by creating vessels that can move visitors across the Bay. Your job is to design an efficient vessel that that can hold as many passengers* as possible and then glide across water using its own power.

- **Galileo Ball Drop** Students learn about gravity, momentum, inertia, Newton's laws and forces.
- **GEMS: Magnets** Students investigate material properties by sorting magnetic and nonmagnetic objects.
- **Glass Forensics I types of glass & Density** "How can an investigator differentiate one glass sample from another?" Students will be forensic scientists who are collecting evidence from a crime scene - a hit and run car accident in the school parking. The police have requested that the students from this class compare the glass fragments found at the crime scene with those taken from two suspect vehicles. They will need to report your findings to the police department as soon as possible.
- **Glass Forensics II- Broken Glass Patterns** Students learn that fracture patterns in glass are unique. Fracture features in a piece of glass reflect the nature of the glass and the direction of travel and velocity of the breaking object. Glass fracture examinations can provide information as to the direction of the breaking force and the sequence of multiple impacts. A physical match of two pieces of glass establishes that they came from the same source to the exclusion of all other sources. In this workshop, glass panes are being broken with different tools and reconstructed to see what facts can be found. Currently, crime labs are often asked to determine on which side the impact was made. We were interested to see if additional information can be obtained.
- **Heat Energy- Best Insulators** Students explore heat energy. They make friction by rubbing things together and create wind using a lamp.
- **Homemade Loudspeakers** Students build homemade loudspeakers using ring magnets and plastic cups. While constructing the loudspeakers, students will learn about electromagnetism, the interaction of magnetic fields, and the mechanical amplification of sound.
- **Inertia and Momentum** The rise of Galileo and his fall from grace. Copernicus conjectured that the Earth spins on its axis and orbits around the sun. So why do objects fall to Earth rather than hurtle off into space? Why do you lean in a turning car? What is centripetal force? Risking his favored status in Rome, Galileo helped to answer such questions with the law of inertia. We test what happens to an egg dropped off a balcony!
- **Introduction to: Light Quantity and Quality** Why are some things seen as red while others are seen as blue? For instance, why is the ocean blue while plants are often green? The answer has to do with light and the way it interacts with objects. This workshop shows students that some wavelengths of light are absorbed more than others in sea water. Objects that are a color where that wavelength has been completely absorbed appear black. Students analyze this data, create a line graph and correctly identify the independent and dependent variables.

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- **Invisible Light Sources and Detectors** In an investigation of the electromagnetic spectrum students examine wave motion, then face challenges at "invisible energy" stations, including infrared (TV remote); radio; ultraviolet (black light) and others. They learn that these have become powerful tools in astronomy. Students are also introduced to Gamma Ray Bursts and ponder the most powerful explosions in the Universe.
- **Lasers, Jell-O Lenses and Light** Light propagation using Jell-O as a medium to understand the fundamentals of optics along with their application in today's worldwide telecommunications networks.
- **Light and Mirrors** Students use their reflections in plastic mirrors to discover how to make a million eyes, a "tunnel" through the desk, periscopes, and how the "fun house" mirrors work. A laser is used to show the light path. This lesson only works in rooms that can be darkened. This relates to reflection, refraction, interference, rainbows, lasers, light waves, and color.
- **Light Sources and Shadows** Children investigate shadows indoors and outside to develop their understanding of the sun as a light source and how its apparent motion across the sky changes the size and direction of the shadows formed.
- **Magnet Sculptures** This fascinating workshop lets students explore magnetism in a completely new way, thanks to the magnetic properties of British pennies and two EXTRA-STRONG Magic Penny Magnets! Students make pennies spin at 1,000 revolutions per minute, build pyramids and structures, make pennies move as if by magic and more!
- **Magnetism** Explore what magnets really attract (not every metal!) and investigate magnetic poles. Learn where magnets are used and try out some magnetic magic tricks.
- **Magnets and Lenz Law** After Oersted's 1820 discovery that electric currents create magnetism, it was obvious that in some way magnetism should be able to create electric currents. The discovery of electromagnetic induction, in 1831, by Michael Faraday and Joseph Henry was one of the most important of the 19th century, not only scientifically, but also technologically, because it is the means by which nearly all electric power is generated today. Students drop powerful magnets a vertical copper pipe, and find it falls much slower than a steel ball would. Its rate of fall quickly reaches a terminal velocity and it takes much longer for it to fall out of the other end than a steel ball would take. This is the same theory used for braking systems in subway, roller coasters and the Drop Zone!
- **Magnets: Compass Design Challenge** Let a steel needle point the way north! Students build a simple and flexible compass design can float on water or be suspended ("float" in the air).

- **Motion: Marble Works** This is a great workshop for kids to learn about gravity, potential and kinetic energy. Students design and construct marble mazes with ramps, connectors, funnels and tunnels.
- **Parachute Design Challenge** Leonardo da Vinci said: "If a man is provided with a length of gummed linen cloth with a length of 12 yards on each side and 12 yards high, he can jump from any great height whatsoever without injury." A simple parachute will land a small payload-but how big a canopy does it take to bring Barbie back down to Earth? We'll be making parachutes out of facial tissues-but testing some larger ones and their 'carrying capacity."
- **Photography Series: Digital Photography Exploration** This 6-week workshop series is designed to develop an appreciation for photography and especially for the modern tools that we use today. We will cover almost all aspects of photographic theory as well as rely upon many other disciplines such as mathematics, chemistry, and hands on assembly using various tools. Students will actually build a working pinhole camera, make photographs with it and then develop their photos using traditional photo chemicals in a real darkroom environment.
- **Photography Series: Pinhole Cameras** The world is imbued with light. This light interacts with us organically to bring our eyes messages of what is out there in the world. Through photography, we can slow down long enough to examine the fleeting messages and capture them for further study and use. Modern photography is a discipline that incorporates both the scientific as well as the artistic fields. Through photography, the student can find a practical application for mathematics, history, science, art and civic involvement. With the use of modern digital photography and a digital SLR camera, we can capture, prepare, print and study the photographs in real time, without further polluting the world with toxic chemicals or wasted paper for test prints. This class will introduce to the student: Photographic history, Modern digital camera operation, Determining proper exposure, Creative use of aperture and shutter speeds, Measuring light intensity and color temperature, Basics of color theory, Fundamentals of composition and Preparing a photo essay. Students will also have an opportunity to learn modern photographic digital darkroom techniques to process the digitally captured photographs, print them, and present them either matted or framed.
- **Pressure & Hydraulics** Air & Water Pressure is literally what holds our cells & bodies together! Amplifying our human power! Learn how Pressure and the hydraulic effect make Air, Water & Oil do work for us in everything from Pumps to Bulldozers to Aircraft Carriers.
- **Reflections** A flat mirror will always reflect an image that is right-side up and reversed right to left. A cylindrical mirror can produce images that are flipped upside down and images that are not reversed. The image you see in a cylindrical mirror depends on the orientation of the mirror and the

distance between you and the mirror.

- **Roller coasters**

Why toys? Kids call it playing. Scientists call it experimenting. Playing = problem solving How do roller coasters work? The Answer - Physics. If you ever thought that physics was boring, think again because without it, we wouldn't have roller coasters. This workshop explores the physics of roller coasters. The science focuses on work, motion, forces, and energy, with an emphasis on gravity, potential energy, and kinetic energy. Activities include experimenting with roller coasters by varying the height and angle of the rollercoaster track and by adding a jump and a bump.
- **Seeing Sound**

We introduce ocean floor mapping and features. It is important for students to understand that one can "see" in many different ways. Workshop activities help students grasp how one can see with sound waves. It also introduces them to the vast amount of information contained in sound. The intent is to understand how sonar can help science see the ocean floor. The concept of seeing with all kinds of waves, not just light, can be extended to many areas of science--i.e. seismicity and earth structure, planetary surfaces and radar, etc. This is a standard activity, but with a distinctive twist.
- **Soda Straw Rockets**

Student make small flying rockets out of paper and propel with air blown through a straw using an air compressor
- **Sound Science**

Students participate in a musical acoustics workshop. Students learn about simple harmonics, standing waves, nodes and nulls, wavelength and amplitudes. Subjects covered are the following: sound travels in waves and is produced by vibrating objects; long = low pitch, short = high; pitch; sound intensity increases with amplitude; how to measure frequency.
- **Sound Science: Sound Tubes**

Students receive the instructions/materials and a model of a musical instrument that they can build. This instrument can be used for a wide range of exploration into the science of sound.
- **Sound Science: Stethoscope Kit**

Students discover how sounds can travel through solids, liquids, and air using a simple stethoscope that they make and can keep. This relates to the anatomy of the ear, vibrations, sound amplification, and anatomy of the heart. This simplified monaural stethoscope will allow students to hear the "lub-dub" of their heart a-pumpin' blood.
- **Sound: Musical Instruments Design Challenge**

Student make Tooter Tubes, harmonica's and Buzzers using recycled materials
- **Survive On Science: Fire**

Everyone loves a good fire. No one can resist the magic of the dancing flames. Without the ability

to produce fire, it is doubtful that human kind would have evolved into the world as we know it. A variety of fire making techniques will be taught in this program including the Bow Drill, Hand Drill, Flint and Steel, Steel Wool and Batteries, Fresnel Lenses, and Magnesium Strips.

- **Survive On Science: First Aid**

Safety skills including: how to recognize an emergency, how to get help, how to control bleeding, how to perform rescue breathing, and first aid for nosebleeds, bites, bruises, choking, and fractures. Students also learn all about fire safety, water safety, and what to do for poisoning. This is a fun and interactive course that includes manikin practice, relay races, hands-on bandaging, and more.
- **Survive On Science: Flintknapping**

Stone, surprisingly useful and beautiful in its natural state, is one of the most essential yet often overlooked tools available when it comes to survival. A naturally fractured rock becomes a simple knife. A simple unworked flake, struck from a flint core, served to scrape split maple withes for basketry or to finish the smoothing of a bow. This workshop will take you back in time to learn the ancient skills of stone tool making. Each student will begin with a hunk of rock, with no visible use, and turn it into one of the most important survival tools ever invented. And you will be introduced to several techniques and materials that will unfold a world of possibilities for the beginning or intermediate flintknapper. Focusing on the seven stages of reduction, starting with the raw materials and finishing with a useable tool, will help you to understand how various types of stone tools evolved over the course of time. This workshop will focus flintknapping and on the techniques/technologies that go into the arrow (making the shaft, using sinew, glues, fletching).
- **Survive On Science: Orienteering**

Once you know the basics of map and compass, it's time to navigate your path in uncharted territory. Orienteering involves locating "control points" by using a map and compass, along with natural topographic features, to navigate the terrain. Join us on a fun and interesting trek through the woods, with a surprising finish!
- **Survive On Science: Rope Making**

The knowledge of how to make rope is one of the most basic & important human skills. In this workshop you will learn how to make your own thread and cords from various fibers. You will also be taught what natural fibers are, how they can be located, processed, and can be used to prepare thread and cord for bookbinding and other book arts uses. We will show you how to ply cord, (using existing thread and make it heavier) and how to splice cord (to extend it's length, without tying a knot). In addition, you will explore fibers from plants such as Flax, Jute, Yucca, Pineapple, Raffia and Dogbane.
- **Survive On Science: Shelter**

Students learn techniques for constructing the debris hut, and wicki-up.

- **Survive On Science: Water** Students collect water using a solar still, sink hole, plants, and other methods; purifying, transporting and storing water.
- **Vectors and Velocity** Physics must explain not only why and how much, but also where and which way. Physicists and mathematicians invented a way of describing quantities that have direction as well as magnitude. Velocity describes speed and direction. Vectors, which describe displacement and velocity, are universal for all coordinate systems. Position, forces, motion & balance are all intertwined. We'll use toys, our bodies, ropes and spring scales and build a mobile to illustrate this.
- **Water Rockets** Better wear your swimsuit to this workshop as students design and launch rockets made from 2-liter bottles.
- **Where's The Shooter** Using the same techniques as a real forensic scientist, students calculate bullet trajectory and determine the location of the shooter in a mock crime scene, and will test for exposure to gunshot residue.