

Earth Science Workshop Descriptions

Astronomy

Sun Science - Students will learn about the physical and chemical properties of the sun.

Time Shadows - Students will build their own sundials and simulate the 'time shadow' created by the rotating Earth. The shape of the earth, their location on it and how a compass works are considered in the workshop.

Planets, Asteroids and Comets - Impact cratering is a process found everywhere in the solar system. Craters are among the most fascinating features of many moons and planets. In this workshop, your students experiment to find out more about what causes the various features of impact craters, including the rim of mountains around the edge, and the streaks or rays that fan out from large craters.

Night and Day - The *Night and Day* workshop provides students with materials to construct a model of the earth-sun system and to observe the causes behind the change from night to day ... and from day to night. They will observe why countries experience daylight at different times and be able to determine how often and in which direction the earth rotates on its axis. In the second half of the session, students will position their flashlights such that they can model the earth-sun relationship that produces the changing seasons. The beautiful finished model is artistic and will provide a fascinating take-home model for continued investigations at home.

Reasons for the Seasons - Students learn about the reasons for the seasons, phases of the moon, and eclipses through hands-on activities.

Earthquake Engineering - How do engineers construct buildings that withstand earthquakes? The students apply the lessons learned in their Strength of Materials workshop in building their structures.

River Erosion- Students will create river models using a dripper system and diatomaceous earth, and begin to understand rivers as dynamic, ever changing systems. They will investigate the concepts of erosion, pollution, toxic waste, and human manipulation of rivers.

Environmental Science

Alternative Energy - students create wind cars, and experiment with solar cars.

Biodiesel GoKarts

Comparison Of The Amount of Sulfur Dioxide, Nitrate Oxide and Particulates in Different Brands of Gasoline - We use chemical badges to analyze the exhaust of cars for such pollutants as sulfur dioxide, lead, and mercury.

Clean Air Challenge

Acid Rain Experiments - Our acid rain experiments use field pH meters as well as narrow range pH paper. The data collected is graphed and analyzed against the information learned about the buffering capacity of the Guadalupe River System. We also record on a map the location of each "rain site" in order to determine in industry, freeways and airports contribute to acid rain pollution.

Bioremediation by Oil Eating Bacteria - Students simulate bioremediation of marine oil spills using microbes that consume oil. These microbes have specialized metabolic pathways that enable them to use oil as food while converting it into nontoxic byproducts. In a controlled experiment, students work in pairs to apply a suspension of oil-degrading microbes to a small amount of oil and chemical indicator in a culture tube. A change in indicator color signifies breakdown of the oil. Students also perform the experiment without indicator and over time observe visible changes in the appearance of the oil.

Water Analysis Studies - The water analysis theme of our workshop emphasizes hands-on lab skills and basic chemistry. Students measure dissolved oxygen, chlorides, pH, hardness, nitrates and nitrites, and carbon dioxide. From this data they determine the buffering capacity of the Guadalupe River System. This information in turn leads to conclusions about the vulnerability of our river system to chemical pollution. We use the water-hardness data as the baseline for future heavy metal tests. In addition, chlorides are a good measure of how much salt washes into the wetland from the San Francisco Bay.

Green Cleaners – Baking soda to clean sinks, and vinegar remove the tarnish from your silverware? Students will learn chemistry as they make environmentally friendly household cleaners. They will learn some basic knowledge of chemistry: pH, Acids, Bases, Water-Soap, Surface Tension.

Water, Water Everywhere and Not A Drop To Drink - Students will do a variety of experiments that will demonstrate the properties of water and the effects of water pollution.

Macroinvertebrates As Pollution Indicators - The fresh water insect study will provide students with even more opportunities in population counting and collecting. We hope to see if fresh water insect are a natural indicator of water contamination by chemical pollutants. Students will collect samples of aquatic insect and indicate where each sample was found. They will also analyze water samples for pH, dissolved oxygen and phosphate concentrations so that they can correlate water data with insect larvae populations.

Garbage Dump Science - Each student will receive a make-believe garbage dump: a cup containing salt, beans-rice-cream of wheat mixture, metal, and wax. The challenge is to separate the mixture without touching it with their hands. The children then be asked what could be done with the separating garbage? This workshop provides the perfect springboard for recycling activities or other environmental related school projects.

Geology

Rock Cycle - The Earth is active. As you are reading this volcanoes are erupting; earthquakes are shaking; mountains are being pushed up and are being ground down; rivers are carrying sand and mud and laying them down; and all the time huge slabs of the Earth's surface are moving - about as fast as your fingernails grow. All this Earth action is linked by the rock cycle. Find out for yourself how different parts of the rock cycle work by coming to this workshop.

Flintmaking – Rocks in Industry: This workshop will focus flintknapping and on the techniques/technologies that go into the arrow (making the shaft, using sinew, glues, fletching).

Rock and Mineral Identification - Students learn how to identify and classify rocks using the MOH hardness scale, color, texture, buoyancy, and cleavage. Students learn that the properties of rocks and minerals reflect the processes that form them.

Plate Tectonics - Students make a paper model illustrating the concept of sea-floor spreading and the development of symmetrical magnetic "stripes" on either side of a mid-ocean spreading center.

Plate Tectonics and Volcanoes – Exploding Hair Gel, Alka Seltzer and Baking Soda Volcanoes, Fig Newton Convergent Zones and Milky Way Divergent Zones! Using these exciting and fun hands-on activities, students will learn about the types of volcanoes and how they relate to plate boundaries, what makes some volcanoes more dangerous than others, Volcanic rocks and landforms, and how volcanic eruptions affect Earth's climate and living things

Earthquakes: Strength of Materials - Students will observe and describe the properties of wood, clay, plastic, metals (copper, steel, zinc, and brass). Students will investigate the causes of failure for various materials. How and why do things break? How do engineers decide what materials to use in their designs?

Erosion - Students learn that waves, wind, water, ice and chemical reactions shape and re-shape the Earth.

Paleontology

Fossils - How does a living thing become a fossil? The mysterious processes by which evidence of past life is preserved will be explored. By thinking about and participating in some simulated sedimentary processes, children will be able to remove much of the mystery behind fossils and fossilization.

Dinosaur Tracking - We will practice measuring tracks, length, width and stride. We will use dinosaur tracks and human (kid) tracks and then put the measurements on a chart. The literature states that the length of a dinosaur track may be 1/5 of the length from foot to hip so we will see how big our dinosaur might have been! If the weather permits, we will use finger paint on some 'volunteering' feet and put our human tracks on butcher paper to measure. We will also test the difference in stride between a walking trail and a running trail--what would you guess the difference in measurements might be?

Hominids - By comparing human, hominid and primate skeletons and skulls, students will better understand how natural selection may have favored bipedal locomotion in the hominid lineage.

Paleoclimate - Students gain an understanding of *planktonic foraminifera*. They learn that our planet's climate has not always been as it is today. *Neogloboquadrina pachyderma* is an excellent recorder of climatic temperatures through geologic time. When the earth experiences periods of relatively cold temperatures, ocean waters are cooler and *Neogloboquadrina pachyderma* forms its test (shell) such that it coils to the left. Alternatively, during periods of relatively warm temperatures when ocean waters are warmer, *Neogloboquadrina pachyderma* constructs its test with a coiling direction to the right.

Weather

Air Pressure - Students will learn that air takes up space and has weight. They will learn about some basic principles about pressure and discover how pressure and temperature differences cause air to move. Students will learn that the wind that transports pollutants in the air and dilutes the pollution on the way. Knowledge of wind speed and direction can help you calculate in which direction pollution will travel and how much they will mix with the unpolluted air.

Air Moves - Using our flow density demonstrator, solar wind bag and singing pipe, students will learn that hot air rises and cold air sinks. Students won't believe their eyes as they explore the powerful properties of air as you put marshmallows to the pressure test. Students will be challenged to use Bernoulli's Principle to blow up an 8-foot long bag. With a little practice they will be able to inflate the bag using only one breath!

Water Cycle - Air pressure can tell us about what kind of weather to expect as well. If a *high pressure* system is on its way, often you can expect higher temperatures and clear skies. If a *low pressure system* is coming, then look for colder weather, storms and rain. Our workshops will introduce the concept of cloud formation and the conditions necessary for precipitation. The students will start with a quick look at part of the water cycle, and the combined gas laws. They will then progress through a hands-on/minds-on activity demonstrating the combined gas laws. Our experiments will lead them through the conditions necessary for cloud formation. Students learn that weather can be observed, measured, and described. Students learn that water is a resource that needs to be conserved.

Weather Instruments - students will be building Galileo Thermometers, and barometers.