
Schmahl Science Workshops EXPLODES the myth that science is dull. Our instructors are talented scientists and engineers who engage students’ curiosity, imagination and creativity using a fun, hands-on approach. Students learn to apply the scientific process as well as core scientific principles, all while making exciting new discoveries.

Students become engineers in the tradition of Leonardo da Vinci. They build clocks, design submarines, build rockets, learn about lenses and light, construct trebuchets, drop parachutes, make pinhole cameras, and explore anamorphic art.

6/20: Leonardo’s Submarine

**Density:** Students discover the idea of density as a mathematical concept. Students determine the mass and volume of 2 density specimens, and graph the results. The data is not random, but shows a clear linear pattern with a slope characteristic of the material used. The slope is called the density of the substance. The samples will also be used for testing students’ measuring abilities, and as samples of industrially important materials. (Code 260)

**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’. Students correlate pressure and diving depth using our syringe pump and pressure gauge. (Code 261)

**Submarines:** It is believed that the first underwater submersible was created around 1620 and powered by oars. Since then, submarines have made great technological leaps and have been used for salvage, search, and military purposes. Submarines can be expensive for an average, run of the mill person living during modern times. We will be building a smaller version of a submarine using water bottles, pennies and hot glue that can be played with in your bathtub! (Code 122)

6/21: Flight Inventions:

**Parachutes:** In the 15th century, 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 a golf ball back down to Earth? We’ll be making parachutes out of coffee filters, but testing some larger ones and their ‘carrying capacity.” (Code 454)

**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. (Code 3)

6/22: Leonardo’s Machines:

**Simple Machines: Gears and Levers:** Give me a lever long enough and a place to stand, and I will move the world.” –Archimedes, 230 BC. Students investigate household gadgets to see how simple machines impact them daily by making work easier. Students construct a team gear train and in the process learn skills such as troubleshooting and collaboration. (Code 87)

**Clock Anatomy:** Students construct a clock that will help them understand how the potential energy stored in the spring drives the
Children are motivated to learn when their ideas are cultivated. The parallax measurements we will make in this lab will construct buildings that withstand earthquakes. The bridge's own definition. The first bridge building.

6/23: Leonardo’s Architecture

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. (Code 176)

Paper Bridges: Paper folded or rolled into columns and beams can be surprisingly strong. Through exploring the simplest type of paper bridges, children discover that they can make very strong structures with very limited materials. As they continue to take on more and more difficult bridging challenges and learn more about the capabilities of their materials, they gradually uncover a number of simple principles of bridge building. (Code 218)

Leonardo da Vinci Bridge: Sometime around 1485-1487, Leonardo da Vinci devised a method for building a self-supporting arched bridge that doesn’t require any ropes or other fasteners. The bridge’s own weight keeps it together; the more you stack on it, the more stable it gets. It was originally meant to be a quick bridge for military usage - just bring along the pre-cut pieces and slot them together. Students build an arch bridge that stands by itself without any fasteners or complicated joinery! (Code 466)

6/24: Leonardo’s Art

Anamorphic Art: An Anamorphic image is an extreme case of perspective, where the image is stretched beyond recognition. 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! (Code 467)

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. (Code 453)

You’re as High as My Eye: How do we tell how big something is, just by looking at it? Why do things look smaller when they are farther away? How can the brain compute the real size of things, even when they appear tiny? Astronomers first used parallax to measure distances to other planets in 1672, but living organisms have been using parallax for several hundred million years - ever since the first animals having two eyes evolved. The parallax measurements we will make in this lab use a technique you have been practicing since infancy. In some sense, you are already an expert at using parallax to measure distances, but at the same time, you may not know how your brain accomplishes this very useful trick. (Code 295)

About Schmahl Science Workshops

Schmahl Science Workshops is a non-profit partnership of students, parents, teachers, scientists and engineers who come together to foster the innate curiosity and love of science that exists among children. Founded in 1996 by a group of four children and their parents, Schmahl Science Workshops provides pre-K through 12th grade children with an unmatched breadth of hands-on science workshops spanning biology, chemistry, earth science, forensics, math and physics. Our mission is to prepare children of all backgrounds for a future in which science and technology will drive every industry and vocation. We believe that children are motivated to learn when their ideas are cultivated through the joy of designing and carrying out an experiment. Through these authentic research experiences, our workshops enable students to explore and invent what inspires them, and to develop the skills needed to achieve success in all areas of their lives. 2016 © Schmahl Science Workshops