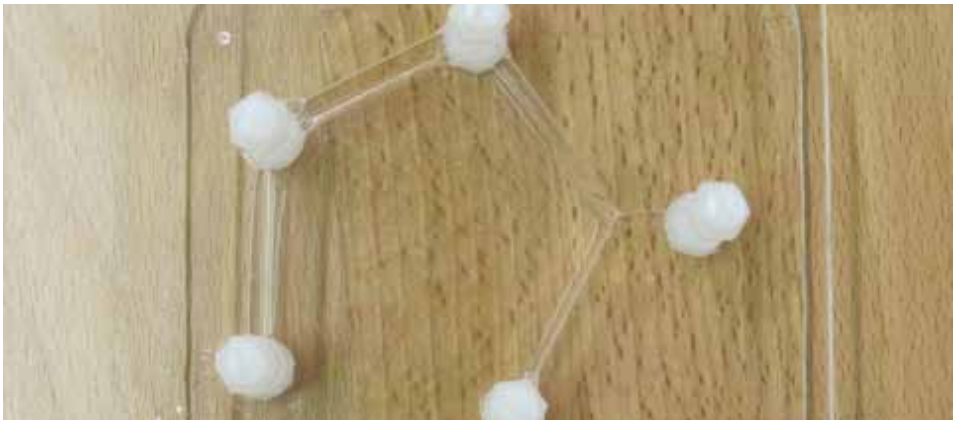
EXHIBIT:

# ACTIVITY: Bubble Paths

*Why are bubbles spherical? What other shapes can they make?*



## DISCOVER

Students will experiment with various geometrical configurations of soap film and bubbles while discovering how light behaves when it passes through the distinct media of soap and water.

## MATERIALS

For a durable bubble block, you will need:

- 2 4-inch squares of 1/8" or 1/16" acrylic sheets (available at hardware stores)
- 3-6 nylon bolts (you can use metal screws, but they will eventually rust) (available at Radio Shack or Home Depot)

You can also build a cheaper version using:

- 1 plastic CD case
- 1-2 drinking straws, cut into 3-6 pieces about 1/4" long
- Hot glue or other water-resistant glue

You can use a store-bought bubble solution or make your by mixing:

- 2/3 cup Joy dishwashing soap
- 1 gallon water
- 2-3 Tbl of glycerin (find it at your local pharmacy)

You will also need:

- A drill with a bit that matches the size of the bolts, screws, or straws
- A razor or utility knife (to score the acrylic sheets or CD case)
- A container to hold the bubble solution, with an opening wide enough to dip the blocks in and out.
- Paper towels

Grades: 8th-12th

Group Size: 1-3 students per bubble block

Time: 30 minutes for construction; 10 minutes for discovery

Utah Core Curriculum:

- 6th Science 6.2 a, b, c, d, e
- 8th Science 4.1 b, c
- Geometry
- Chemistry 3.3 c

Process Skills & Higher Level Thinking Skills:

- Observing
- Questioning

Related Activities/ Exhibits:

- Hylozoic Veil
- Holotype

## WHAT'S GOING ON?

Light is refracted and reflected when it passes through the bubble. We see so many colors because the soap film causes some of the light waves to reflect off the outer surface of the bubble. Other light waves enter the thin film and then reflect off the inner surface of the film. Both of those emerging reflected waves will interact with each other. The resulting interference will produce different wavelengths of light, or different colors. Varying thicknesses of bubble film produce different colors, because light takes longer to travel through a thicker film, so the resulting light wave interference changes. If the film gets thinner than the wavelength of visible light, it appears black. To put a bubble's width in perspective, a bubble can be up to 500 times thinner than a human hair!

You can view a video exploring the idea of the shortest distance between points at http://www.snibbeinteractive.com/platforms/socialfloor/products/boundary_functions

## PREPARE

If you use acrylic sheets, you'll need to drill the holes. Experiment with the number and location. If you glue the posts to the squares, allow time for the glue to dry. Have some towels handy so you can wipe up any spilled bubble solution.

## PONDER

- What's the shortest distance between 2 points? 3 points? 4 points?
- How are the rainbows in nature formed?
- Why is a bubble covered in so many colors, when just white light is shining on it?

## EXPERIMENT

1. Submerge the bubble blocks in the bubble solution and remove. Watch how the path of the soap film configures itself.
2. Gently blow the soap film to change its path, and observe how it re-configures itself back to equilibrium. The soap film will follow the shortest path between points, because this provides the most stable bonding between water and soap molecules.
3. Document your findings.
4. Use a block as a "bubble wand" to blow a bubble. Coat another block or your hand with soap to catch the bubbles. Observe the patterns of light on the surface of the bubble.