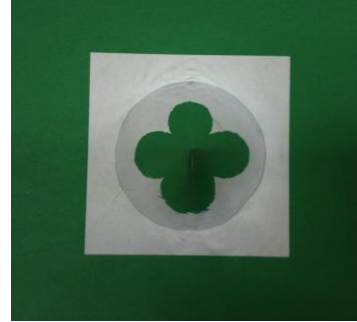# Conical Mirror

Recommended Grade Level:
6th–12th grade

NGSS Science & Engineering Practices
- Asking questions
- Planning and carrying out investigations
- Using mathematics and computational thinking
- Constructing explanations and designing solutions

Time:
25 min

Materials Needed:
- mirrored mylar
- cone template (attached)
- cardstock
- glue stick
- tape
- scissors
- colored paper

Background Information:
When you look downwards at the tip of a conical mirror, it reflects everything around it towards the center of the cone.

To Do and Notice:
1. Print the cone template onto cardstock or other stiff paper.
2. Glue enough mylar to the back of the template to cover the area of the circle.
3. Cut along the solid lines to get two semicircles (give the other to a friend).
4. Curve the mirror so that the mylar is on the outside and tape the inner edge to the dotted line on the template.
5. Place a 10 cm x 10 cm square sheet of colored paper on a larger piece of a different color paper.
6. Put your mirror in the center and place your eye above the tip of the cone. What do you see?

What's Going On?

expl(O)ratorium ®

Conical mirrors provide an interesting reflecting surface for anamorphic images. The images are best viewed with the eye looking downwards from a fixed point above the apex of the cone. Just as in planar mirrors, light from the image hits the mirror and is reflected into your eye. The angle between light from the image and the surface of the mirror is the same as the angle of the light that is reflected into your eye. Light is bouncing in all directions, but you only see what is perfectly reflected into your eye. In a conical mirror, the angle can be measured by imagining a tangent plane at each point in the cone. This infinite set of infinitely small planar mirrors reflects the images back to your eye in straight lines. This simple geometry can be used to predict how images will look to you when you view them in the mirror.

your eye

θ

B

θ

A
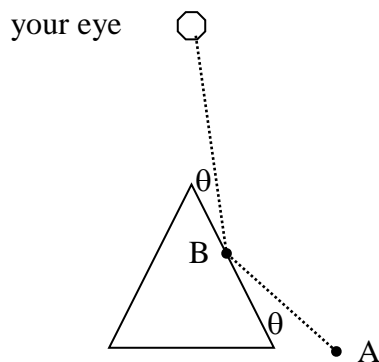
Light hitting point A in the image is reflected off of the mirror at point B into your eye. You see whatever is at point A at point B as well. The two angles made by the reflected light rays are identical.

Going Further
The template is designed to generate a cone with a height of 7.5 cm and base diameter of 7.5 cm. A cone of this size will not reflect anything greater than a regular sheet of paper. What are the bounds to the space that you can see?

Use the grid template to draw your own conical anamorph!

expl◯**ratorium**®