



# Astronomer demo: Comets

**Time:** 45 Minutes

**Skill Level:** Elementary (age 6–11), Middle School (age 12–14)

## Background

### What is Science Inquiry?

Children are natural scientists. From a very early age they explore the world, ask questions and seek answers. This journey of exploration and discovery is Science Inquiry. Science Inquiry helps young people understand their environment, solve problems and gain knowledge about scientific ideas and processes.

## Next Generation Science Standards (NGSS)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions	PS1: Matter and its interactions	2. Cause and effect: Mechanism and explanation
6. Constructing explanations	ESS1: Earth's place in the universe	4. Systems and system models
7. Engaging in argument from evidence		7. Stability and change

## Objective

In this demonstration, students will learn about comets and observe a real-life “comet” created in the classroom.

## About the Scientist

Astronomers are scientists that study the stars, planets, and space. The word *astronomer* comes from the ancient Greek word, *ástron*, meaning *star*. Our solar system has one sun, which is a star located at the center of our solar system, and eight *planets* that *orbit* the sun. The sun gives off energy, which provides planets with heat and light. In addition to stars and planets, our solar system contains smaller objects (formally called *small solar system bodies, SSSB*), including *asteroids* and *comets*.

## The Science of Comets

Comets are large cosmic snowballs of frozen gases, rock, and dust. When a comet orbits close to the sun, heat causes the ice to change from a solid directly to a gas (skipping the liquid phase). This type of phase change is called *sublimation*. The dust and gases then form a *tail*, which may be visible from Earth when sunlight reflects off the gas particles.

### Materials List:

Garbage bags	Large spoon
Mixing bowl	Sand or dirt
Dry ice	Ammonia
Hammer	Corn syrup
Gloves	Water
Goggles	

**Discuss** ...What do students know about astronomers and the solar system? What about Pluto—is it a planet? What other objects do we see in space (e.g., moons, satellites, asteroids, comets, etc.)? Explain the properties of a comet. How can students imagine using the provided materials to make a comet?

**Predict** ...Generate Ideas. Select a Solution

### Experience “What to Do”- What is the plan for the investigation?

Demonstrate making a 6-inch comet as follows:

1. Line a mixing bowl with a garbage bag.
2. Add 2 spoonfuls of sand or dirt, a dash of ammonia, a dash of corn syrup, and 2 cups water.
3. Wearing gloves and goggles, place dry ice in 3 garbage bags that have been placed inside each other.
4. Use the hammer to crush 2 cups of dry ice, then add the dry ice to the bowl mixture.
5. Stir vigorously until mixture is almost frozen.
6. Lift comet out of the bowl using the liner and shape it as you would a snowball.
7. Unwrap the comet as soon as it is frozen sufficiently to hold its shape.
8. Simulate movement of the comet through the solar system by walking around the classroom. Try walking more quickly and swing the comet through the air.

**Share** ...Encourage students to discuss what they are observing.

### Reflect ...Analyze and interpret the data and results. Discuss among the group.

What did you observe? What causes the vapor that is being emitted from the comet?

### Generalize ...to real world examples. Construct explanations.

Based on your observations, how does a comet form a tail? What happens when a comet nears the Sun?

### Apply ...outside the classroom or club meeting.

When ice melts, it turns into water. What did you observe when the dry ice melted? Why does dry ice melt differently than an ice cube from your freezer?

### Additional resources:

- This experiment is based on an activity designed by Dennis Schatz, available on the National Optical Astronomy Observatory (NOAO) website, <http://www.noao.edu/education/igcomet/igcomet.html>
- For more information on comets and comet exploration, see NASA’s website: <https://solarsystem.nasa.gov/comets>

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Agriculture Sciences & Natural Resources, Family & Community Health, 4-H Youth, Forestry & Natural Resources, and Extension Sea Grant programs. Oregon State University Extension Service offers its programs and materials equally to all people.