

SUGGESTED REFERENCES

- *Amazing Space - Comets, an interactive program that has many interactive elements*
http://amazing-space.stsci.edu/resources/explorations/comets/lesson/lab.html
- *Windows to the Universe, our solar system - information and activities delivered at three levels*
www.windows.ucar.edu/tour/link=/our_solar_system/solar_system.html
- *NASA's Stardust comet mission website - activities and games*
http://stardust.jpl.nasa.gov/classroom/kids.html
- Ron Miller
Asteroids, Comets and Meteors (Worlds Beyond)
21st Century, August 2004

NATIONAL SCIENCE EDUCATION STANDARDS

Grades K - 4, 5 - 8

Science as Inquiry

Abilities necessary to do scientific inquiry
Understandings about scientific inquiry

Grades 5 - 8

History and Nature of Science

Nature of science
History of science

*Source: *National Science Education Standards, 1996, National Academy Press*

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COMET - *Visitors from Space*

SYNOPSIS

Comets have been causing fear in the minds of humans for millennia. Now spacecraft are helping us to understand what they are made of and how they behave. The time it takes for a comet to make one complete orbit around another object is known as the orbital period. The range of a comet's orbital period may be from a few years to hundreds of thousands of years. Short-period comets originate in the Kuiper belt, or its associated scattered disc, which lie beyond the orbit of Neptune. Longer-period comets are thought to originate in the Oort Cloud, a spherical cloud of icy bodies in the outer Solar System. Comets allow us to study what the solar system was like in its formative period. This program will help students understand why comets cause both fear and fascination.



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Center for Interactive
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www.jets.org

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RUNNING TIME

10 minutes

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BACKGROUND

Out at the edges of the solar system are objects that formed from earliest galactic activity. Too small and far away from the Sun to form planets or moons, these objects have caused fear and fascination for millennia.

Formed from icy crystals of methane, ammonia and water, comets orbit the sun in the Kuiper Belt and the Oort Cloud. Occasionally, comets have their orbits disturbed by the gravitational wobble of a nearby star and then are drawn in towards the Sun. As a comet gets closer to the Sun it heats up and ice crystals stream off of it like a great tail. These tails always point away from the Sun and are composed of two parts, one gas tail and one dust tail.

Dust from the tail litters the wake of a comet. When it intersects earth, some grains streak into the atmosphere and burn up, we call these events shooting stars.

A comet's orbit can take it directly into the Sun, where it is incinerated. Others just miss the Sun, while some settle into a stable orbit. Long period comets have orbits that take them out into the Kuiper Belt and back around the Sun. Short period comets are captured by the gravity of both the Sun and another planet such as Jupiter. Halley's Comet is the most famous short period comet; records of its appearance date as far back as the 11th century. Compared to the elliptical orbits of planets, comets orbits are described as eccentric elliptical orbits, meaning they are less circular and more flattened.

CRITICAL THINKING EXERCISES

1. Describe why comets have unusual orbits.
2. Illustrate the eccentric orbit of a comet, with its tail, as it travels around the sun.
3. Distinguish between the orbits of comets thought to originate in the Oort Cloud from comets thought to originate from the Kuiper Belt.
4. Justify the need for more research and information regarding comets, including how the information might be used by scientists.

CAREER POSSIBILITIES

- ASTRONOMER
- COSMOLOGIST
- ASTRONAUT
- ENGINEER
- ASTROPHYSICIST
- PHYSICIST

ADVANCED ORGANIZERS

Prior to viewing this program, students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 4. The Physical Setting

Section A: The Universe, Grades 6-8

- Large numbers of chunks of rock orbit the Sun. Some of those that the Earth meets in its yearly orbit around the sun glow and disintegrate from friction as they plunge through the atmosphere and sometimes impact the ground. Other chunks of rocks mixed with ice have long, off-center orbits that carry them close to the sun, where the sun's radiation (of light and particles) boils off frozen material from their surfaces and pushes it into a long, illuminated tail.

Benchmark 4. The Physical Setting

Section F: Motion, Grades 6-8

- An unbalanced force acting on an object changes its speed or direction of motion, or both. If the force acts toward a single center, the object's path may curve into an orbit around the center.

**Benchmarks can be found at www.project2061.org/tools/bencho/bolintr.htm*

VOCABULARY

- Comet** A celestial body moving about the sun, usually in a highly eccentric orbit, consisting of a central mass surrounded by an envelope of dust and gas that may form a tail that streams away from the sun.
- Halley's Comet** Comet named after Edmond G. Halley who was the first to suggest that comets were natural phenomena in orbit around the Sun. He suggested that a certain comet was a regular visitor, returning every 76 years.
- Kuiper Belt** An area of the solar system outside of Neptune's orbit, which is believed to contain asteroids, comets, and icy bodies.
- Long Period Comet** A celestial body with an unpredictable orbit, thought to originate in the Oort cloud, randomly oriented on the celestial sphere, with a period much longer than 200 years. They can return on their steps after periods of thousands to millions of years, or not at all.
- Oort Cloud** A region of the solar system far beyond the orbit of Pluto in which billions of comets move in nearly circular orbits around the Sun unless one is pulled into a highly eccentric elliptical orbit by a passing star.
- Short Period Comet** A celestial body with a predictable orbit, thought to originate in the Kuiper belt, with a short period - up to 200 years. There are two major families of short period comets: the Jupiter family with periods of less than 20 years and the Halley family with periods from 20 to 200 years.