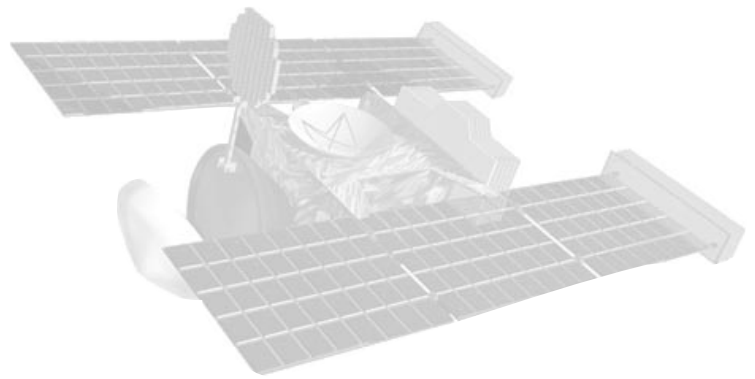


Vocabulary



Aerogel - A silicate dioxide material with the lowest known density of any solid, made of 99% air. Sometimes referred to as solid blue smoke, aerogel is lightweight, strong, and has more insulating power than fiberglass. The STARDUST spacecraft will use aerogel to capture microscopic, high-velocity particles from the coma of a comet and interstellar dust.

Asteroid (also "planetoid") - A rocky body orbiting the Sun, usually greater than 100 m in diameter. Most asteroids orbit between Mars and Jupiter, roughly 2 - 4 AU from the Sun.

Astronomical unit (AU) - One AU is equal to the average distance between the Sun and Earth, approximately 150 million kilometers (93 million miles).

Central Peak - A small mountain that forms at the center of a crater more than 40 km across in reaction to the force of the impact.

Circle - A geometric shape, where all points are the same distance from the center.

Coma - A cloud of dust and gas that forms around a comet's nucleus as the Sun heats it.

Comet - A small icy object with highly eccentric orbits around the Sun. See long-period and periodic comets.

Crater - Impact craters are the result of an asteroid, comet, or planetary body hitting the surface of another planetary body. The resulting explosion leaves a round hole or crater.

Density - The mass of a substance for a given volume.

Eccentricity - A numerical value for the shape of an orbit ranging from 0 (zero) which equals a circular orbit to nearly 1 (one) which equals a long, flattened orbit. Planets (except Pluto), moons, asteroids, and short-period comets have eccentricity values close to 0 (zero). Long-period comets have eccentricity values of 0.5 or more.

Ellipse - An oval, where all the points on the curve form the sum of the distances from two fixed, or focal points.

Ejecta - The debris that shoots out of the impact site when a crater forms.

Feedback Loop - Information flowing two ways, in the case of STARDUST between mission control operators and the spacecraft.

Floor - The bottom part of an impact crater. It can be flat or rounded and is often lower than the surrounding surface of the planet or moon.

Focal Points - See definition for ellipse.

Gravity - Force of attraction between matter, proportional to its mass. Gravity holds us on Earth and keeps the planets orbiting around the Sun. Just as Earth pulls on you, you pull on Earth; however, the effect of your pull on Earth is negligible since Earth's mass is so much bigger.

Gravity Assist - The process of flying close to a planet in such a way as to gain energy and deflect a spacecraft onto a different course. The spacecraft accelerates, while the planet slows down a minute amount.



Kuiper Belt - A disk-shaped region roughly 30 to 100 AU from the Sun (past the orbit of Neptune) containing many small icy bodies. It is believed to be the source of short-period comets.

Long-period comets - A comet with an orbital period of more than 200 years. Examples: Comet Hale-Bopp, 4,000-year orbit; Comet Hyakutake, more than a 65,000-year orbit.

Mass - The measure of an object's inertia, i.e., how heavy it is. Mass is not the same as weight, which measures the gravitational force on an object.

Magnitude - A numerical value for the brightness of a celestial object. The brighter an object is in the sky, the smaller its magnitude.

Meteor - A bright streak of light in the sky caused by a meteoroid or a small icy particle entering Earth's atmosphere. It is also known as a "shooting star" or "falling star." Meteor showers sometimes occur when the Earth passes through debris left behind by an orbiting comet.

Meteorite - The rocky remains of meteoroids that survive the fiery journey through Earth's atmosphere and land on Earth.

Meteoroid - A small rocky object orbiting the Sun less than 100 m in diameter. Meteoroids are smaller than asteroids.

Nucleus - The solid part of a comet, made of ices and rock. As the nucleus approaches the inner solar system, its ices melt, creating a much larger coma of dust and gas which surrounds it. The true nucleus of a comet (Halley) has only been seen once, by the spacecraft Giotto.

Oort Cloud - A huge spherical "cloud" that extends from beyond the orbit of Neptune and Pluto, half way out to the nearest star. It may contain a trillion or more comets orbiting the Sun. This is thought to be the source of long-

period comets.

Orbit - The path a planetary body makes as it revolves around the Sun. The orbit of a comet tends to be far more elliptical than planets.

Particle - A tiny, or minute, quantity of a substance.

Perihelion - The point where an object orbiting the Sun is closest to the Sun.

Periodic or short-period comets - A comet with an orbital period of less than 200 years. Short-period comets fade over time as more and more of their ices melt with each passage of the Sun. Examples: Comet Halley, 76-year orbit; Comet Encke, 3.3-year orbit; Comet Wild 2, 6.2-year orbit.

Rays - The bright streaks that start at the rim of the crater and extend outward.

Rim - The highest point along the edge of a crater hole.

Spectrometer - An instrument used to obtain and record a spectrum of an astronomical object. A spectrum is a series of colors that is produced when light is spread out in order of wavelength. Scientists use spectra to determine the chemical composition of an object.

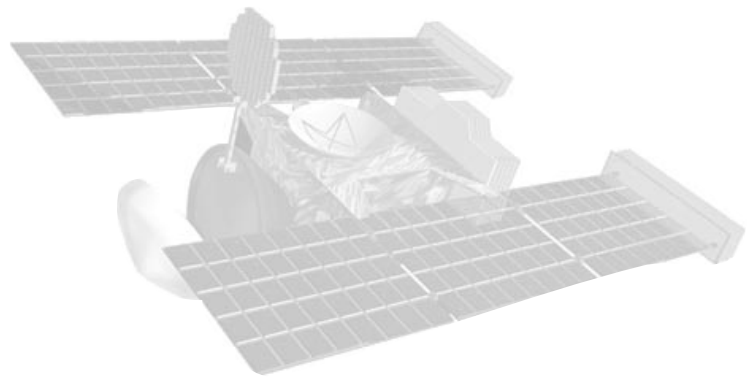
Sublimation - The process of an ice turning from a solid state directly to a gas state, without changing to a liquid first.

Tail - A long trail of dust and gas that extends out from the coma of a comet. The tail always points away from the Sun! These appendages come in a variety of shapes and lengths that can cover a significant portion of the sky.

Wall - The sides of the bowl of a crater.



Resources



The following is a list of websites, organizations, and magazines teachers can consult for more information about the STARDUST mission, comets, and other small bodies. Happy hunting!

Websites

Asteroid and Comet Page

NASA and National Space Science Data Collection
<http://nssdc.gsfc.nasa.gov/planetary/planets/asteroidpage.html>
http://nssdc.gsfc.nasa.gov/planetary/planetary_home.html
Contains fact sheets, FAQs, photo galleries, future mission information, and offers CD-ROMs

Comets and Meteor Showers

<http://medicine.wustl.edu/~kronkg/index.html>
You've probably seen a "shooting star" flash briefly across the sky on a clear summer night. This site will help you learn about these and other cosmic interlopers. Plenty of pictures and hints for observing are among the highlights here.

Comet Observation Home Page

<http://encke.jpl.nasa.gov/>
Check this site for the latest comet observations, finder charts, and background information on comets.

Comet Hale-Bopp Home Page

<http://www.halebopp.com>
Be sure to visit the official Comet Hale-Bopp page and find out just how Dr. Alan Hale discovered this mysterious cosmic visitor! HINT: It wasn't from some huge observatory ...

JASON Foundation for Education

<http://www.jasonproject.org/front.html>
Visit this site for the latest expedition information and ways to get involved.

JPL Comet Hale-Bopp Page

<http://www.jpl.nasa.gov/comet/>
Chronicles one of the brightest comets ever observed. Clear explanations and numerous pictures let you keep tabs on this visitor from deep space.

JPL's Shoemaker-Levy 9 homepage

<http://www.jpl.nasa.gov/sl9/>
Contains images of comet Shoemaker-Levy 9's impact with Jupiter, including many from spacecraft Galileo. This website was visited more during the week of the impact with Jupiter than any homepage to date.

NASA Spacelink

<http://spacelink.msfc.nasa.gov/home.index.html>
Offers educational materials, software, and images on aerospace topics. Special features for teachers that sign-up for accounts. Check for upcoming events for educators.

National Space Science Data Collection (NSSDC) Homepage

<http://nssdc.gsfc.nasa.gov/planetary/>
Offers latest news in planetary science, CD-ROM collections, and information on all comets.

Night of the Comet

NASA, SOFIA, and Internet in the Classroom
<http://www.comet.arc.nasa.gov/comet/>
Chronicles amateur astronomers from around the world sharing information and photographs of Comet Hyakutake.

Omniplex at Kirkpatrick Science and Air Space Museum

<http://www.cpb.uokhsc.edu/okc/kirk/kirkmap.html>
Four museums are housed at this Kirkpatrick Center site.

Sky On Line Homepage

<http://www.skypub.com/>
This is the Sky & Telescope magazine homepage. Offers news bulletin, Sky Publication Catalogs, Comet Page, tips on backyard astronomy, star parties and events, links to Internet telescopes, clubs, and observatories.

Space Image Libraries

NASA Aerospace Education Specialists Site
<http://www.okstate.edu/aesp/image.html>



Offers latest pictures on rockets, probes, and spacecraft, Hubble Telescope, NASA-related sites, Space Agencies, Astrophotography, special missions, observatories, and events.

STARDUST Mission homepage

<http://stardust.jpl.nasa.gov/>

Includes information on the mission, spacecraft, and comets, and educational materials with terrific links to other sites.

Non-Web Resources

Organizations

Astronomical Society of the Pacific: ASP has a free quarterly educational newsletter, a catalog full of great educational items. Project ASTRO's Universe at Your Fingertips comprehensive and ready-to-use collection of classroom activities, teaching ideas, and annotated resource lists is a must-have resource for every school in the country! For around \$30, it is a bargain that cannot be passed up. Call (800) 335-2624 or write to the Astronomical Society of the Pacific, 390 Ashton Avenue, San Francisco, CA 94112.

Challenger Center For Space Science Education: A part of STARDUST's Education Outreach Team, Challenger Center is a not-for-profit organization committed to using the theme of space exploration to create positive learning experiences, foster interest in science, math, and technology, and motivate young people to explore. Challenger Center offers classroom programs and teacher workshops as well as providing a network of over 30 Challenger Learning Centers in partnership with museums, science centers, schools, universities, and communities across North America. For more information write Challenger Center, 1029 N. Royal Street, Suite 300, Alexandria, VA 22314, or call (703) 683-9740.

JASON Foundation for Education: A part of STARDUST's Education Outreach Team, JASON is a non-profit educational organization founded to administer the JASON Project, an educational project begun in 1989 by Dr. Robert D. Ballard following his discovery of the wreck of the RMS Titanic. After receiving thousands of letters from children who were excited by his discovery, Dr. Ballard and a team of associates dedicated themselves to developing ways that would enable teachers and students all over the world to take part in global explorations using advanced interactive telecommunications. For more information write: JASON Foundation for Education, 395 Totten Pond Road, Waltham, Massachusetts 02154 or call (781) 487-9995.

Harvard-Smithsonian Center for Astrophysics: CfA offers broadcast and instructional television programs, in-service and preservice workshops, and a physical science curriculum for elementary students called Project ARIES, among other programs. CfA can be contacted at 60 Garden Street, Cambridge, MA 02138.

Kirkpatrick Science and Air Space Museum at Omniplex: A part of STARDUST's Education Outreach Team, Kirkpatrick Center is the home of four major Oklahoma City Museums: the Air Space Museum, the International Hall of Fame, the Omniplex Science Museum, and the Red Earth Center. For more information write 2100 N.E. 52nd Street, Oklahoma City, OK. 73111 or call (405) 427-5461.

Lunar & Planetary Institute: This branch of the Center for Advanced Space Studies is part of the Universities Space Research Association (USRA) that offers specialized slide sets for educators on a variety of Solar System topics. Contact LPI, Order Dept., 3600 Bay Area Blvd., Houston, TX 77058. Call (281) 486-2172. NASA CORE: The Central Operation of Resources for Educators for NASA-generated materials. CORE, Lorain County JVS, 15181 Rt. 58 South, Oberlin, OH 44074. Call (216) 774-1051, ext. 293 or 294.

National Science Teachers' Association: In addition to hosting wonderful conferences and producing a variety of classroom resources, NSTA coordinates NASA's two primary teacher training programs for elementary and secondary teachers-known as NEWEST & NEWMAST-and the Space Science Student Involvement Program. NSTA, Space Science and Technology, 1840 Wilson Blvd., Arlington, VA 22201-3000. Call (703) 243-7100. National Space Society: With membership comes a subscription to NSS' Ad Astra magazine, a great way to stay in touch with the current events and issues surrounding space exploration. NSS, 600 Pennsylvania Avenue, SE, Suite 201, Washington, DC 20003. Call (202) 543-1900.

Magazines

Astronomy Magazine: Found in most public libraries, this popular astronomy magazine is loaded with articles on current events in astronomy. Write to 21027 Crossroads Circle, P.O. Box 1612, Waukesha, WI 53187.

Sky & Telescope Magazine: Found in most public libraries, this popular astronomy magazine is loaded with articles on current events in astronomy. P.O. Box 9111, Belmont, MA 02178.



