11 HANDS-ON STEM PROJECTS

Astronomy special issue

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Q: Why is Saturn such a good name for a planet?
A: It has a nice ring to it!

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See the SUN safely

by Mike Reynolds

YOU WANT TO LOOK AT THE SUN, but you don't have a solar filter for your telescope. Maybe you don't even have a telescope. No problem!

Somewhere at home, we'll bet you have a cardboard box. That and a few other things will let you build a "pinhole viewer" for the Sun. And even though the Sun will look tiny, it will be the Sun, and you can watch it as long as you want. This viewer is totally safe — and also pretty close to free.

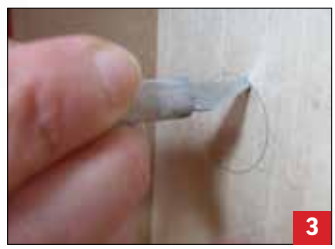
Just follow these steps. Feel free to change the size of the box and decide whether you want to cut off the extra cardboard pieces. You also can try using a thicker pin or a sharp pencil to see if it gives you a better-looking Sun.

Remember that you're not building a telescope, so you won't see much detail. But that white circle will definitely be the Sun.

Start with a cardboard box at least 18 inches (46 centimeters) long. If you use a box shorter than this, the image of the Sun will be tiny.

ALL PHOTOS: HOLLEY BAKICH

In the center of one of the box's small ends, trace a circle around a quarter. You could use a nickel, a dime, or a penny, too.



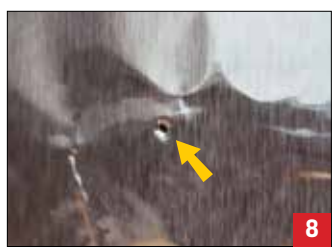
Ask an adult to carefully cut out the circle with a sharp knife.

The hole doesn't have to be perfect — or even round!

Cut out a small piece of aluminum foil big enough to cover the hole in the box. The best foil to use is a heavy-duty kind.

Tape the foil over the hole.

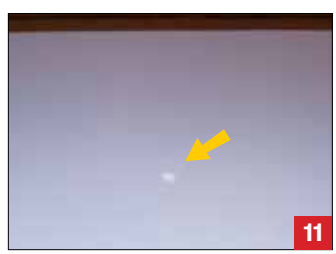
Poke a hole in the foil using a pin. A pin is better than most items you could use because you want a hole with clean (not ragged) edges. If you don't have a pin, use a sharp pencil. But don't make the hole too big. A bigger hole lets more light through and makes a brighter Sun, but if your hole is too big, you'll just see a blob.



Make sure the hole is round and that nothing is blocking it.

Cut away as much of the extra cardboard pieces as you want. Or fold them over and tape them to the box's sides. That will make the viewer a bit sturdier.

Tape a white piece of paper on the inside of the box opposite the hole.



Point the hole at the Sun and look at the paper. Congratulations! That's the Sun.

Q: Why does a space rock taste better than an Earth rock?

A: Because it's a little meteor.

ALIEN: DANIELFELA/DREAMSTIME. SUN: EVGENII141/DREAMSTIME

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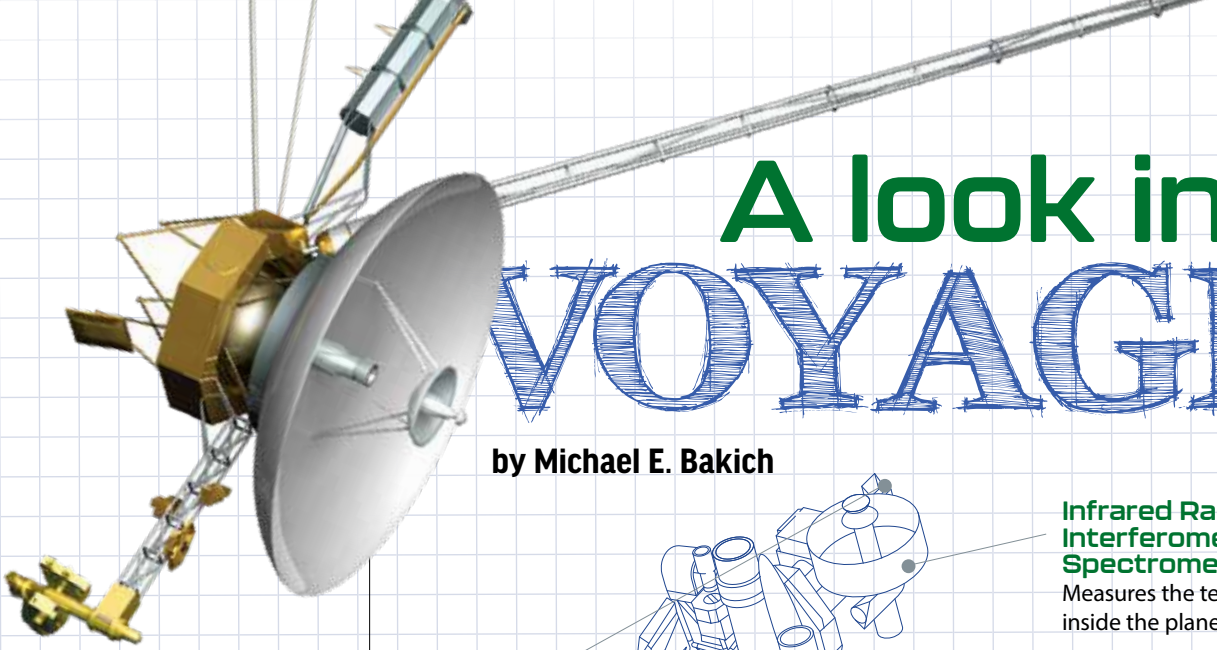
A look inside VOYAGER

by Michael E. Bakich



Two Voyager spacecraft launched in 1977. NASA/JPL

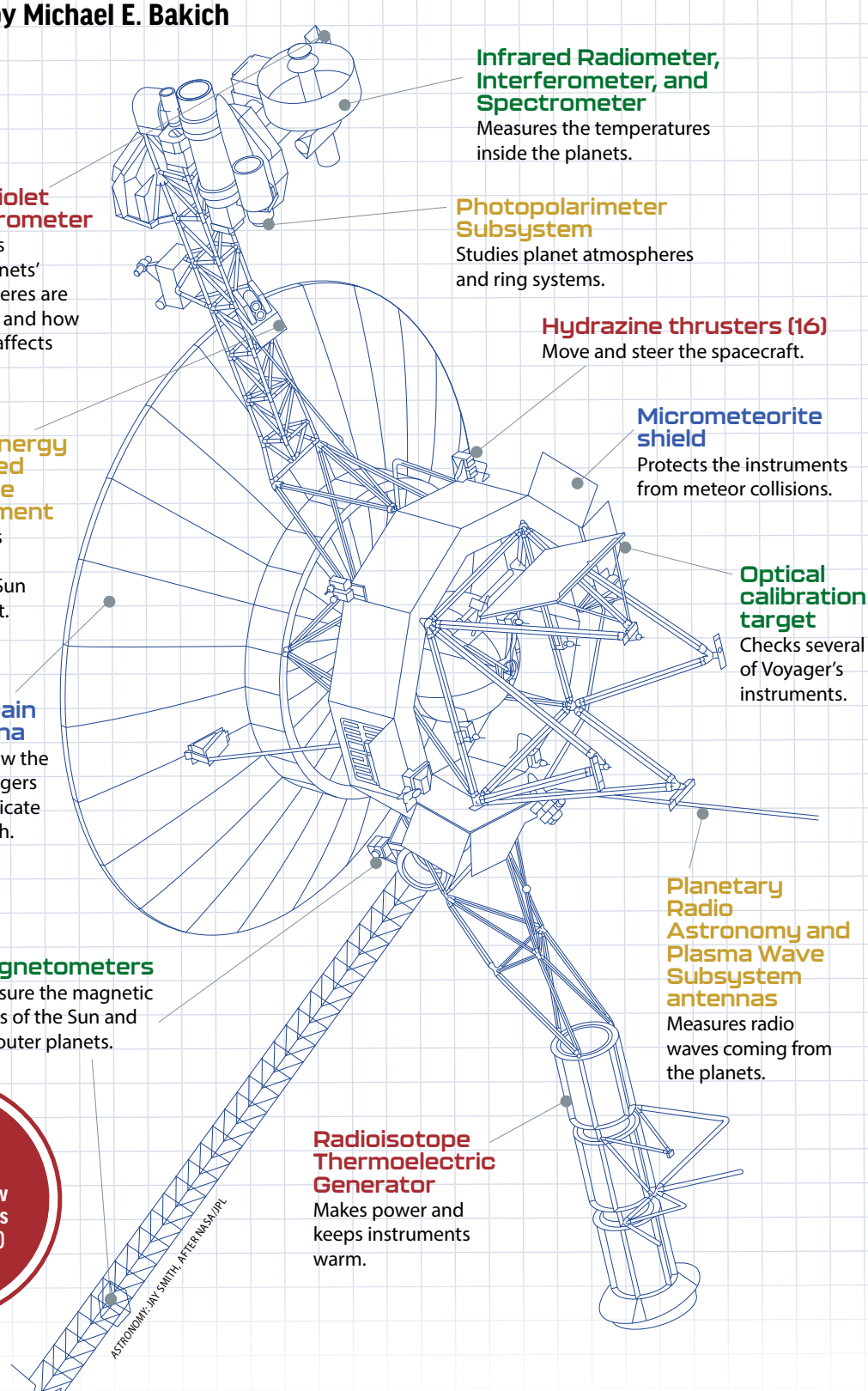
The two Voyager spacecraft gave us lots of information about the giant outer planets. Launched in 1977, Voyagers 1 and 2 flew by Jupiter and Saturn, and then Voyager 2 flew by Uranus and Neptune.

Voyager 1 and 2 flew by Jupiter in 1979. They took close-up pictures of the planet, saw icy cracks on the moon Europa, and even discovered volcanoes on the moon Io.

Two years later, both spacecraft approached Saturn and its amazing rings. After this, Voyager 1 was finished exploring planets and started its journey out of the solar system.

In 1986, Voyager 2 passed only 50,000 miles (80,467 kilometers) from Uranus. It discovered many moons and studied the planet's unusual tilt. Then, in 1989, the spacecraft flew by Neptune, recording amazing images of the planet's weather and discovering more moons. Then it, too, headed toward deep space.

FUN FACT
Voyager 1 is now 13.4 billion miles (21.6 billion km) from Earth.



ASTRONOMY: JAY SMITH, AFTER NASA/JPL

Learn about comets

by Michael E. Bakich

What is a comet?

Comets are dark, solid bodies a few miles across. Scientists describe them as "dirty snowballs" because they are a mix of dust and frozen gases.

Astronomers call a comet's solid part its nucleus. Some of the nucleus's ice turns into gas when the comet gets close to the Sun. As the ice changes, the dust inside it also is released. This creates a ball of gas and dust that surrounds the nucleus, called the coma. It can extend 620,000 miles (1 million kilometers). Sunlight sweeps this material away from the nucleus, and that's what makes the comet's tails.

Comets usually have two tails. The gas tail glows blue and points directly away from the Sun. Dust given off by the comet creates a wider, brighter, curving yellow tail. A comet's tails can be as long as the distance between Earth and the Sun!

How do comets get their names?

A comet can be named for up to three of its discoverers. And some of those discoverers might not be people. Observatories and satellites also can get credit for discovering comets.

Astronomers always give comets an official catalog number. It begins with one letter, usually a C for "comet" or a P for "periodic" (meaning that it will return), followed by the discovery year and a letter that tells in which half-month the discovery occurred. A is January 1 though 15, B is January 16 through 31, and so on. I and Z are never used.

But what if two or more comets are found in the same half-month? Astronomers add a number showing the order of the discoveries. Here's an example: Comet Lovejoy was the fourth comet discovered in the first half of March 2017, so its official number is C/2017 E4.

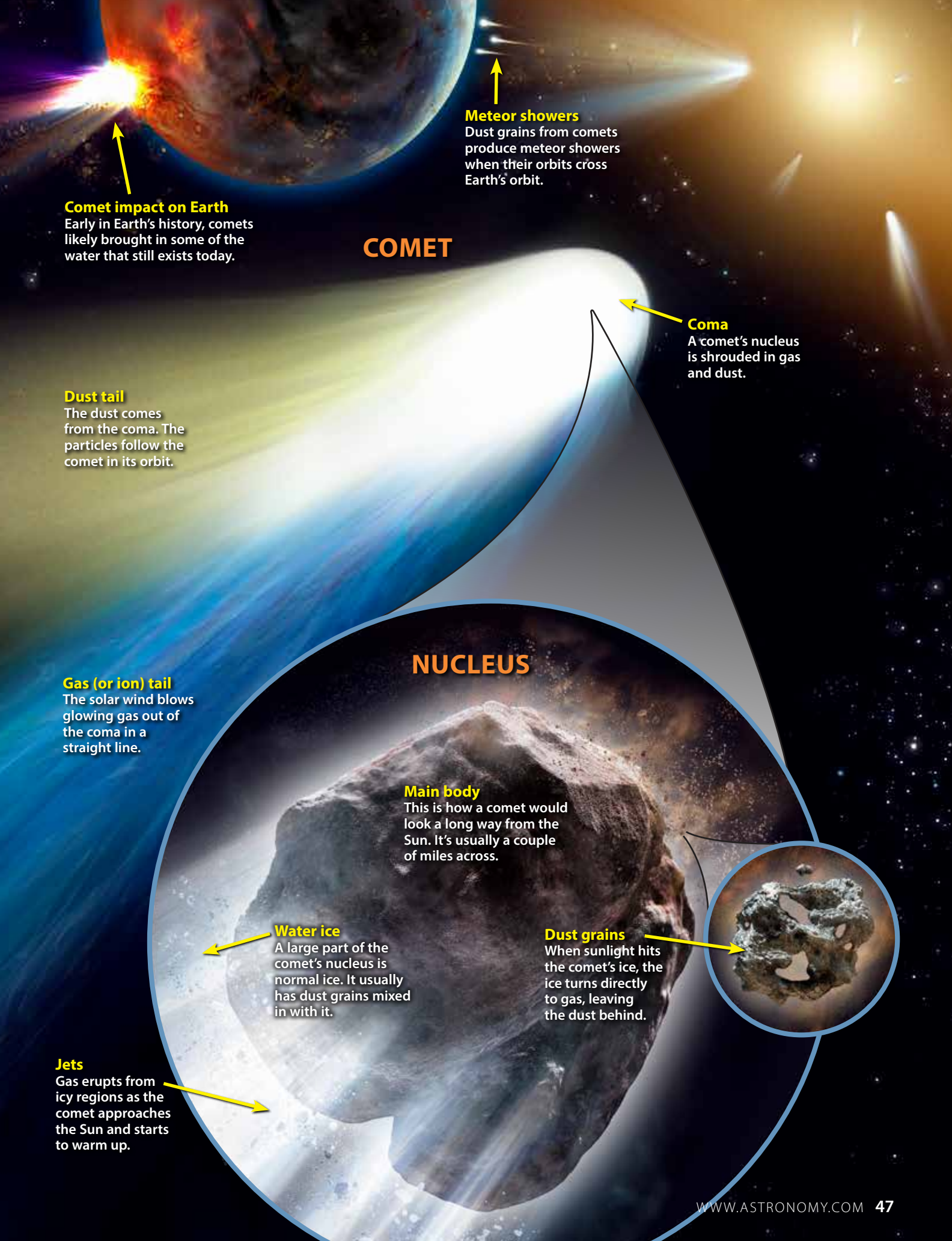
Why are comet orbits so weird?

Astronomers think comets come from two areas. The inner one is shaped like a thick disk. It begins near Neptune and goes out about 50 times Earth's distance from the Sun. This is the Kuiper Belt, and it contains about 70,000 objects larger than 62 miles (100 km) across.

The Kuiper Belt lies in a much larger comet cloud called the Oort Cloud. It starts where the Kuiper Belt ends and goes out to more than 60,000 times the distance between Earth and the Sun. That's about one-quarter of the way to the nearest star! Astronomers think the Oort Cloud contains 2 trillion comets.

Stars don't have to get close to Earth to have an effect on us. If a star passes close enough to the Oort Cloud, the star's gravity can nudge some of the comets there and start them on a trip toward the Sun. The trip might take a million years, but comets are patient. Because the Oort Cloud surrounds us, these comets can come from any direction.

ASTRONOMY: ROEN KELLY


Meteor showers
Dust grains from comets produce meteor showers when their orbits cross Earth's orbit.
Comet impact on Earth
Early in Earth's history, comets likely brought in some of the water that still exists today.
COMET
Coma
A comet's nucleus is shrouded in gas and dust.
Dust tail
The dust comes from the coma. The particles follow the comet in its orbit.
NUCLEUS
Gas (or ion) tail
The solar wind blows glowing gas out of the coma in a straight line.
Main body
This is how a comet would look a long way from the Sun. It's usually a couple of miles across.
Water ice
A large part of the comet's nucleus is normal ice. It usually has dust grains mixed in with it.
Dust grains
When sunlight hits the comet's ice, the ice turns directly to gas, leaving the dust behind.
Jets
Gas erupts from icy regions as the comet approaches the Sun and starts to warm up.

35 STEM PRODUCTS for fun learning!

by Phil Harrington

A NOTE FOR PARENTS AND TEACHERS: Can you recall the fascination you had as a child when you looked up at the stars in the night sky? I remember one special winter night when I was maybe 7 years old, sleigh riding in my backyard. The snow made it light enough to see the ground, but the stars blazed overhead. I looked up and saw three perfectly spaced, equally bright stars, and said to my mom, "I wonder if scientists know about them." I had just discovered the Belt of Orion.

Children have a natural curiosity about the night sky. We see signs of that all around us, in books, television, movies, and other popular media. As adults, we should foster this interest, as my parents did with me, to cultivate a passing comment into a lifelong fascination.

Fortunately, there are many products available today to nurture a young person's interest in the universe. Here is a quick look at 35 of the best, arranged alphabetically. As you'll quickly see, there are plenty of ways to fuel that fascination with the sky. Whether it be a book, a puzzle, a model, or a telescope, the sky is not the limit. And we've made it simple, too. You'll find all of these great products online at MyScienceShop.com.

1 3D Comet 67P

Wouldn't it be great if a child could actually hold a comet in their hands? We can't offer that, but this accurate 3D model of Comet 67P/Churyumov–Gerasimenko's nucleus is the next best thing. When the European Space Agency's Rosetta mission went into orbit around the comet in 2014, astronomers were surprised to see images that showed the nucleus was made of two chunks connected by a bridge, or neck. It reminded some scientists of a rubber ducky. This to-scale replica is created from Rosetta's three-dimensional images. The model also includes a brochure detailing the comet's discovery and features.

2 Constellation Flashcards

Help your young astronomer enjoy the beauty of the night sky while learning the prominent constellations with this set of 36 flashcards. One side of each card features a beautiful shot of the constellation taken by acclaimed astroimager Tony Hallas. The flip side includes proper pronunciation, times when the constellation is visible, where to look for it in the sky, information on its brightest stars, and other details.

4 Celestial Buddies Plush Package – Sun, Earth, & Moon

Celestial Buddies is a series of stuffed toys that will become fast favorites. This collection of three, which are also sold separately, is a great way to show even the youngest astronomers how Earth orbits the Sun and that the Moon orbits Earth. They are also ideal for showing how eclipses work. The Sun is approximately 9 inches (23 centimeters) in diameter, while the Moon and Earth are each approximately 5 inches (13 cm) across. Other members of the Celestial Buddies series include all major planets, dwarf planet Pluto and its moon Charon, Comet Polaris, and a black hole.

3 Astronomy 40° North Planisphere

This star finder, or planisphere, makes it easy for everyone to find and identify which stars and constellations are visible at any time of night for any day of the year. By simply dialing in the date and time, you'll see which stars are above the horizon at that moment. The planisphere shows constellation names and outlines and more than 1,000 stars down to 5th magnitude. Many bright stars are labeled by name. On the back are instructions and the locations of the naked-eye planets for the next several years. Best for children 10 years and older.

5 3D Puzzle Saturn V Rocket

July 20 is the anniversary of the Apollo 11 astronauts' landing on the Moon. It took the largest and most powerful U.S. rocket ever built to get them there: the Saturn V. Kids will love assembling this free-standing model from 68 interlocking pieces. When complete, it measures 15 inches (38 cm) tall. The Saturn V 3D puzzle makes a perfect home display for commemorating that "one small step."

OPPOSITE PAGE BACKGROUND: FENIX84/DREAMSTIME