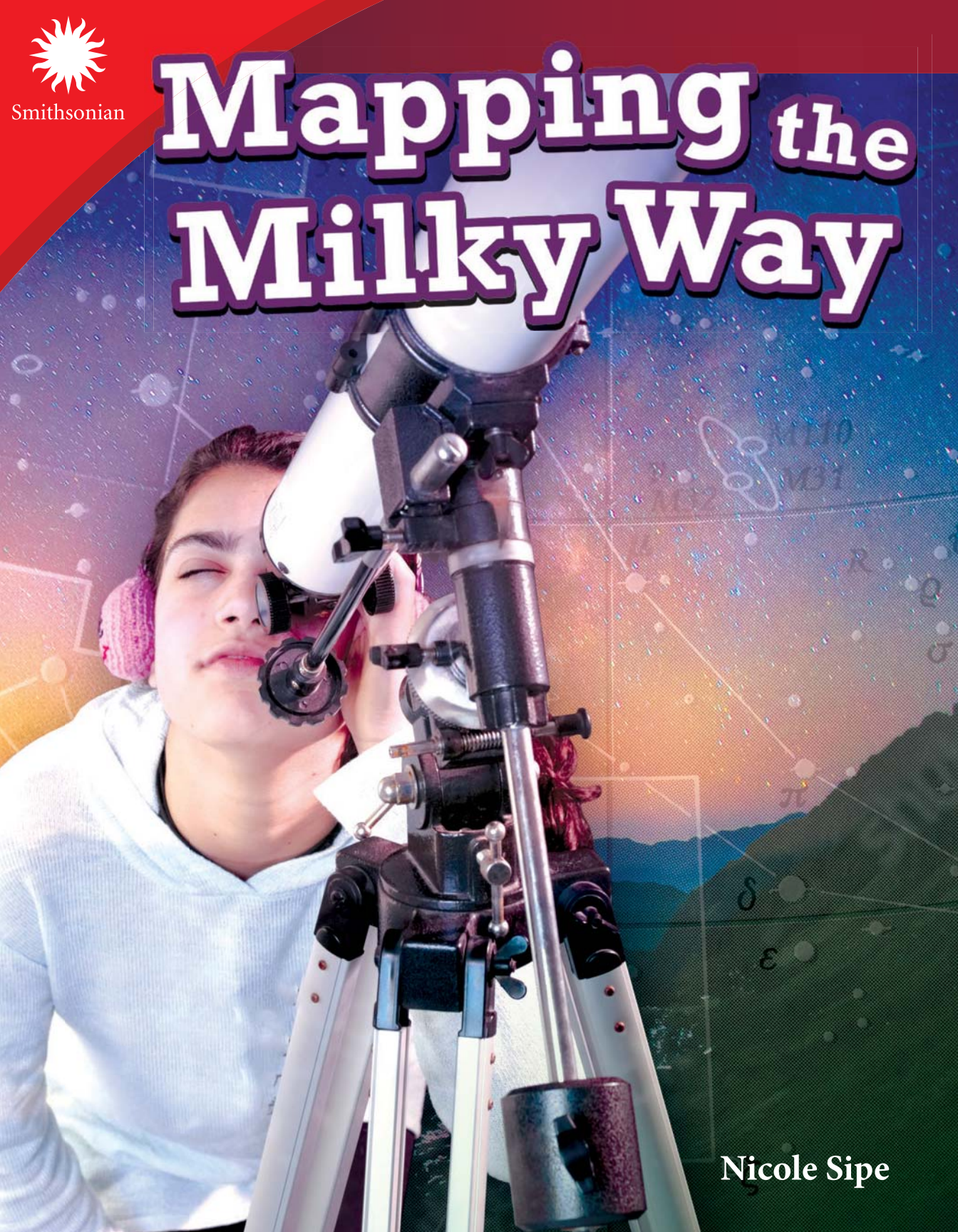
Smithsonian

Mapping the Milky Way



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Mapping the Impossible

Imagine you are standing in the middle of a large forest. Can you count all the trees in the forest from where you stand? You can count the trees that you can see. You can even guess how many trees are in the forest. But the forest is large, and you are standing in the middle of it. So counting all the trees seems like an impossible task!

This is what it is like for scientists who are trying to create a map of the Milky Way. It is a very difficult thing to map! The Milky Way is huge. Also, Earth is part of it. And then there is the pesky problem of the gas and dust at the center of the Milky Way that block our view. How do we make a map of the Milky Way under these difficult conditions? A lot of people have worked to figure this out.

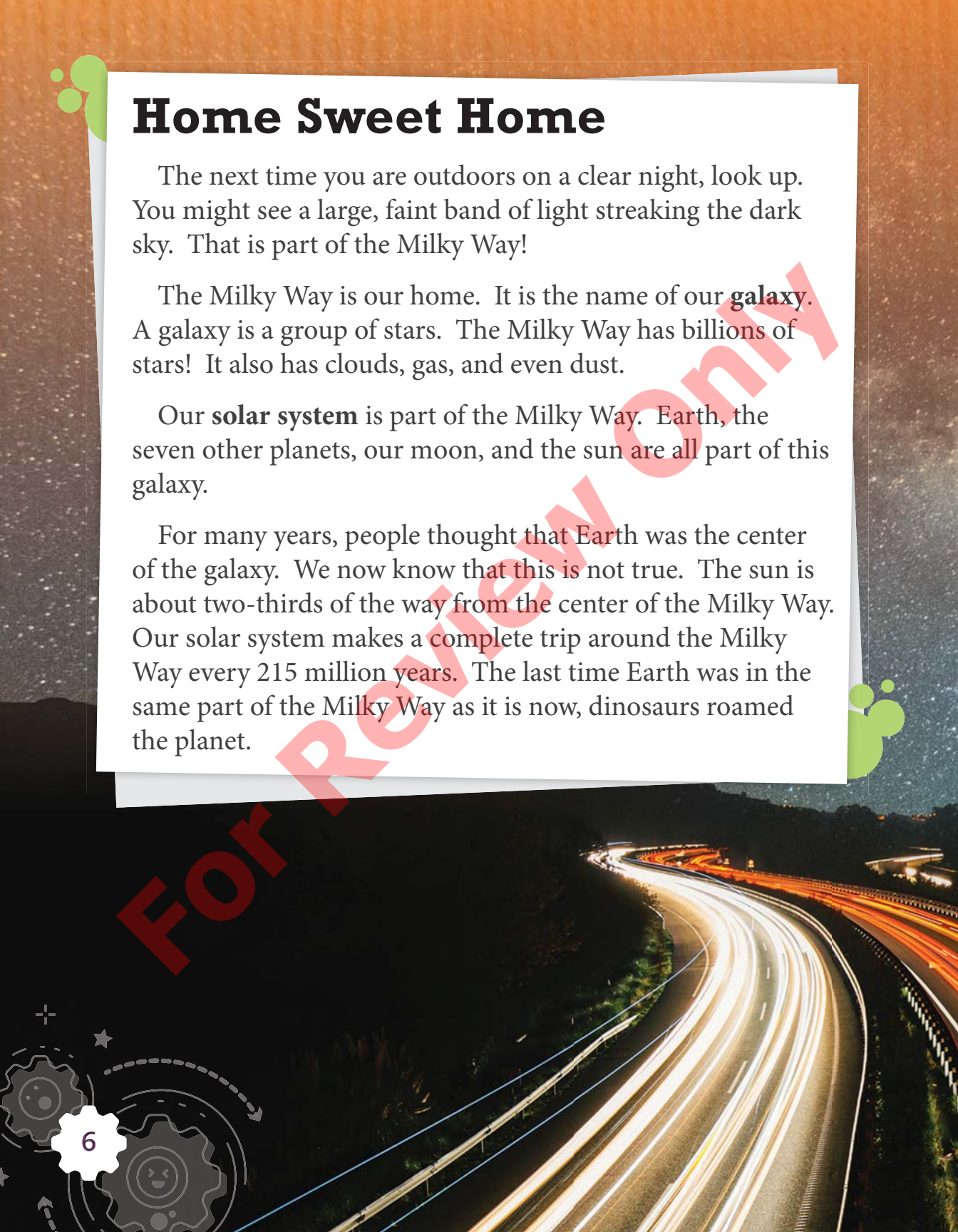
Home Sweet Home

The next time you are outdoors on a clear night, look up. You might see a large, faint band of light streaking the dark sky. That is part of the Milky Way!

The Milky Way is our home. It is the name of our **galaxy**. A galaxy is a group of stars. The Milky Way has billions of stars! It also has clouds, gas, and even dust.

Our **solar system** is part of the Milky Way. Earth, the seven other planets, our moon, and the sun are all part of this galaxy.

For many years, people thought that Earth was the center of the galaxy. We now know that this is not true. The sun is about two-thirds of the way from the center of the Milky Way. Our solar system makes a complete trip around the Milky Way every 215 million years. The last time Earth was in the same part of the Milky Way as it is now, dinosaurs roamed the planet.



a band of the Milky Way as seen from Earth

SCIENCE

Twinkle, Twinkle, Little Star

Look up at the stars at night. Do they look like they are twinkling? This happens because you are looking at the stars through a thin layer of gases that surround Earth. This layer is called the **atmosphere**. It bends the light in random directions, making the stars look like twinkling lights.

The Milky Way is a spiral galaxy. From above, it would look like a spiral with a bulge in the center. It has four bright arms that wrap around to form a disk shape. Think of a giant space pinwheel. Unlike a pinwheel, the Milky Way is never still. It is always moving and changing. Earth and the rest of our solar system are near one of the arms of the Milky Way.

The center of the Milky Way is much harder to see than the arms. Thick layers of dust and gas block our view. Some scientists think that a big black hole is in the center. A black hole is an area in space with gravity so strong that light cannot escape.

The **halo** is the outer edge of the Milky Way. Old stars and dark matter are found in this hot and gassy area. Dark matter is invisible. But we know it is there because its gravity pulls on the matter we can see.

A black hole is so strong that it can pull in anything that gets close to it. It can even merge with other black holes!

A spiral galaxy looks kind of like a pinwheel.

STEAM CHALLENGE

Define the Problem

Scientists have developed a new infrared telescope. The images will provide more data about stars and the Milky Way. Now, they must use a spacecraft to send it into space. Your task is to design and build a shield for the spacecraft. It must block radiation from the sun and other objects in space.

Constraints: You may only use types of paper to build the shield.

Criteria: You will test your design by placing the shield on top of a flashlight. The materials must prevent the light from traveling through.

Research and Brainstorm

How do infrared telescopes work? Why are infrared telescopes used mostly in space? What types of materials absorb light?

Design and Build

Sketch your design. What purpose will each part serve? Which types of paper will work best? Build the model.

Test and Improve

Test your design by shining a light on the model. Did the materials work to shield the light? How can you improve it? Modify your design, and try again.

Reflect and Share

Could it work with less paper? Does the model also shield heat? How could you test this? How do you think scientists test space instruments on Earth?