



THE STAR★WITNESS

Supplemental Educational Support Materials for Special Feature: “The Hubble Space Telescope: Time Machine to the Galaxies”

Discussion questions

Q1.

Why do you think the Hubble Space Telescope is sometimes called a “time machine”?

Answer:

The Hubble Space Telescope is sometimes called a time machine because it sees distant galaxies as they appeared billions of years ago. The light from these distant galaxies must travel for a long time before arriving at Earth. It takes billions of years for that light to arrive, so we are seeing the galaxies as they appeared when the light left them billions of years ago.

Q2.

Why do astronomers want to study the very distant galaxies seen in the Hubble Ultra Deep Field?

Answer:

Astronomers want to study the very distant galaxies seen in the Hubble Ultra Deep Field because those galaxies are very young. By studying nearby galaxies and those that are far away, astronomers can see that galaxies change. Seeing very young galaxies allows scientists to put together a more complete picture of how galaxies formed and changed over time.

Q3.

Suppose a new star is seen in the sky today. Scientists announce that it was born on your birthday, but they saw it today for the first time. Based on your age and the distance light travels in a year (called a “light-year”), how far from Earth is the star?

(One light-year, converted to miles:

1 light-year = 5,900,000,000,000 miles = 5.9 trillion miles.

One light-year, converted to kilometers:

1 light-year = 9,500,000,000,000 kilometers = 9.5 trillion kilometers.)

Continued ...

Answer:

The distance to the star depends on the age of the student. A 12-year-old may answer the question this way: The light has been traveling for 12 years, so the distance is 12 light-years. Since 1 light-year equals 5.9 trillion miles, 12 light-years will be 12 times 5.9 trillion miles = 72 trillion miles. Also, 1 light-year equals 9.5 trillion kilometers so 12 light-years will be 12 times 9.5 trillion kilometers = 114 trillion kilometers.

Q4.

Look at the largest close-up from the Hubble Ultra Deep Field. All of the points of light in the photo are galaxies. Write down three questions you would ask an astronomer about the galaxies in this image.

Answer:

Some questions that you might want to ask are:

- Why are the galaxies different colors?
- Do the different colors mean something?
- Why are the galaxies different shapes?
- Are the galaxies all the same size?
- Are the galaxies made up of the same material?
- Are the bigger galaxies closer to us?
- How do astronomers know that all the points of light are galaxies?
- Are there galaxies in the picture we cannot see?
- How many galaxies are in the picture?

Vocabulary words

Astronomer

A scientist who studies the universe and the celestial bodies residing in it, including their composition, history, location, and motion. Many of the scientists at the Space Telescope Science Institute are astronomers. Astronomers from all over the world use the Hubble Space Telescope.

Galaxy

A collection of stars, gas, and dust bound together by gravity. The smallest galaxies may contain only a few hundred thousand stars, while the largest galaxies have thousands of billions of stars. The Milky Way galaxy contains our solar system. Galaxies are classified or grouped by their shape. Round or oval galaxies are elliptical galaxies and those showing a pinwheel structure are spiral galaxies. All others are called irregular because they do not resemble elliptical or spiral galaxies.

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Gravity (Gravitational Force)

The attractive force between all masses in the universe. All objects that have mass possess a gravitational force that attracts all other masses. The more massive the object, the stronger the gravitational force. The closer objects are to each other, the stronger the gravitational attraction.

Milky Way Galaxy

The Milky Way, a spiral galaxy, is the home of Earth. The Milky Way contains more than 100 billion stars and has a diameter of 100,000 light-years.

Observatory

A structure designed and equipped for making astronomical observations. Observatories are located on Earth and in space.

Star

A huge ball of gas held together by gravity. The central core of a star is extremely hot and produces energy. Some of this energy is released as visible light, which makes the star glow. Stars come in different sizes, colors, and temperatures. Our Sun, the center of our solar system, is a yellow star of average temperature and size.

Visible Light

The part of the electromagnetic spectrum that human eyes can detect; also known as the visible spectrum. The colors of visible light are red, orange, yellow, green, blue, and violet, along with various combinations and shades of these colors. Within the visible part of the spectrum, red light has a longer wavelength than blue light.