

# What is the difference between a galaxy and a solar system?

By NASA, adapted by Newsela staff on 09.19.17

Word Count **819**

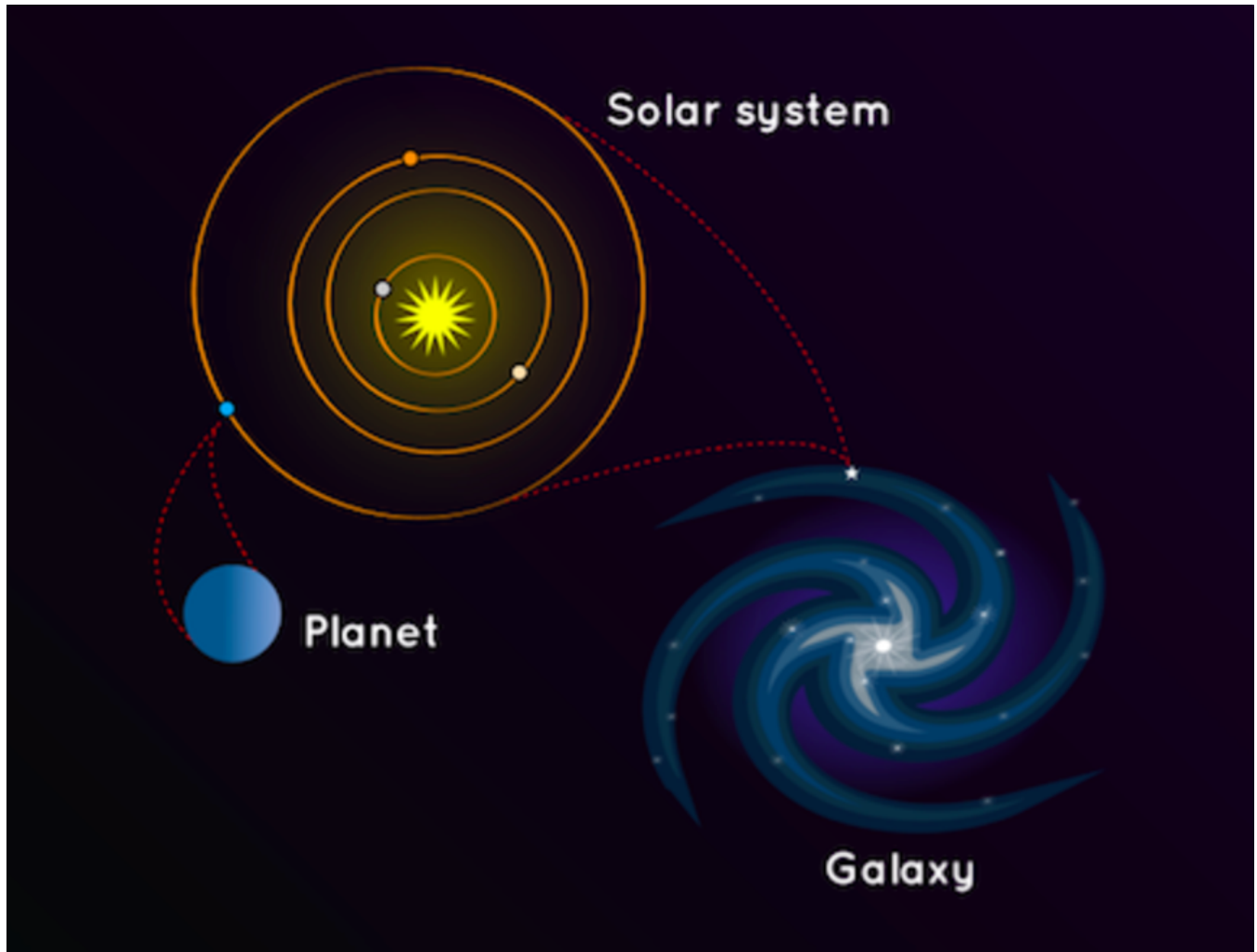
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An image of the Milky Way galaxy taken in celebration of the International Year of Astronomy in 2009. Infrared and X-ray light were used to see through the dust and show where there is intense activity. The center of the galaxy is in the bright white region to the right. Photo by: NASA/JPL-Caltech/ESA/CXC/STScI.

The sun warms us each and every day, but did you know it is also a star? In fact, all the stars in the night sky are suns too. These stars, or suns, can have their own solar systems made up of hundreds of planets, all of which orbit around them.

There is a difference between galaxies and solar systems. Galaxies are made of billions of stars as well as their solar systems. Our galaxy, the Milky Way, also has a supermassive black hole in the middle.



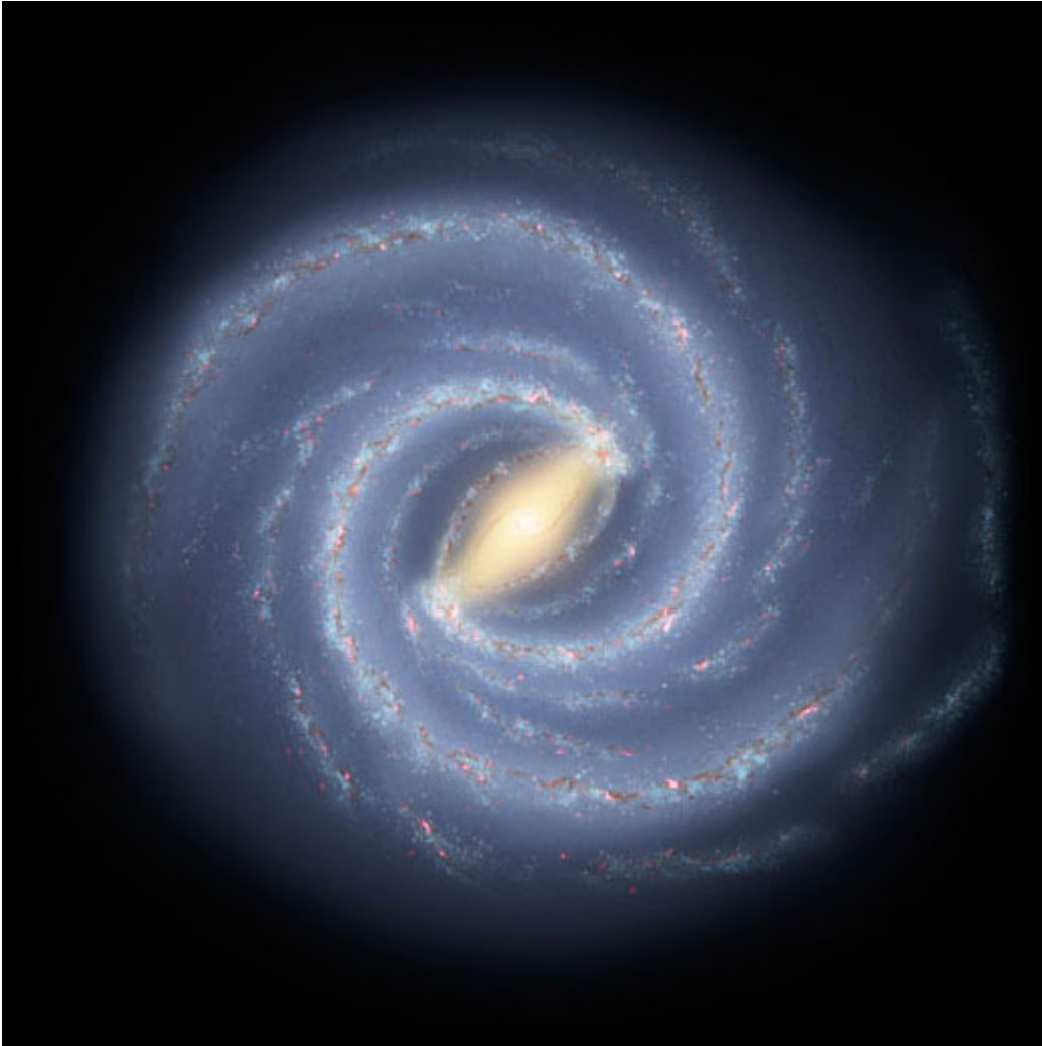
When you look up at stars in the night sky, you're seeing other stars in the Milky Way. If it's really dark out, you can even see the dusty bands of the Milky Way stretch across the sky.

Our sun is just one of at least 200 billion stars in our own Milky Way galaxy. Similarly, our solar system is one of many solar systems, and even our galaxy is just one of many galaxies. Scientists believe there are hundreds of billions of galaxies in the universe.

Our galaxy is in a neighborhood of about 30 galaxies, called the Local Group. Our nearest major neighboring galaxy is called Andromeda.

### **Galaxies: How They Look**

The Milky Way is spiral-shaped. Many other galaxies in the Universe are also spiral-shaped, but some are elliptical and a few look like toothpicks or rings.



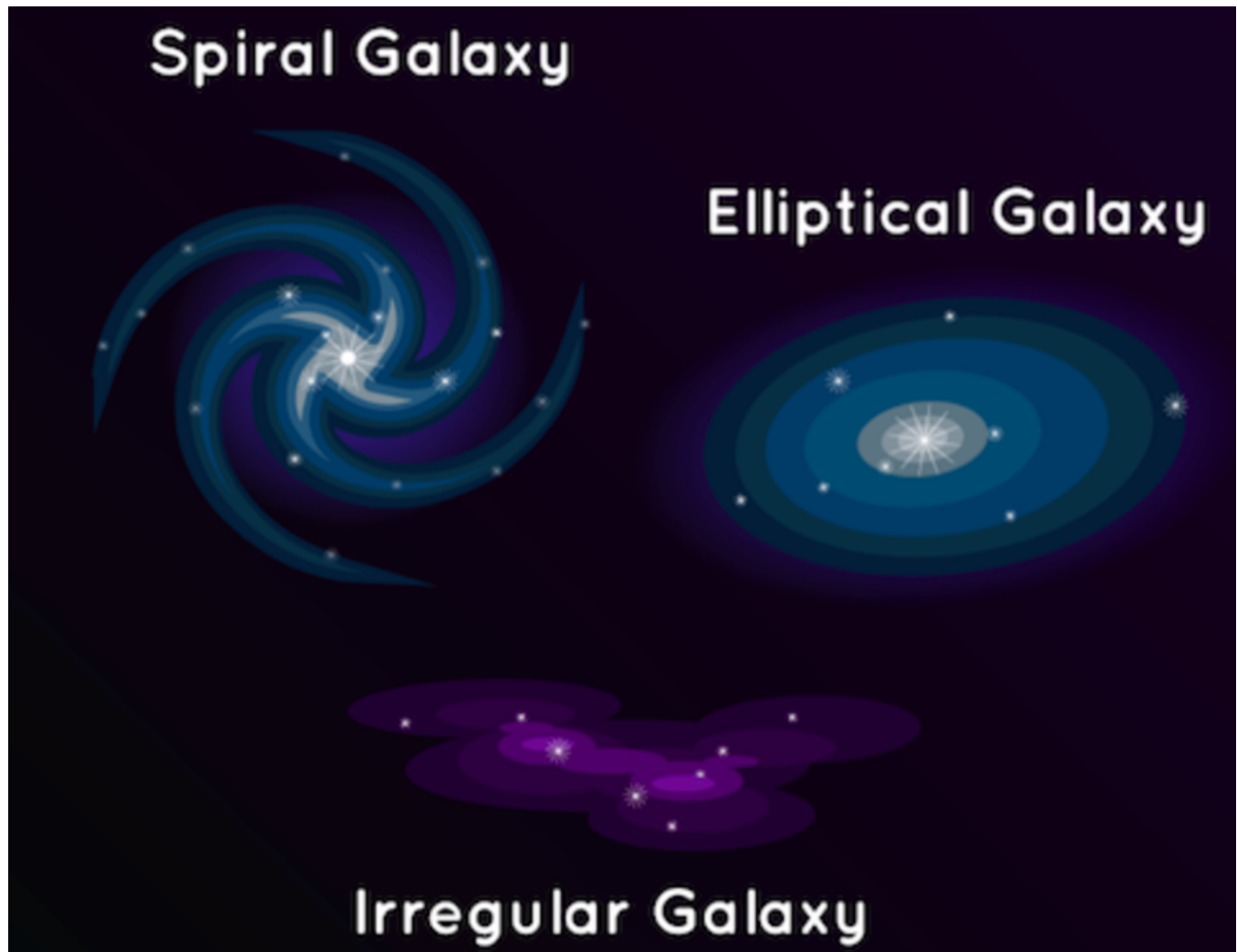
How do we know what other galaxies look like, given how extremely far away they are? Scientists have been able to observe distant galaxies thanks to a very strong telescope known as the Hubble Space Telescope. The telescope is so powerful that it can see beyond our galaxy. It was built by NASA, the U.S. research lab dedicated to the study of outer space.

Our galaxy, the Milky Way, is a typical galaxy. It has hundreds of billions of stars, and enough gas and dust to make billions more stars. In addition, it has at least 10 times as much dark matter as all the stars and gas put together.

What is dark matter? It is the opposite of bright matter. Bright matter is what we can see with our naked eye or with the help of telescopes. Objects such as planets, stars and galaxies are some examples of bright matter. Dark matter is what exists around all those bright objects. We know it exists because we can measure its pull on other objects in the universe — we just can't see it.

Examples of dark matter include black holes and objects that are just a little too small to be stars and which can't produce light of their own. Scientists believe that most of the dark matter in the universe is made of particles smaller than atoms. These particles are different from anything scientists have ever detected or studied so far.

## Shape And Size Of Our Galaxy



The Hubble Space Telescope has detected many thousands of galaxies, of all sizes, shapes and colors. Like more than two-thirds of these known galaxies, the Milky Way has a spiral shape. A lot of energy gets generated at the center of the spiral. Occasionally, a bright flare of light shoots out from that point.

Galaxies and solar systems are held together by a force called gravity. Black holes are parts of space with such a strong gravitational pull that no object can escape. Only a very powerful gravitational force can explain the energy at the center of the galaxy and the way stars move around it. This is why astronomers believe that the center of the Milky Way is a supermassive black hole.

## **The Big Bang Formed The Universe**

The Universe was formed by an event known as the Big Bang, a large explosion of matter. After the Big Bang, the universe was composed of radiation and free-floating subatomic particles. What happened next is unclear. Did small particles slowly join to form stars, star clusters and galaxies over time? Or did the universe first organize as immense clumps of matter that later broke apart into galaxies? So far, no one has been able to prove one or the other.

## **When Galaxies Collide**

Galaxies often collide or crash into each other. The Milky Way itself is on a collision course with our nearest neighbor, the Andromeda galaxy. Don't worry, though — the crash won't happen for around another 5 billion years. Even if it happened tomorrow, you might not notice. Galaxies are so large and spread out at the ends that even though they bump into each other, the planets and solar systems often don't get close to colliding.

**Quiz**

- 1 Read the sentence from the section "Galaxies: How They Look."

*Our galaxy, the Milky Way, is a typical galaxy.*

Which of the following words, if it replaced the word "typical" in the sentence above, would CHANGE the meaning of the sentence?

- (A) standard
  - (B) ordinary
  - (C) special
  - (D) normal
- 2 Read the following sentence from the section "The Big Bang Formed The Universe." Then, fill in the blank.

*Or did the universe first organize as immense clumps of matter that later broke apart into galaxies?*

The word "immense" in the sentence above emphasizes \_\_\_\_\_

- (A) the uncontrolled and random force of the Big Bang
- (B) the huge scope and significance of the Big Bang
- (C) the orderly structure of the early universe
- (D) the mystery surrounding the formation of the universe

3 Look at the image in the section "Galaxies: How They Look."

Which detail from the article is MOST related to the image?

- (A) Similarly, our solar system is one of many solar systems, and even our galaxy is just one of many galaxies. Scientists believe there are hundreds of billions of galaxies in the universe.
- (B) Scientists believe that most of the dark matter in the universe is made of particles smaller than atoms. These particles are different from anything scientists have ever detected or studied so far.
- (C) Like more than two-thirds of these known galaxies, the Milky Way has a spiral shape. A lot of energy gets generated at the center of the spiral.
- (D) The Universe was formed by an event known as the Big Bang, a large explosion of matter. After the Big Bang, the universe was composed of radiation and free-floating subatomic particles.

4 Examine the diagram in the introduction [paragraphs 1-5] and read the selection below.

*Our sun is just one of at least 200 billion stars in our own Milky Way galaxy. Similarly, our solar system is one of many solar systems, and even our galaxy is just one of many galaxies. Scientists believe there are hundreds of billions of galaxies in the universe.*

How does the diagram support the information in the selection above?

- (A) It shows the relationship between solar systems and galaxies.
- (B) It illustrates the difference in size between planets and their suns.
- (C) It shows that there are numerous galaxies and solar systems.
- (D) It illustrates the different types of galaxies that exist in the universe.