

The nature of dark matter

By NASA.gov, adapted by Newsela staff on 12.02.16

Word Count **443**



TOP: The Bullet Cluster of galaxies. Photo: Photo: NASA.

In general, scientists learn about the universe by studying electromagnetic radiation, or light. The light they study is in the form of radio waves and infrared, optical, ultraviolet, X-ray and gamma-ray emissions. But what if there is material in the universe that does not glow? How will scientists ever know it is there? How will they tell how much of it there is and what it is?

Such material is called "dark matter." Scientists now believe that most of the material in the universe is made of this stuff. It is material that does not release enough light for scientists to directly identify it. However, there are some ways for them to indirectly identify it. The most common method involves the fact that dark matter has a gravitational pull on the light that scientists can identify. From the effects of this "extra" gravity, scientists can make educated guesses about how much dark matter is present.

Undetected "Missing Mass"

The image at right shows one way this is done. Pictured here are two images of the Coma Cluster of galaxies. The images are laid on top of each other. The red areas are X-ray light seen by the Einstein satellite. The blue is visible light from an image taken by telescopes in California. Scientists have used these observations and others to determine the amount of

gravity required to hold together all the mass detected in the image. Surprisingly, there is not nearly enough mass observed to explain the amount of gravity. Somehow, there is undetected "missing mass." What could this "missing mass" be?

The kinds of materials that people experience every day are made of atoms, which are composed of protons, neutrons and electrons. Atoms are so small that they cannot be seen without the help of special instruments, such as microscopes. Scientists call this type of regular matter "baryonic." Is the dark matter in the universe also baryonic? Or is it something strange ... some kind of new material that scientists could call non-baryonic?

Signs Point To Both Types Of Dark Matter

So far, it looks like there are both baryonic and non-baryonic types of dark matter. Some dark matter might be composed of regular (baryonic) matter, but simply not give off much light. Things like brown dwarf stars would be in this group.

Non-baryonic dark matter might include tiny particles that aren't a part of "normal" matter at all. Depending on their mass and number, they might make up a large part of the dark matter in the universe. In that case, it's possible that most of the matter in the universe is still a mystery. Scientists cannot even identify it yet.

Quiz

- 1 Which sentence from the introduction [paragraphs 1-2] shows how scientists usually learn about things in the universe that are not dark matter?
- (A) The light they study is in the form of radio waves and infrared, optical, ultraviolet, X-ray and gamma-ray emissions.
 - (B) Scientists now believe that most of the material in the universe is made of this stuff.
 - (C) It is material that does not release enough light for scientists to directly identify it.
 - (D) The most common method involves the fact that dark matter has a gravitational pull on the light that scientists can identify.

- 2 Based on the information in the article, which of the following is TRUE?
- (A) Scientists have developed a way of making dark matter visible.
 - (B) Scientists use gravity to identify how much dark matter is present.
 - (C) Scientists discovered a new particle that makes up regular matter.
 - (D) Scientists can understand all of the universe by studying baryonic matter.

- 3 Read the sentence from the section "Undetected Missing Mass."

Scientists have used these observations and others to determine the amount of gravity required to hold together all the mass detected in the image.

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

- (A) discovered
- (B) revealed
- (C) noticed
- (D) overlooked

- 4 Read the sentence from the section "Signs Point To Both Types Of Dark Matter."

Some dark matter might be composed of regular (baryonic) matter, but simply not give off much light.

Which sentence uses "composed" in the same way as the sentence above?

- (A) The music teacher composed a new song for the school band to perform.
- (B) The new student felt nervous, but on the outside she looked calm and composed.
- (C) The fruit punch was composed of apples, oranges, strawberries and bananas.
- (D) The author composed a fairy tale about some friendly woodland creatures.

Answer Key

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(C) It is material that does not release enough light for scientists to directly identify it.

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