

Name: \_\_\_\_\_

Class: \_\_\_\_\_

# The Center of Our Solar System

By Jessica McBirney  
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*In this informational text, Jessica McBirney discusses the importance of the sun to our solar system. As you read, take notes on the different things that the sun does for the earth.*

- [1] Have you ever been outside on a hot summer day and wished the sun was just a little cooler or just a little farther away? Like it or not, the sun is vital<sup>1</sup> to our existence here on Earth. The sun's energy keeps our planet at just the right temperature to support life and allow us to grow food. It even keeps the earth spinning year after year. For all that the sun does for us, maybe it's worth learning a little bit more about it.



*"Giant prominence on the sun erupted" by NASA/SDO/ AIA/Goddard Space Flight Center is in the public domain.*

## It's NOT All About Earth

For a long time, people believed the earth stood at the center of the universe and everything, including the sun, revolved around it. This belief is called geocentrism. Geocentrism was an accepted truth until the Polish astronomer Nicolaus Copernicus came along. In 1543, Copernicus proved through his observations and mathematical calculations that the earth actually revolved around the sun. This view is called heliocentrism. Copernicus was not the first scientist to discover heliocentrism, but his book *On the Revolutions of the Heavenly Spheres* provided more detailed support behind the theory.

Other scientists built on his work. In 1609, Italian astronomer Galileo Galilei built the most powerful telescope of his time and used it to confirm heliocentrism. Unfortunately, the Catholic Church, which was a major power in Europe, supported the more commonly-held theory of geocentrism. The Roman Inquisition questioned Galileo and accused him of heresy.<sup>2</sup> In 1633, they sentenced him to life under house arrest. But Galileo continued to write. His work was so influential that he is often called the "father of modern physics."

Heliocentrism became widely accepted over the next century, and eventually the Church stopped resisting. Scientists could freely study the skies and our star, the sun.

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1. **Vital (adjective)** absolutely necessary or important
  2. the support of an idea that contradicts the teaching of the Roman Catholic Church

## One of Many Stars

- [5] The sun is a star, just like the other millions of stars you see when you look at the night sky. In fact, the sun is a relatively normal star. Like all stars, it is a large ball of gas that produces huge amounts of energy. Stars form when particles floating in space are drawn closer together by gravity, until the cloud of space dust is round and dense. Inside that dense center, hydrogen atoms are under so much pressure that they fuse together into helium atoms. This process is called nuclear fusion, and it releases a lot of extra energy in the forms of heat and light. Nuclear fusion is what keeps stars burning.

## A Whole New World

4.5 billion years ago, when the sun formed, it was not the only clump of gas and dust swirling around space. As the sun's particles pulled together, other particles and clouds farther away began circling around it, too. Those clouds started condensing<sup>3</sup> into planets. The process was dramatic. Clumps of space dust slammed into each other, breaking apart and reforming, over millions of years. Finally, they solidified into the eight planets we know today. Without the sun and its powerful gravity, the earth may not be here!

## The Sun: The Center of Attention

The sun sits at the center of our solar system. The solar system includes the sun and everything that circles around it: the eight planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune), their moons, and asteroids.<sup>4</sup> The sun is so huge that it accounts for over 98% of all of the mass in the solar system; the pull of its gravity is incredibly strong. All of the planets are stuck circling in this gravitational field, orbiting the sun. Imagine tying a weight to one end of a string, then holding the other end of the string in your hand and spinning the weight around. The weight is orbiting your hand. The sun holds the whole solar system together in a similar way.

The one big difference between the weight on your string and the planets is that each planet's orbit is actually an oval, or an ellipse, not a circle. This theory was popularized in the early 1600s by Johannes Kepler, a German mathematician and astronomer. Kepler's laws of planetary motion, as well as Isaac Newton's law of gravity, supported Copernicus' theory that the sun was the center of the solar system because it explained how the sun held other planets in orbit.

## Putting It in Perspective

Even though it acts just like any other star, the sun is extremely important to us here on Earth. Here are some more things to know about our sun:

1. It is actually pretty big. Scientists estimate that, by mass, it is in the top 10% of all stars.

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3. to make dense or more compact
  4. a small rocky body circling the sun

2. It is about 4.5 billion years old. Think about this: humans have been around for about 200,000 years, so humans have existed for only 0.00004 percent of the sun's life.

3. Sun is about halfway through its supply of hydrogen. This means that in another 4.5 billion years, it will run out of hydrogen and swell into a different kind of star that cannot sustain<sup>5</sup> life on Earth.

4. The sun's core is about 27 million degrees Fahrenheit. Compare that to Earth's core at about 11,000 degrees Fahrenheit.

5. The volume of the sun is about 1,409,272,569,059,860,000 km<sup>3</sup>. That means 1.3 million Earths could fit inside it.

- [10] The sun helps us in more ways than we can count. Its gravitational pull helped form the earth and keeps our planet spinning. Its nuclear fusion keeps us warm and gives us light to grow our food. It holds our solar system together! No wonder so many of scientists have dedicated their lives to figuring out how it works.

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5. **Sustain (verb)** to provide what is needed for something exist or continue

## Text-Dependent Questions

**Directions:** For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which statement identifies the central idea of the text?
  - A. The sun is the most important star in our solar system and is responsible for life on Earth and order in our solar system.
  - B. Astronomers know very little about the sun and are constantly working to figure out how important it is to our solar system.
  - C. While the earth is the center of our solar system, the sun provides organisms with the light and warmth to live.
  - D. Astronomers believe that the sun could support life on other planets as it is responsible for sustaining life on Earth.
  
2. PART B: Which detail from the text best supports the answer to Part A?
  - A. "For a long time, people believed the earth stood at the center of the universe and everything, including the sun, revolved around it." (Paragraph 2)
  - B. "The sun is a star, just like the other millions of stars you see when you look at the night sky. In fact, the sun is a relatively normal star." (Paragraph 5)
  - C. "Think about this: humans have been around for about 200,000 years, so humans have existed for only 0.00004 percent of the sun's life." (Paragraph 9)
  - D. "Its nuclear fusion keeps us warm and gives us light to grow our food. It holds our solar system together!" (Paragraph 10)
  
3. Which of the following describes the structure of information in the text?
  - A. The author compares what astronomers know about the sun today with what they hope to learn about it in the future.
  - B. The author discusses theories about the sun made in the past and then what we know about its importance today.
  - C. The author describes how the sun benefits life on Earth and then discusses the threats that it poses to the planet.
  - D. The author discusses how the sun helps the earth and then goes into detail about how it positively affects the other planets.
  
4. What affect does the sun have on the other planets of our solar system?
  - A. The sun's heat allows other planets to sustain life.
  - B. The sun's gravity prevents the other planets from colliding with it.
  - C. The sun's gravity keeps the planets orbiting around it.
  - D. The sun's light allows us to study the other planets.

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MONARCH BUTTERFLIES



photograph

Did you know?

Did you know that Monarch Butterflies are poisonous to frogs, birds, and other predators?

Directions: Use the text features to answer the following questions

What information would you find about butterflies on page 4?

List one of the monarch butterflies predators.

What is a life cycle?

What is another name for larva?

What state do many butterflies reside in during the winter?

What country do butterflies migrate to?

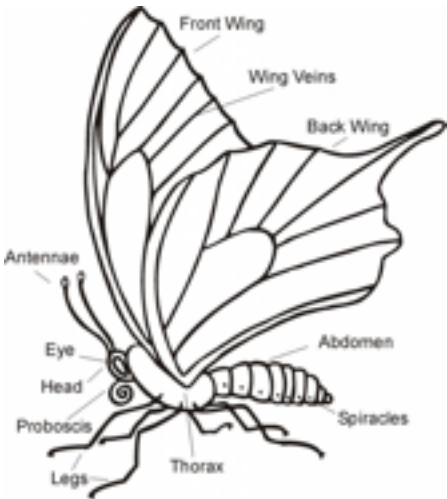
If I wanted to find out the different species of butterflies, what page would I go to?

Adult Monarch

Monarch butterflies go through four stages during of life cycle, and through four generations in one year. It's a little confusing so keep reading and you will understand. The four stages of the monarch butterfly life cycle are the egg, the larva (caterpillar), the pupa (chrysalis), and the adult butterfly. The four generations are actually four different butterflies going through these four stages during one year until it is time to start over again with stage one and generation one.

map

North America



diagram

glossary

life cycle: the growing stages a butterfly goes through

larva: caterpillar stage

pupa: chrysalis stage