



## THE STAR★WITNESS

### Supplemental Educational Support Materials for Special Feature: “Albert Einstein: A Genius, Relatively Speaking”

#### Discussion questions

**Q1.**

What did you know about Albert Einstein before you read this story?

**Answer:**

Your answers to this question may be different from others’ answers. You may not have heard of Albert Einstein before you read the text, or you may have known a number of facts about his life and work. Here are a few of the more common facts:

- Einstein is one of the most well-known scientists. (He ranks with Galileo and Newton.)
- As a child, his parents worried because he was slow in learning to speak.
- Some reports of Einstein’s early life described him as a poor student, but this information is a myth. Teachers reported grades differently when Einstein was in school. Comparing Einstein’s school records with those of today’s students makes the budding scientist’s grades appear low. Teachers in Einstein’s day would have considered his grades as excellent.
- Einstein left school at age 15, but a year later he returned to school.
- He failed the entrance exam to the Swiss Federal Institute of Technology, but after further study, he was accepted at the school. Later, he became a physics and math teacher.
- He wrote his first science papers while he was working in the patent office in Bern, Switzerland.
- He was married and had two sons, but later he divorced his wife and married his cousin.
- He discovered the relationship between energy and mass, which he wrote as the equation,  $E = mc^2$ .

**Q2.**

What did you learn about Albert Einstein from this story?

**Answer:**

Your answers to this question may be different from others’ answers. Here are a few things you may have learned:

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- Even as a child, Einstein was curious about his world.
- He worked in a patent office in Bern, Switzerland.
- He won the Nobel Prize in Physics for his theory about how light becomes electricity.
- He developed many theories about the universe, including the Special Theory of Relativity and the General Theory of Relativity.
- In later years, he considered his disbelief in his own General Theory of Relativity to be the biggest blunder of his life.

**Q3.**

**Why do you think Einstein wrote so many scientific papers while working in the patent office?**

**Answer:**

Your answers will vary, but they may include the following ideas:

While working at the patent office, Einstein may have been inspired by the works of inventors applying for patents. He probably read about many interesting, new inventions. Most of the time, however, the patent office work was boring. He probably thought about many other things, including physics. The quiet reflection time allowed Einstein to develop new ideas. He may have written down his ideas when he went home at night.

**Q4.**

**How did Edwin Hubble's work help Einstein explain the universe?**

**Answer:**

Einstein thought the universe was motionless because he did not see stars moving. Edwin Hubble showed that galaxies, most of which can only be seen with telescopes, appear to be moving away from each other. The galaxies themselves are not moving, Hubble explained. The universe is expanding, which makes galaxies appear to move.

**Q5.**

**Why do you think knowing the age of the universe is important?**

**Answer:**

Your answers will vary, but they may include some of the following ideas:

Human curiosity causes us to question our origins and ask where we came from. This curiosity extends to our universe, as well. How, for example, did the stars and galaxies that we see in the night sky develop? To answer that question, we need to know how much time they had to develop. The universe's age sets the time scale for the development of all astronomical objects. Stars, for example, cannot be older than our universe.

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## 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.

### **General Theory of Relativity**

A theory Einstein developed to explain how gravity influences space and time.

### **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.

### **Modern Physics**

A group of several theories developed in the early to mid-20th century that explains how small particles are affected by light, how measurements change when objects move very fast, and how gravity affects space and time.

### **Observation**

In science, an observation is a fact or occurrence that is noted and recorded. The Hubble Space Telescope is a tool astronomers use to make observations of celestial objects.

### **Theory**

An accepted idea used to explain nature. Theories not only explain an observed event, they can also be used to predict what will happen. Sometimes, an idea that is really a hypothesis is incorrectly called a theory. A true scientific theory is a hypothesis that makes predictions. Those predictions have been tested and have proven to be accurate.