

INTERMEDIATE SCIENCE 9
UNIT 1: SPACE
WORKSHEET # 10: HOW IT BEGAN



Scientists have been looking into space and all the elements making up the universe and tried to figure out an answer to: how was the universe created.? Here are two theories that try to explain how the universe was created:

1) The Big Bang Theory:

- It believes that 13.7 billion years ago, that all the matter in the universe, was compacted together into a hot and dense point of matter.
- This matter began to move outward after a massive explosion.
- The Big Bang Theory is supported by the fact that the universe is still expanding.

2) Oscillating Theory

- There is enough matter in the universe to, through gravitational force, slow and ultimately stop this expansion and even reverse it.
- According to this theory, all the matter will meet again in a Big Crunch.
- The universe will go through a series of Big Bangs and Big Crunches in an ongoing cycle.

The solar system is a pretty busy place. It's got all kinds of planets, moons, asteroids, and comets zipping around our Sun. But how did this busy stellar neighborhood come to be? Here are two possible explanations of how the solar system was created:

Stellar Collision Theory :

- Our planets, moons, and suns spun off from the collision between stars

2) Nebular hypothesis:

- Hydrogen and other gases swirled around and condensed into our sun and its planets.

Units used to measure distances in space

Astronomical Units (AU): Measurement equal to the average distance between the Sun and the Earth, about 150 million kilometers

Light Year: The distance light can travel in one year, which is 9,500,000,000,000 kilometers

Hands-On Activities: The Universe

Big Bang Balloon

Background Information

In the 1920s astronomer Edwin Hubble used the red shift of the spectra of stars to determine that the universe was expanding. By carefully observing the light from galaxies at different distances from Earth, he determined that the farther something was from Earth, the faster it seemed to be moving away. This relationship has become known as Hubble's Law, and it's just one piece of a bigger puzzle known as the Big Bang theory.

Developed over many years and by many people, the theory states that about 15 billion years ago the universe was compressed into an infinitely small space, known as the primordial atom. It exploded in a sudden burst of energy and created a small, superdense, extremely hot universe that began to expand in all directions. Over time things cooled, and tiny bits of matter clumped together to form stars and galaxies. As a result of this explosion, all of these objects are still moving away from each other. In this experiment, you'll create a simple model to learn how the universe expands over time.

What You Need

- 12-inch (30-cm) round latex balloon
- a permanent felt-tip marking pen
- 24-inch (60-cm) piece of string
- metric ruler

What to Do

1. Inflate your balloon until it is about 4 inches (10 cm) in diameter, but do not tie the end.
2. Using the felt-tip marker, make six dots on the balloon in widely scattered locations. Label one dot "home" and the others A-E. The home dot represents the Milky Way galaxy, and the others represent galaxies formed in the early universe.
3. Without letting air out of the balloon, use the string and ruler to measure the distance from home to each dot. Record the distances in the worksheet table under the heading "Time 1."
4. Inflate the balloon so that its diameter is about 2 inches (5 cm) bigger. Again measure the distances to each of the dots, and record the distances under "Time2" on the worksheet.
5. Inflate the balloon in 2-inch (5-cm) increments three more times. After each inflation, measure and record the distances on the worksheet.
6. Answer the follow-up questions on the worksheet.

Record your measurements below

Distance from home	Time 1	Time 2	Time 3	Time 4	Time 5
Dot A					
Dot B					
Dot C					
Dot D					
Dot E					

Question 1:

How did the distance from the home dot to each of the other galaxies change each time you inflated the balloon?

Question 2:

Did the galaxies near home or those farther away appear to move the greatest distance?
Record your measurements below.

Question 3:

How could you use this model to simulate the Big Crunch, a time when all the galaxies might collapse in on themselves?
