

MAKING MODELS

Using a Physical Model

Physical models are used to represent objects or processes in science. They can help you understand how something works in nature when it is not possible to directly investigate a phenomenon. A model can help you to visualize a scientific process. You can make a very small thing large enough to study, or you can make a very large thing small enough to study. Even if the model contains only the most important features of whatever it is you are investigating, its scale and accessibility will speed your learning process.

MATERIALS

- balloon
- metric ruler
- felt-tipped pen
- calculator

Background information for this activity: Astronomer Sir Edwin Hubble was the first scientist to notice that other galaxies are moving away from Earth and our own Milky Way galaxy. Also, the farther away the galaxy, the faster it is moving away. The universe is expanding. In this activity, you will use a simple physical model to explore the expansion of the universe.

Use the following procedure to make a physical model of the expanding universe.

- Inflate the balloon until it is just firm enough to write on.
- Pick five random spots on the balloon and mark them each with a dot that is approximately 5 mm in diameter.
- Label the five dots A through E. Dot A represents our Milky Way galaxy.
- Measure and record the distance from A to each of the other labeled dots.
- Inflate the balloon completely, but be careful not to pop it.
- Again measure and record the distance from A to each of the other labeled dots.
- Calculate the percent increase in the distances between the dots on the partially inflated and the fully inflated balloon. Use the following formula:

$$\frac{(\text{partially inflated distance} - \text{fully inflated distance})}{\text{fully inflated distance}} \times 100 = \% \text{ increase}$$

Table 1. Distance Points Move Apart

Inflation	A–B Distance (cm)	A–C Distance (cm)	A–D Distance (cm)	A–E Distance (cm)
Partial				
Full				
Percent increase				

Name _____

Period _____

Date _____

1. Compare the distances from point A to each of the other points when the balloon was only partially inflated and when it was fully inflated.

2. In your model, what represents the galaxies? _____

3. What does the surface of the balloon represent? _____

4. What might be the strengths of this model? What are its limitations?

5. How does this model help you to understand the expansion of the universe?

Challenge Scientists think an explosion called the big bang started our expanding universe. How could you use the balloon to model the extremely small and dense particle that is the theoretical beginning of the universe?
