

# RAFT IDEAS

**Topics:** Astronomy,  
Cosmology, Expanding  
Universe

## Materials List

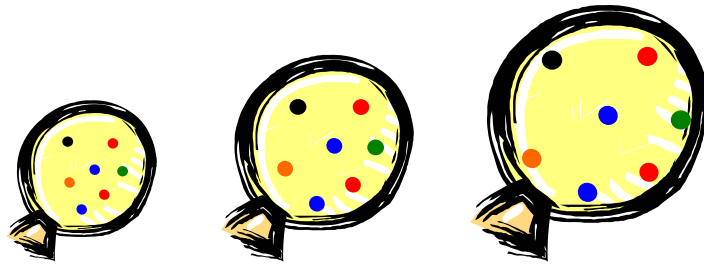
- ✓ Balloon, light colored, 30 cm (12") diameter or larger
- ✓ Dark permanent marker (optional: use pens in several different colors)
- ✓ Optional: Balloon pump

This activity can be used to teach:

- Expanding Universe (CA Science Standards: HS Earth Sciences, 2.g)

# Ballooning Universe

Exploring the idea of an expanding universe



The idea of an expanding universe can be seen with dots on an expanding balloon.

## To Do and Notice

Note: Students should have a clear understanding that galaxies are composed of billions of stars.

1. With a dark color permanent marker, make 6 to 10 dots over the entire surface of the un-inflated balloon. The dots represent galaxies in the universe. Optional: number the dots or use different colors of ink to distinguish the dots.
2. Note (optional: measure and record) the distances between the dots on the balloon before inflation.
3. Partially inflate the balloon.
4. Observe the changes in the distances between the dots. Measure the changes in distance.
5. Inflate the balloon more.
6. Note what has happened to the distances between the dots.
7. Repeat the process as desired.
8. Would an observer located at any dot perceive the other dots as moving away?
9. Note the dots change in size. This part of the demonstration is not an accurate representation of what happens with galaxies.

## The Science Behind the Activity

In 1924 Edwin Hubble discovered that galaxies are distant collections of individual stars rather than clouds of spinning gas. Five years later, by analyzing the “red shift” in the spectrum of the light from the galaxies, he determined that all of the galaxies (outside of our immediate area) are moving away, and the speed of their movement is directly related to their distance from us, suggesting the universe is “expanding”. Furthermore, at any location in the universe, all galaxies would appear to be moving away. The dots on the balloon exhibit this quality when the balloon is inflated.

## Taking it Further

Another way of thinking of the expanding universe is the idea of raisins in bread dough. During rising, the dough expands and the distance between the raisins increases. The bread dough model offers a three dimensional version of the expanding universe and how the distance between all the galaxies increase.

**Web Resources** (Visit [www.raft.net/more](http://www.raft.net/more) for how-to videos and more ideas!)

- Early and current theories of the origin of the universe - [kids.yahoo.com/science/space/article/cosmology](http://kids.yahoo.com/science/space/article/cosmology)
- Animated model - [brahms.phy.vanderbilt.edu/~rkноп/astromovies/expuniv2.html](http://brahms.phy.vanderbilt.edu/~rkноп/astromovies/expuniv2.html)
- For more information on redshift - [wikipedia.org/wiki/Redshift](http://wikipedia.org/wiki/Redshift)