

# EXPLORING THE UNIVERSE

## Expanding Universe

### Try this!



Find a group of four people. With each person holding a handle, work together to evenly pull the four-way elastic bands outward in all four directions. What happens to each of the galaxy buttons? How do they spread out across the board? Slowly release the elastic bands back toward the center.



Use the grey and black circles to figure out how far the buttons move. For each of the elastic bands, line one of the galaxy buttons up at the third circle from the center, and one at the sixth circle.

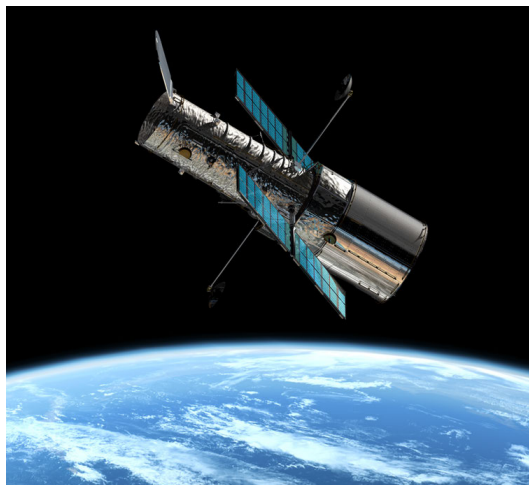
Try pulling the bands out again. Can you make the galaxies from the third circle move to the sixth circle? Where do the outer galaxy buttons fall? Did the galaxies move away from the center at the same rate?

*Astronomers make observations and use mathematical models to understand how the universe changes.*

**Most of the galaxies we can observe are moving away from each other as the universe expands.** Like the stretchy elastic bands in this activity, space is expanding and stretching. But not everything expands. Some objects are held tightly together by gravity, such as our bodies, the Earth, our solar system, and even galaxies like the Milky Way. Like the buttons in our model, these remain about the same size, even as the distances between them increase. As the elastic in our model stretches, the outer buttons move away from the center faster than the inner buttons do. Astronomers have observed and calculated that distant galaxies appear to be moving away from our perspective faster as well. This is because the rate at which a galaxy moves away from us is directly proportional to its distance from us, a relationship that we now know as *Hubble's Law*.



**Galaxies, like M96, are moving away from each other.**



**The Hubble Space Telescope has helped scientists explore and understand the origins of universe.**

**The beginning of the universe, over 13.8 billion years ago, was like a sudden expansion from a very hot, very dense state.**

This rapid expansion happened everywhere at once—there was no space before it. Because we're always looking out at the universe from Earth (or from points within our solar system), it's easy to imagine that we are at its center. But because the whole universe is expanding, it would look like you were at the center no matter where in the universe you were making observations.

While scientists don't yet fully understand this complex event, research suggests that it

produced all of the matter that eventually became galaxies, stars, planets, moons, and even you.