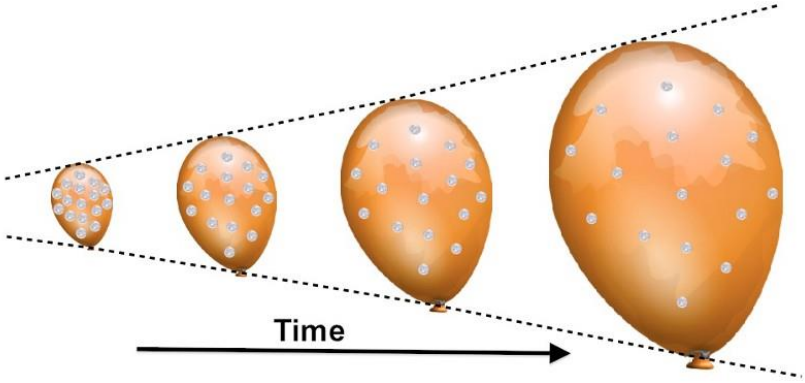
Can you stretch space-time?

Looking at the vast array of stars on the night sky, we always wonder: how did all of this come to be? Has it always existed? If not, how and when did it begin? Scientists have used several methods to figure out the initial conditions of the universe and its evolution. In the 1920s, mathematician Alexander Friedmann predicted an expanding universe. Edwin Hubble confirmed this when he discovered that many galaxies were moving away from our own at high speeds. Hubble measured several of these galaxies and in 1929 published a paper stating the universe is getting bigger. The expansion rate of the universe is known as the Hubble constant. However, the measured current expansion rate of the universe tends to be about 5 percent higher than what is predicted by theory. Scientists think, dark matter and dark energy, which appear to make up about 95 percent of the universe have an important role in the expansion of the universe. Several experiments at Fermilab are seeking to uncover the mysteries of dark matter and dark energy.



Materials: Large balloon, sticky letters

Activity: Blow the balloon little bit and write on it the word UNIVERSE using the sticky letters. Make sure the letters are attached well (you can use double sided tape to fix the letters). Start blowing the balloon and observe what the letters do (assuming they don't come off). Watch the distance between the letters increasing as the balloon gets bigger.

Questions to ask: What does the balloon surface represent? Does the distance between letters (galaxies) change as the balloon gets bigger? Do the letters (galaxies) get larger/smaller? Why the space stretching is not affecting the size of galaxies?

Useful links: https://ed.fnal.gov/lsc_exhibits/list.html

https://twitter.com/FermilabEd/status/1242451101288300546