Expansion of the Universe and the source of the elements.

Introduction:

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 at different distances from Earth he also determined that the farther something was from Earth the faster it seemed to be moving away. This relationship became known as Hubble's Law, and its just one piece of a bigger puzzle known as the Big Bang.

Approximately 13.7billion years ago ALL matter was compressed into an infinitely small space known as a singularity. Expansion then occurred in all directions. Over time tiny bits of matter clumped together to form stars and galaxies. As a result of this expansion these objects are still moving away from each other.

Imagine you are living on Planet X located somewhere in the universe. You look up into the night sky and see everything is moving away from you. You contact your friend who is living on Planet Y and she tells you that when she looks up at the night sky everything is moving away from her? Form both perspectives you and your friend both think you are at the center of the universe. In reality neither of you are located the center of the universe. This type of expansion described proves to be uniform throughout the universe.

Problem: How can you model the big bang?

Procedure:

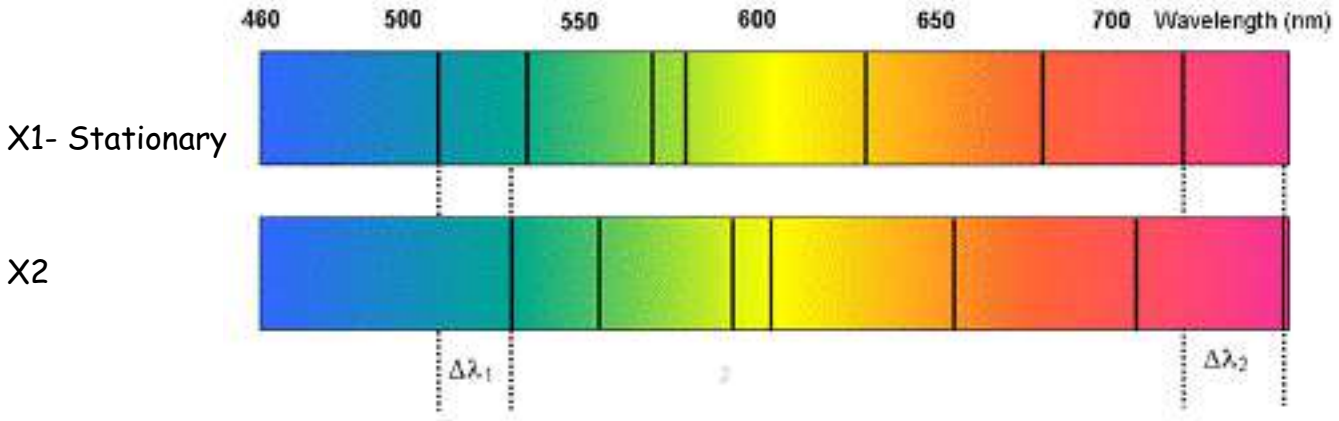
1. Assign one person to be the "inflator". This MUST be the same person who inflates the balloon during the entire activity.
2. All other members of the group will both measure and record. Some one will need to record the data for the inflator.
3. Inflate the balloon to about 10cm in diameter. DO NOT tie the end but hold it close.
4. Using a marker, make six SMALL dots on the balloon in widely scattered locations.
5. Label one dot "home" with the letter "H" and the others A-E. The home dot represents the Milky Way galaxy and the others represent galaxies in the early universe.
6. Using the tape measure (without letting the air out), measure the distance from home to each dot. Record the distance to the nearest tenth(.1) of a cm under Time 1.
7. Inflate the balloon so that its diameter is about 15 cm (5cm bigger). Again measure the distance from home to each dot. Record the distance to the nearest tenth(.1) of a cm under time 2.
8. Inflate the balloon in 5cm increments three more times. After each inflation Measure and Record the distances on the data table.

Observations:

Big Bang Balloon Data Table					
Distance from Home	**Time 1**	**Time 2**	**Time 3**	**Time 4**	**Time 5**
Galaxy A					
Galaxy B					
Galaxy C					
Galaxy D					
Galaxy E					

Conclusions:

1. List the galaxies in increasing distance from home in Time #1.
2. Did the galaxies near home or those farther away appear to move the greatest distance?
3. Use the data from Time #5. Calculate the speed of galaxy A & D if the time was 1 million years. Pretend the distance was measured in Millions of Km instead of cm (3.4 cm =3.4 million Km).
4. Use the spectrograph from star X at 2 different times to answer the following questions.



A. Which color shift has taken place?
B. What is occurring to the wavelength of the light?
C. Is the Star moving towards you or away from you?