

4. Edwin Hubble (the astronomer for which the space telescope is named) measured distances to the same galaxies that Vesto Slipher had observed. By putting the distances and the redshifts of the galaxies together, he made a very important discovery. What was it?

Section II: The Big Bang and the Expansion of Space

1. What do we call the event at the beginning of the universe where everything was in a single point that suddenly expanded?

2. What is “lookback” time?

As stated in the video, the universe was dense and hot after the Big Bang. It eventually cooled and expanded enough that it became transparent (like we see today). If we look far enough away (which is also looking back in time, see “lookback” time) we can see the edge of that hot dense time of the universe. If we had been there during that time, we would have been able to see it gave off light with our eyes! The wavelength emitted was in the visible part of the spectrum. It is now billions of years in the future and that light has been redshifted to the point that we can no longer see that light with our eyes.

3. The light has been redshifted so much that the two astronomers in 1965 that found the signal of this “cosmic microwave background” had to use what kind of telescope to detect it?

4. When we talk about the expansion of the universe, we don’t mean that galaxies are simply moving away from each other, but that space itself is expanding. Phil Plait uses the example of a rubber ruler that expands, the space between tick marks gets bigger. If we replace the tick marks with galaxies, we appear to see them moving away from us. Does this theory explain what Vesto Slipher saw with his redshift measurements? Explain.

5. Astronomers use math to turn the clock backwards to estimate the age of the universe. What is the current best measurement we have on the age of the universe? How does this compare to the age of the Earth?

Section III: Hubble's Law

Watch the following video of Brian Cox explain Hubble's Law and answer the following questions.

<https://youtu.be/PR6wN8ym7SI>

1. What is Hubble's Law?
2. What example did Brian Cox give for the expansion of space? Explain it in your own words.
3. Is there a center of the universe?
4. What is the Hubble constant and what does it mean?