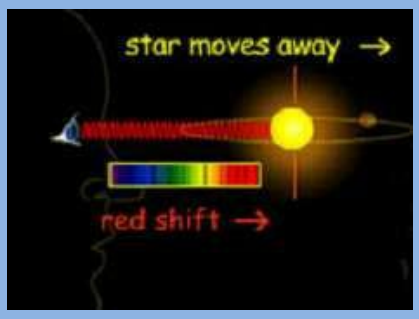
Redshift Factsheet

What is redshift?



(Image Credit: NASA)

When an ambulance drives past you on the road, you will notice the siren changes from a high pitch noise, as it's coming towards you, to a lower pitch noise as it's moving away. This is something called Doppler shift: waves are squished up if an object is coming towards you and stretched out the object moves away. You get the same effect with light: light waves get shorter (shifted to the blue end of the spectrum) for an approaching object; and longer (a shift to the red end of the spectrum) for an object moving away.

Why are most galaxies redshifted?

If we look at most galaxies in the universe, we find that the light from them is redder than we would expect if they weren't moving away from us. This means that most galaxies are moving away from us and this means that the universe is expanding. The astronomer Edwin Hubble noticed that the further away a galaxy is, the faster it is moving away from us. This is because space itself is expanding – this is called cosmological redshift.

Activity 2 gives a physical way of modelling this expansion. Since light takes time to travel across the universe, the further away a galaxy is, the further back in time we are looking.

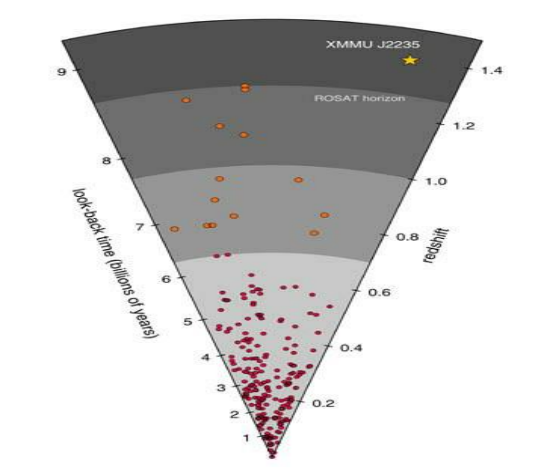


Image Credit: NASA

ACTIVITY 1 – DOPPLER SHIFT

You can hear Doppler shift for yourself

You can hear Doppler Shift for yourself with this simple experiment. Buy a cheap buzzer (or make) and attach it to the end of a string. Whirl the string around your head – make sure there is space for this and everyone is well clear. Your friends should hear the pitch of the buzzer changing as you whirl it around high pitched coming towards them and low pitched moving away.

ACTIVITY 2 COSMOLOGICAL RED SHIFT

Get a long piece of elastic and place star stickers at regular spacing along the elastic. Stretch the elastic out – you will notice that the star stickers close to you are moving more slowly away from you than the stickers further away, just as Hubble's Law predicts for galaxies.