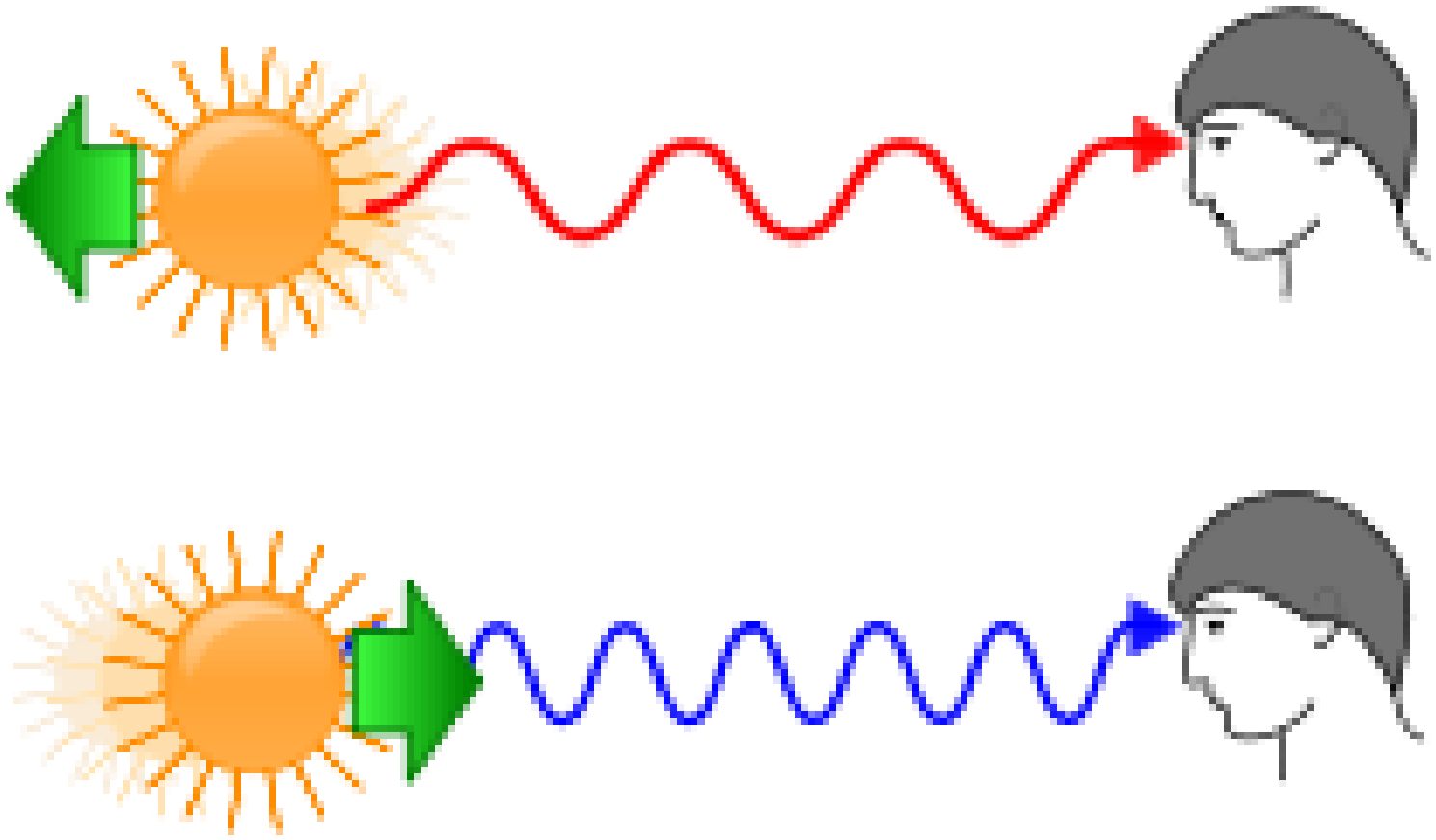
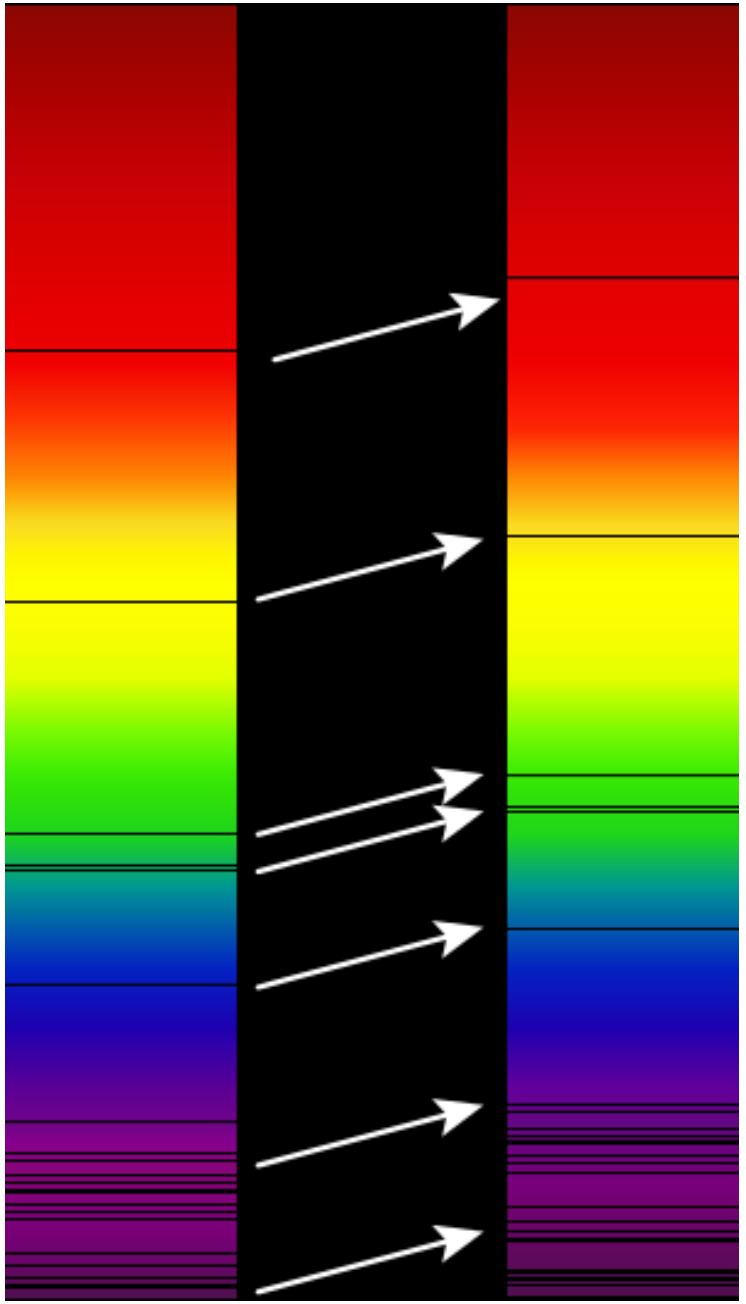
Redshift

Week 25

The Doppler effect



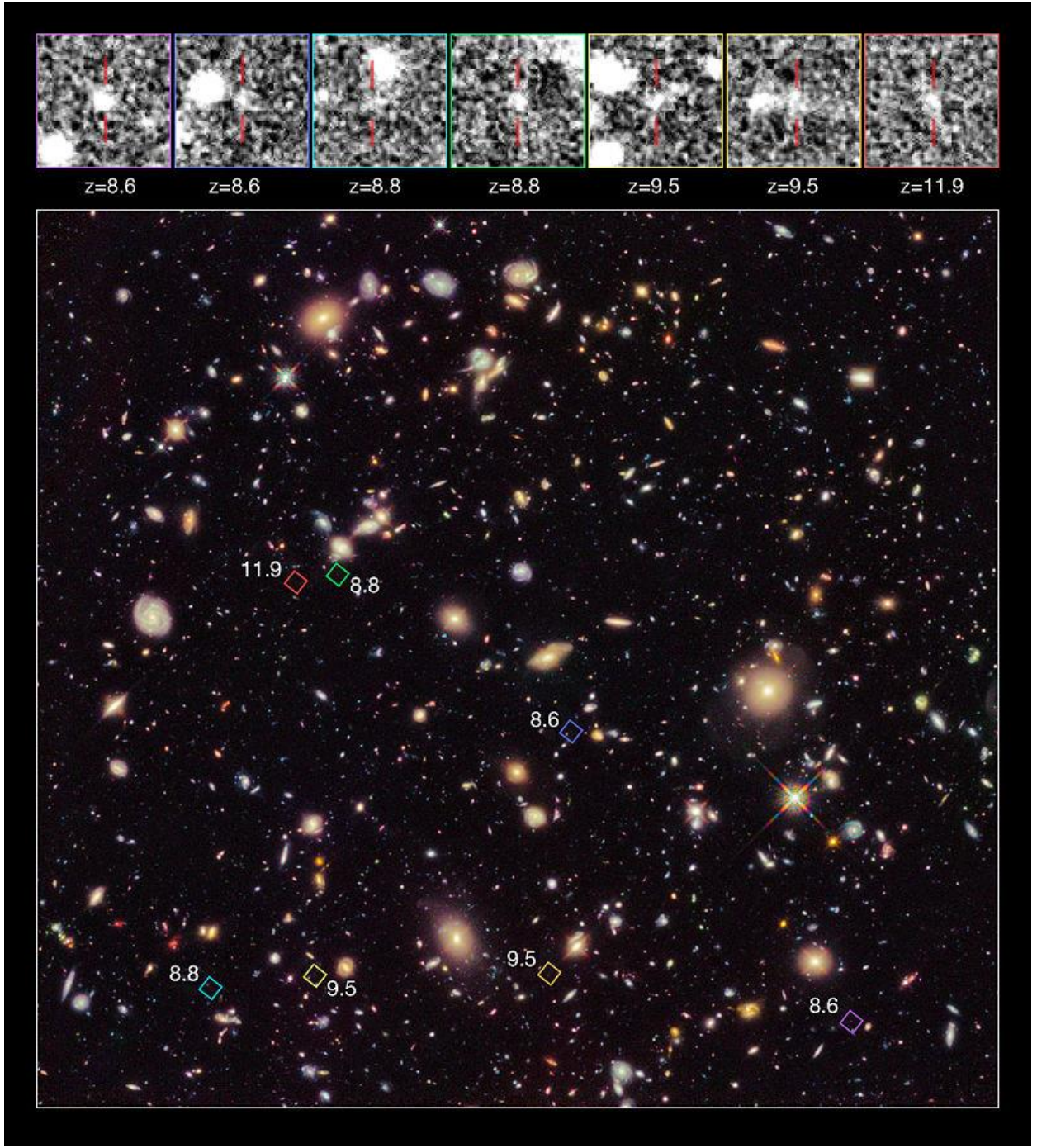
Galaxies moving away from us have their light shifted towards the red end of the EM spectrum.



The Hubble Ultra Deep Field

All of the distant galaxies are red-shifted.

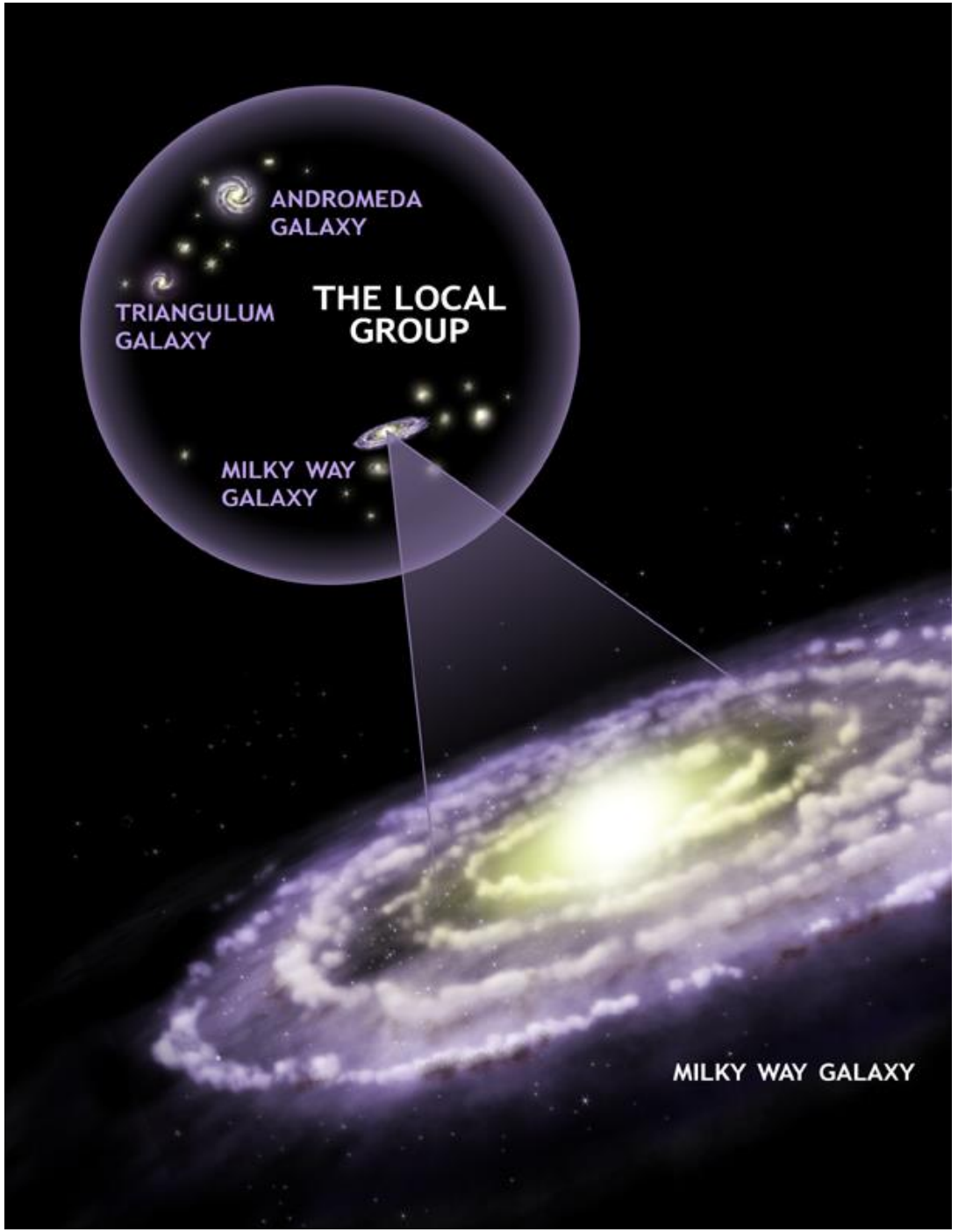
This indicates they are moving away from us and is proof that there must have been a big bang.



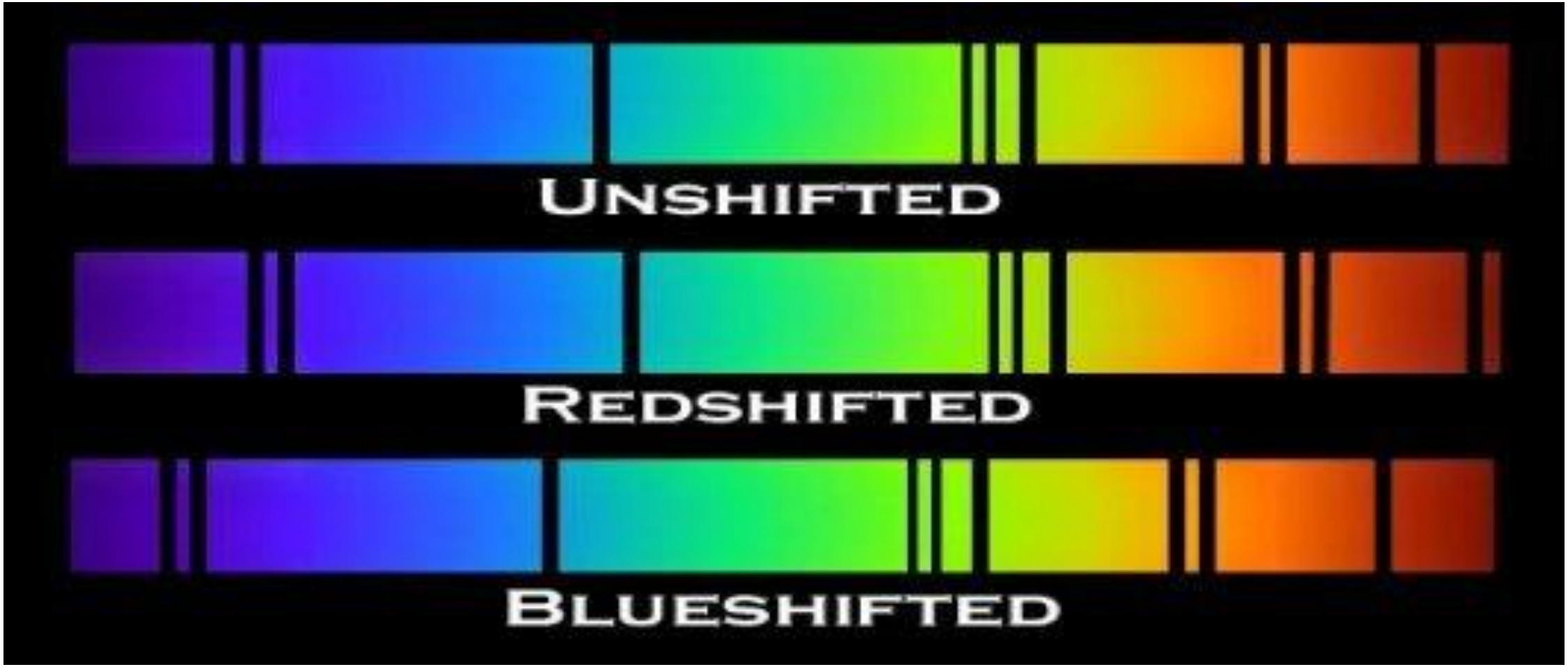
The Local Group

Our local group of galaxies are blue shifted

Our nearest galactic neighbour, Andromeda will collide with the Milky Way in about 10 billion years.



Redshift and blueshift shown on a spectral analysis

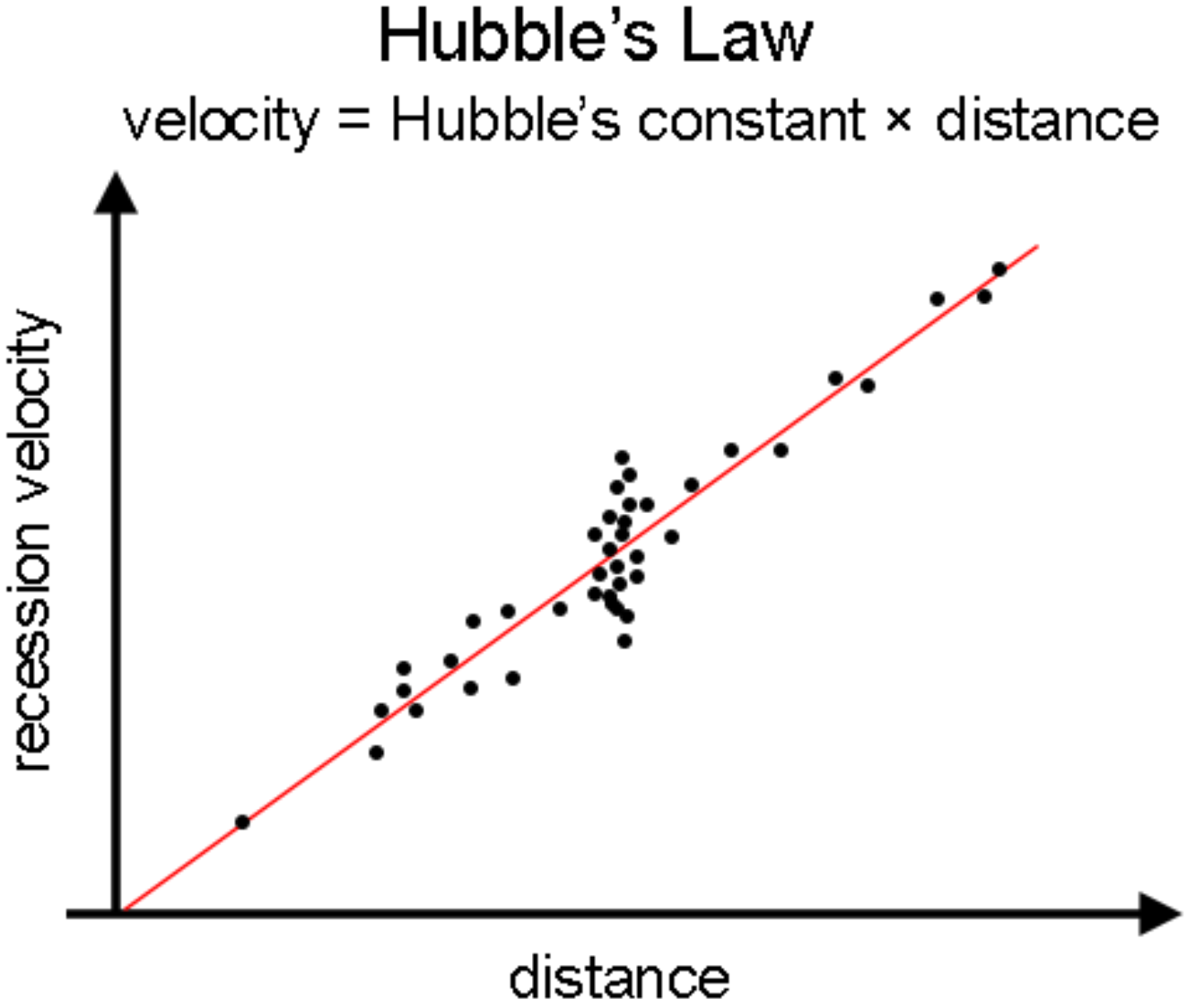


$$z = \frac{\lambda - \lambda_0}{\lambda_0} = \frac{v}{c}$$

Z	redshift
λ	observed wavelength of light
λ_0	actual wavelength of light
v	radial velocity of the galaxy
c	speed of light (3×10^8 m/s)

Hubble found that the amount of redshift was proportional to the distance.

The further away galaxies are, the faster they are moving away from us.



Hubble's law:

$$v = H_0 d$$

v	recessional velocity of the galaxy
d	distance to that galaxy in Mpc
H	Hubble's constant – roughly 77 km/s/Mpc

Hubble's law can be used to predict the age of the universe

4.35×10^{17} seconds

Or

13.8 billion years