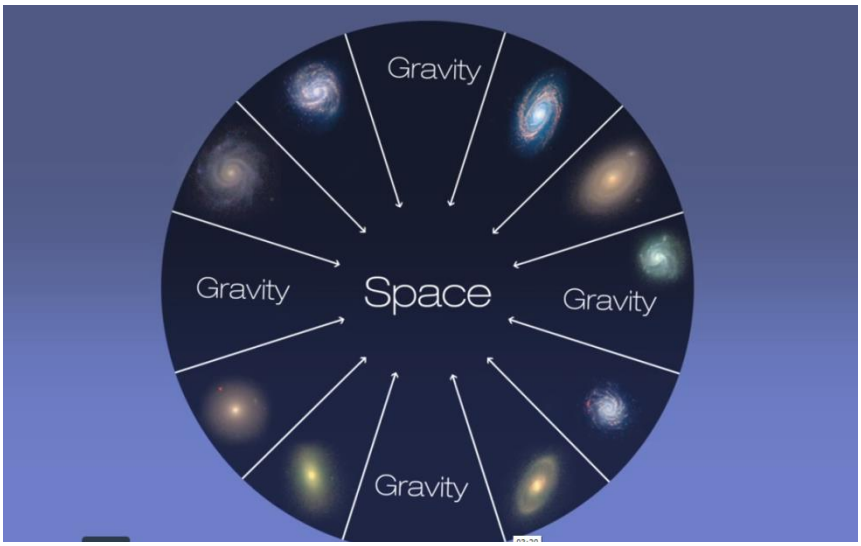
ROYAL OBSERVATORY GREENWICH

Hubble's Law

Key Stage 4

Topics covered: Velocity, distance, Hubble's constant, cosmological units

Watch the video "How big is the Universe?" https://vimeo.com/88899162



Hubble's law states that the recessional velocity of a distant galaxy, v (km/s) is linearly proportional to its distance from us, d (megaparsecs, Mpc) where the constant of proportionality is called the Hubble constant, H_0. The current value for H_0 is 67.8 km/s/Mpc.

$$v = H_0 d \qquad (1)$$

1. What does Hubble's law tell us about the nature of the Universe?

2. The recessional velocity of the quasar 3C 273 is 47502 km/s. Using equation (1) find out the distance from Earth in Mpc. Convert this into light-years (ly), where 1 megaparsec = 3.26 x 10^6 ly. A light-year is the distance that light travels in a year e.g. if a star is 0.2 light-years away the light has travelled for 0.2 years.

3. Our nearest spiral galaxy, Andromeda is 2.5 million light-years away. How many times further away is 3C 273 than Andromeda?

4. Andromeda is moving towards us. Why do you think that is?

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Hubble's Law: ANSWERS

Key Stage 4

1. The Universe is expanding
2. 749 Mpc = 2.4 x 10^9 ly
3. 1000 times further away
4. It is under the influence of the gravitational field of the Milky Way