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How quickly is the Universe expanding?

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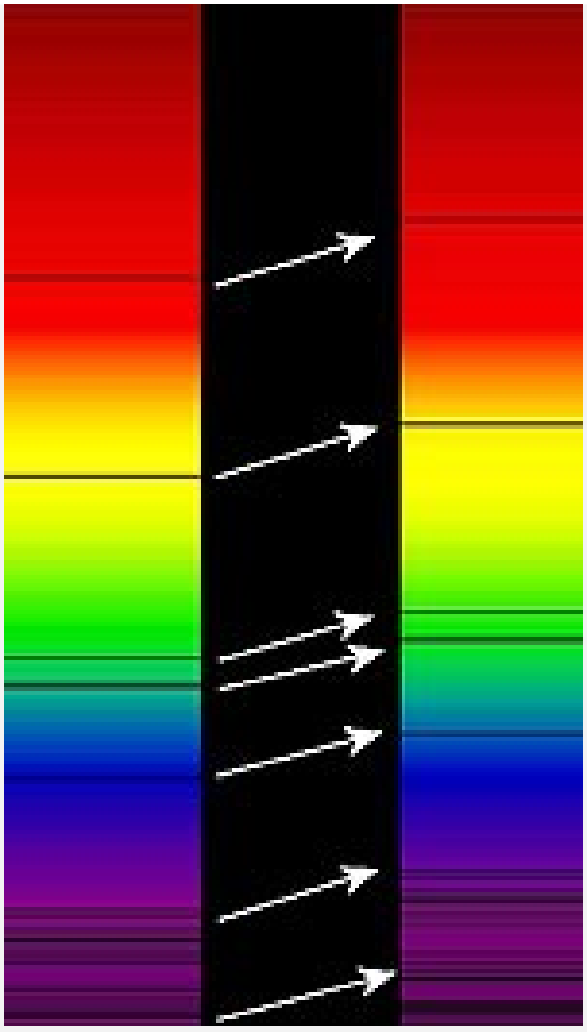
In the 1920s, Edwin Powell Hubble was analysing the distances between Earth and various galaxies using the Mount Wilson Observatory in California. In the process, he measured the electromagnetic radiation of the galaxies and discovered mostly what are known as 'redshifts' in their spectra; that is, in the distributions of the various wavelengths. The Doppler effect, among other things, is responsible for this: when a galaxy moves away from us, the spectral lines shift to the red, long-wave end of the electromagnetic spectrum. If a galaxy moves towards us, the spectral lines are shifted to the blue, short wave end of the spectrum. We are aware of a similar effect with sound waves: the pitch (for example, of an ambulance siren) changes as the source of the sound moves towards or away from the listener.



Redshift of spectral lines in the optical spectrum

In 1929, Hubble published the outcome of his investigation – almost all galaxies are moving away from us and their speed increases in a linear relationship with their distance from us. According to today's calculations, the 'Hubble constant' – the constant of proportionality between the distance of a galaxy and its speed – has a value of around 74 kilometres per second and per megaparsec. This means that a galaxy at a distance of one megaparsec would move away from us at a speed of 74 kilometres per second.

The galaxies are not racing away – space is simply expanding

It is rather improbable that the Earth is at the centre of the Universe and all of the galaxies are thus moving away from us. More likely there is another cause for the frequent redshifts – the Universe is expanding. The Hubble constant thus indicates the speed at which the Universe is currently expanding. The observed redshifts are, therefore, less frequently caused by the Doppler effect than by the fact that space itself is being stretched in an expanding Universe and so too are the wavelengths of the electromagnetic radiation travelling through it.

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