

The Universe

When and where did the Universe originate?



Contact



The Big Bang

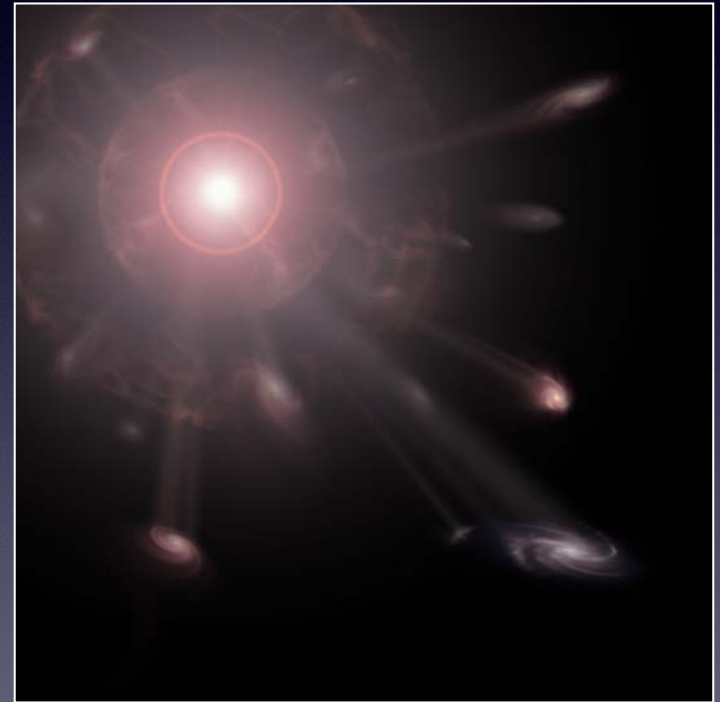
The Universe

- Universe - all the space, matter, and energy that exists in any place
 - Came into existence approximately 13.7 billion years ago with the Big Bang



The Universe

- Big Bang - states that all matter and energy started out concentrated in a small area and after a gigantic explosion, matter began to organize into subatomic particles and atoms



The Universe

Evidence of the Big Bang

- I. Background Radiation - left over energy created by the explosion found in all parts of the Universe
 - Scientists have found evidence of long wave radiation [microwaves] that come from all directions in the Universe



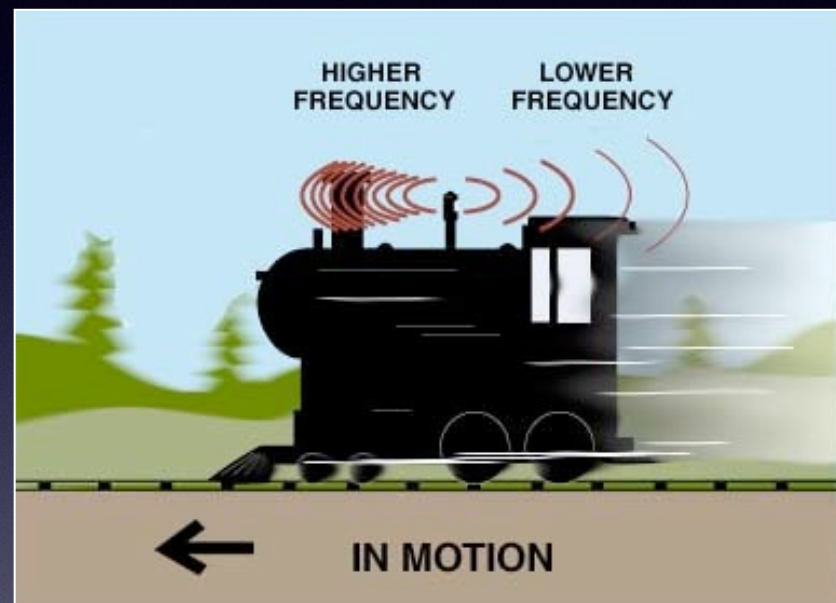
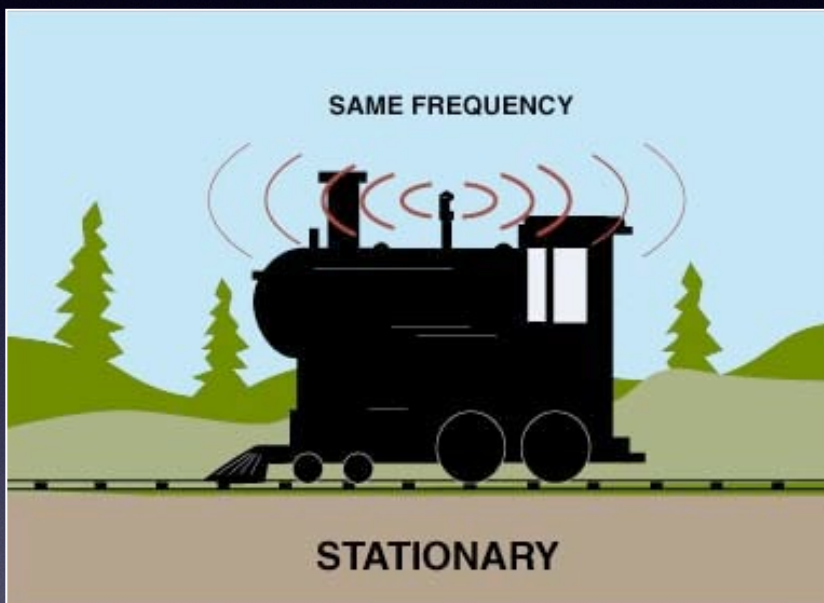
Robert Wilson
RADIO ASTRONOMER

Background Radiation

The Universe

Evidence of the Big Bang

2. Doppler Effect - the apparent wave length shifting of electromagnetic energy caused by the relative motion between the energy source and the observer



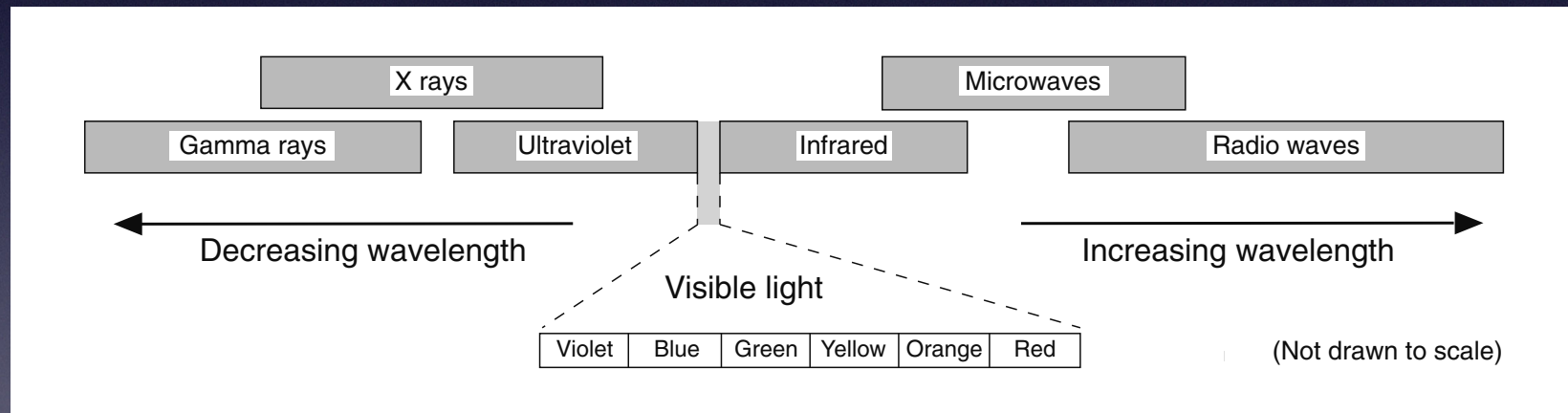
Doppler Effect - Train in Motion



Doppler Effect - Car Horn

The Universe

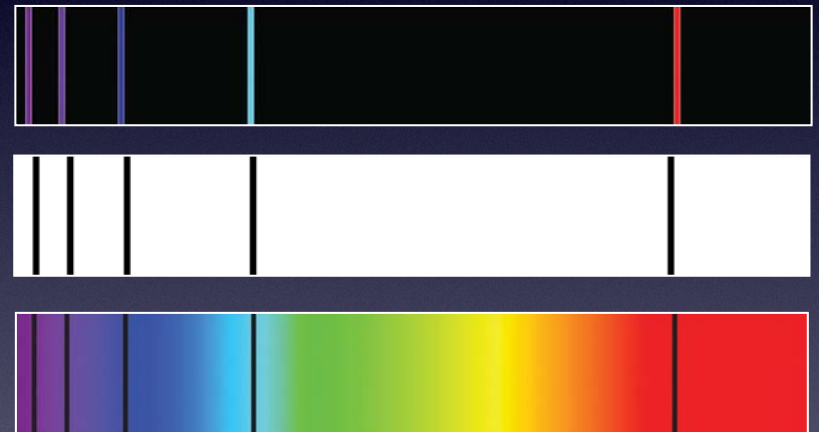
- Electromagnetic Energy - energy that is radiated through space in the forms of transverse waves



Earth Science Reference Tables

The Universe

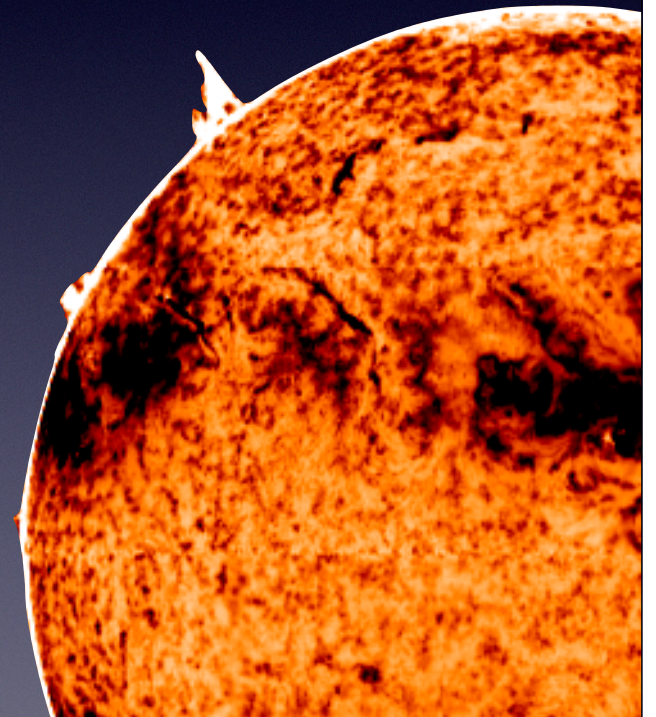
- Each element gives off an electromagnetic spectral line [signature]



Spectral Lines for Hydrogen

The Universe

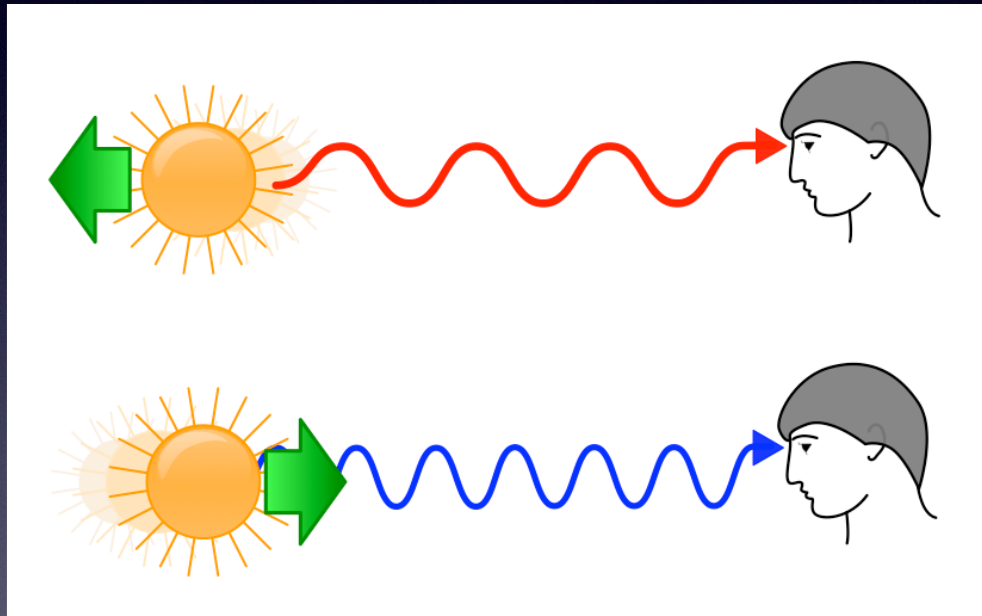
- When scientists study energy coming off a celestial object they can infer:
 - Composition of the object
 - Direction of movement



The Universe

- Positions of the colored lines [spectral lines] shift as they studied stars and galaxies
 - Blue Shift - when Earth and the celestial object are coming together the spectral lines move towards the blue wavelength
 - Red Shift - when Earth and the celestial object are moving apart the spectral lines move towards the red wavelength

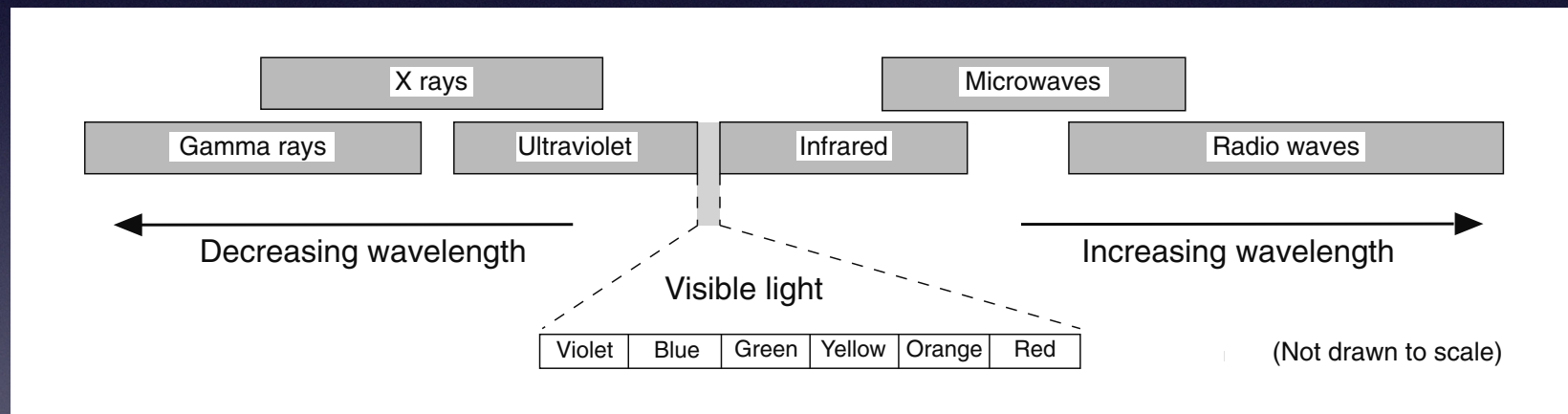
The Universe



Red Shift vs. Blue Shift

The Universe

Electromagnetic Spectrum



Earth Science Reference Tables

The Universe

Normal



Red Shift
Moving Away



Blue Shift
Moving Towards





Expanding Universe