

The Universe

When and where did the Universe originate?



Contact



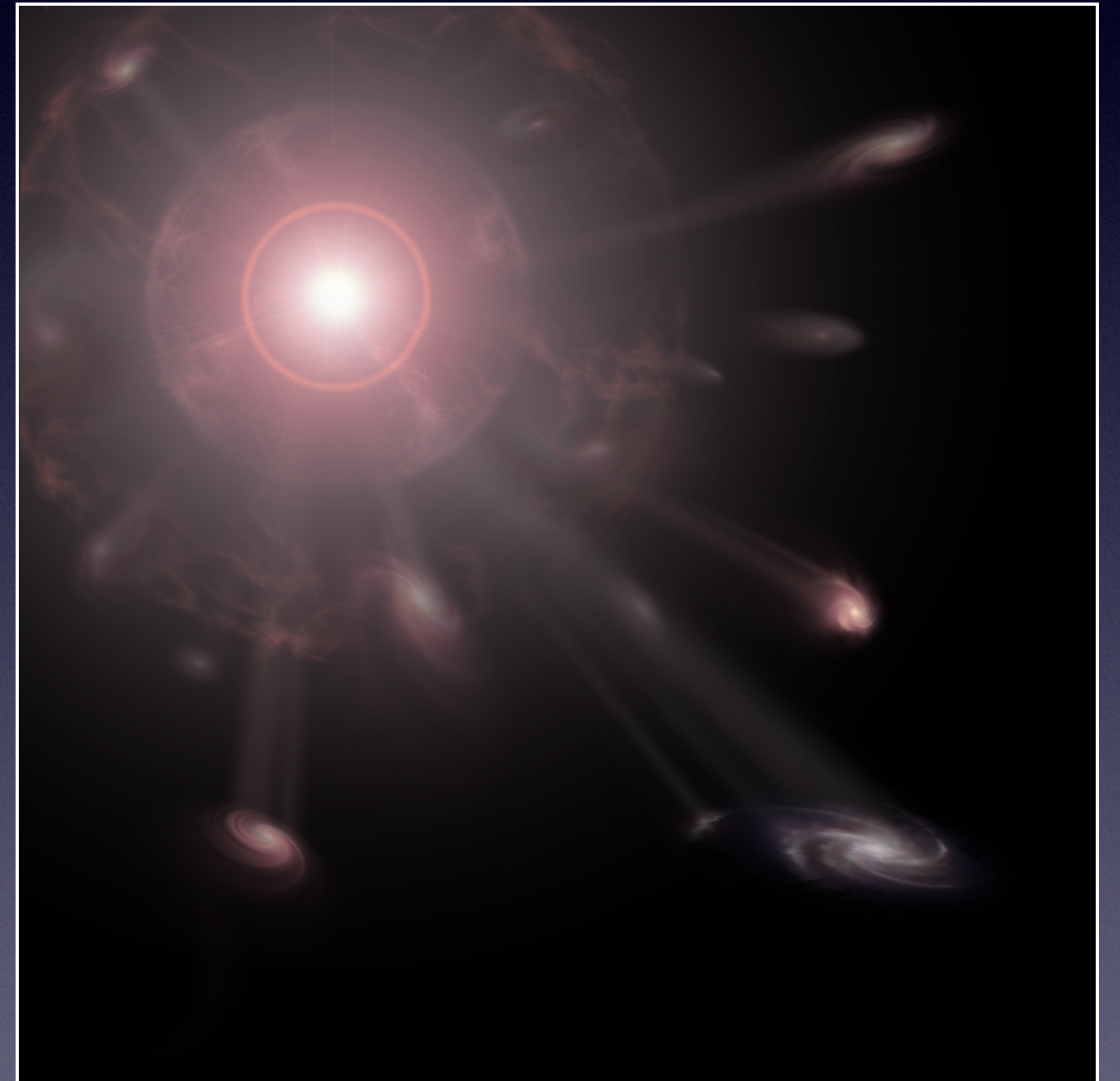
The Universe

- 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 Big Bang



The Universe

Evidence of the Big Bang

1. 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



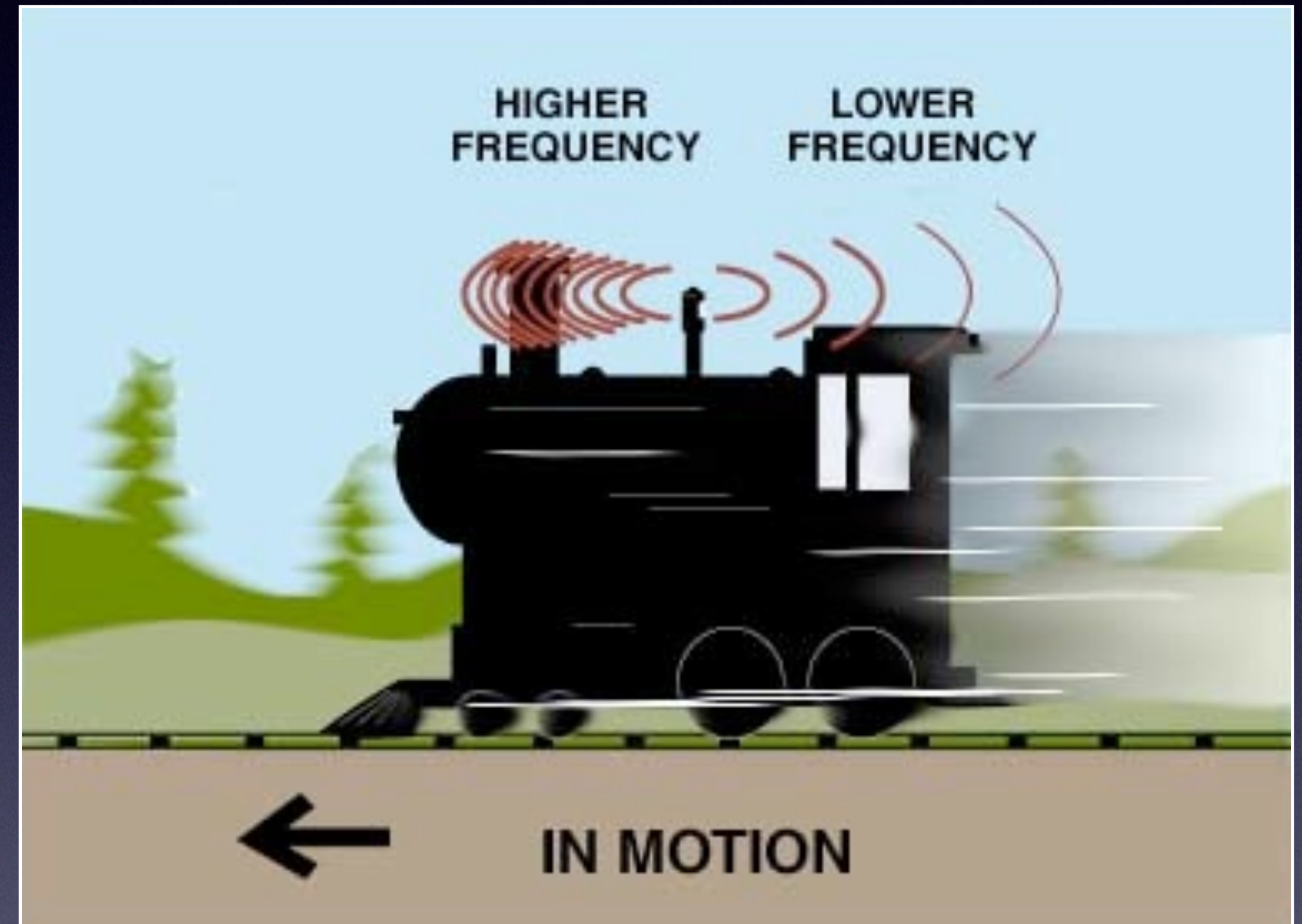
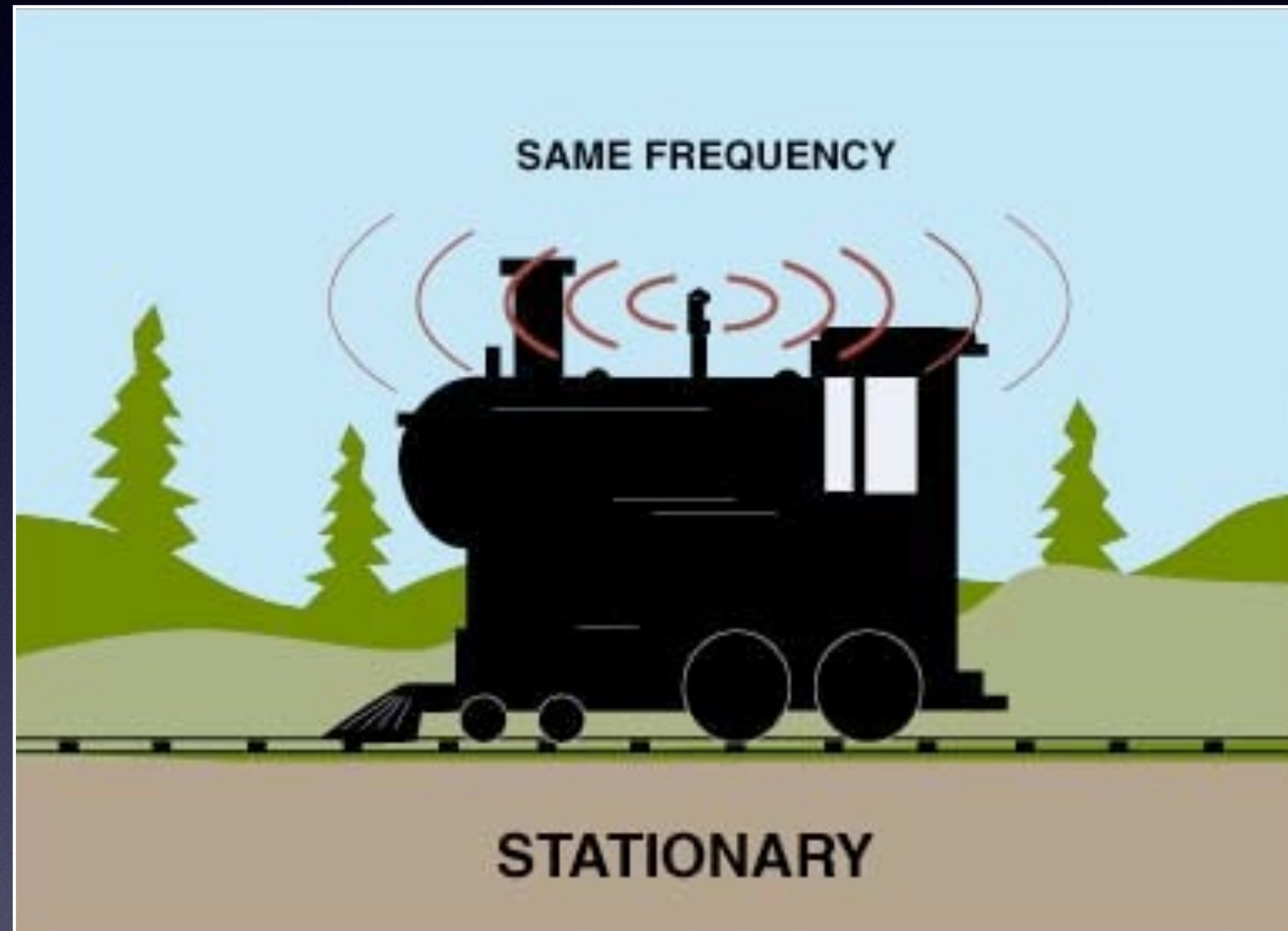
Background Radiation



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Evidence of the Big Bang

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



Doppler Effect - Train in Motion

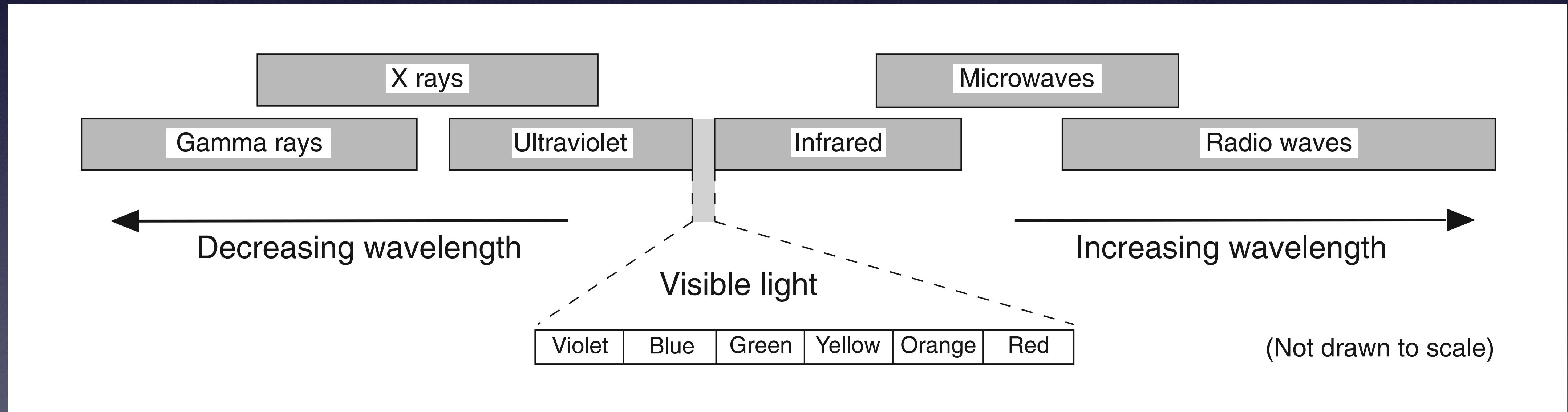


Doppler Effect - Car Horn



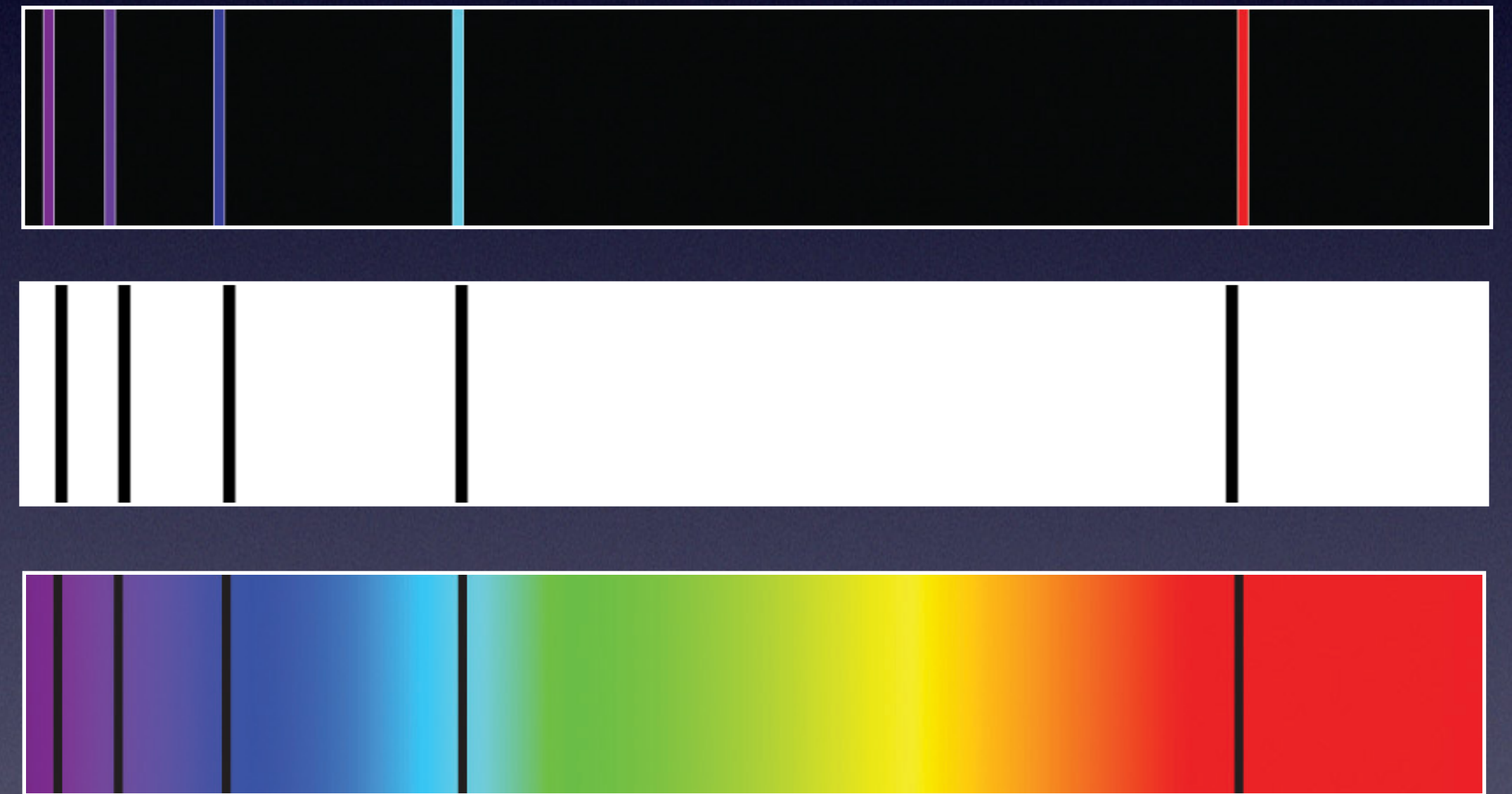
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- Electromagnetic Energy - energy that is radiated through space in the forms of transverse waves



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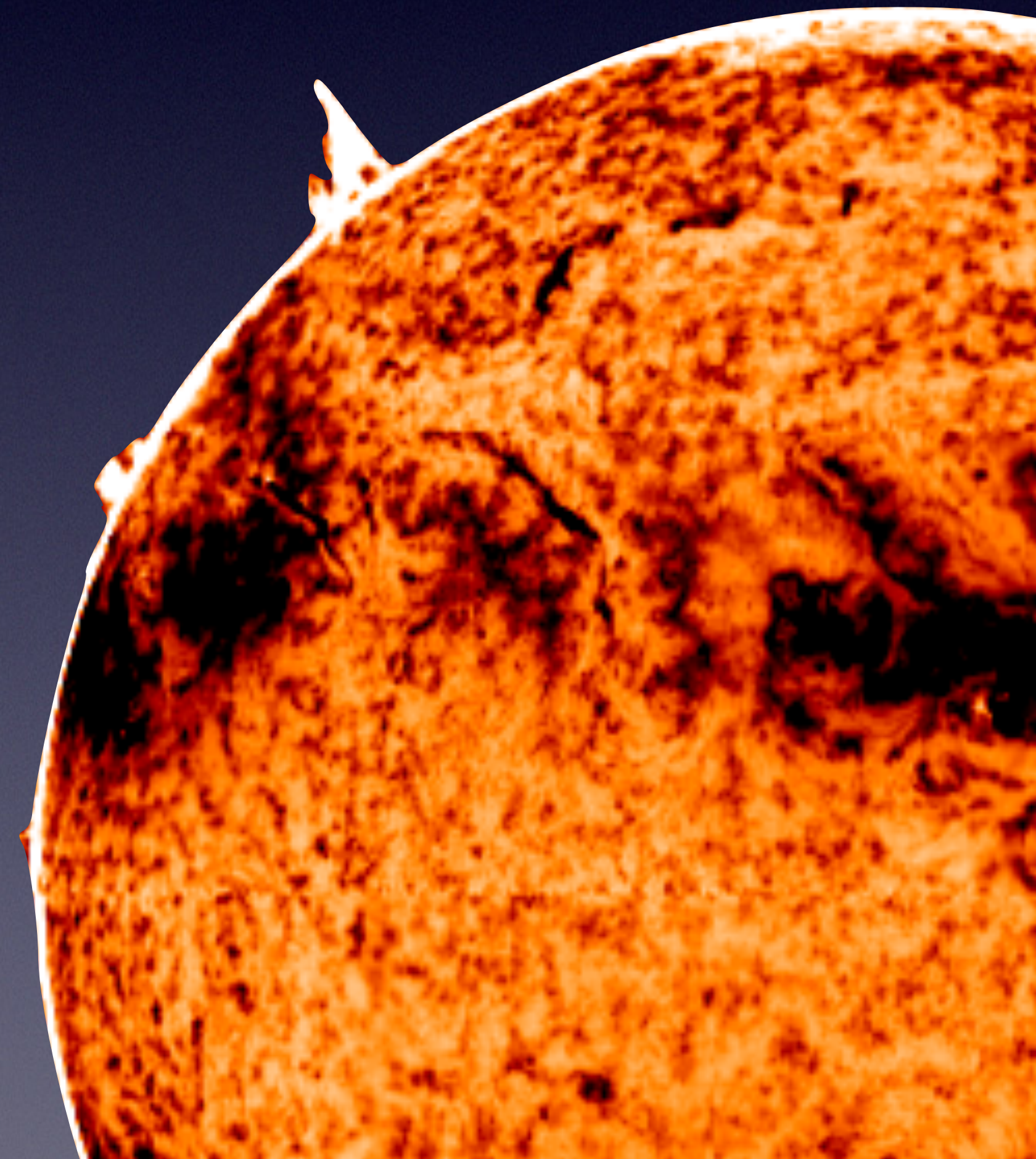
- Each element gives off an electromagnetic spectral line [signature]



Spectral Lines for Hydrogen

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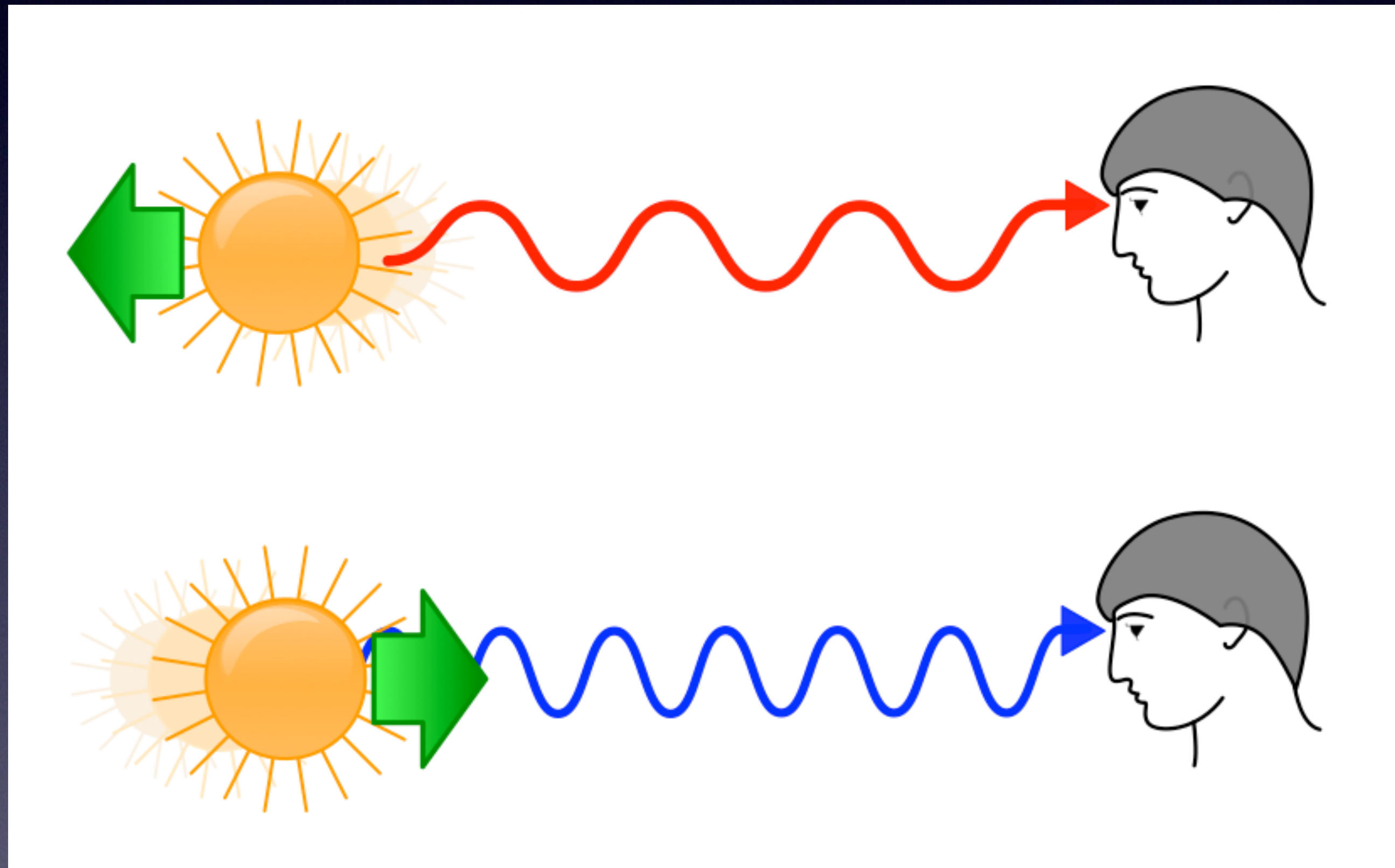
- When scientists study energy coming off a celestial object they can infer:
 - Composition of the object
 - Direction of movement



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- 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

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Red Shift vs. Blue Shift

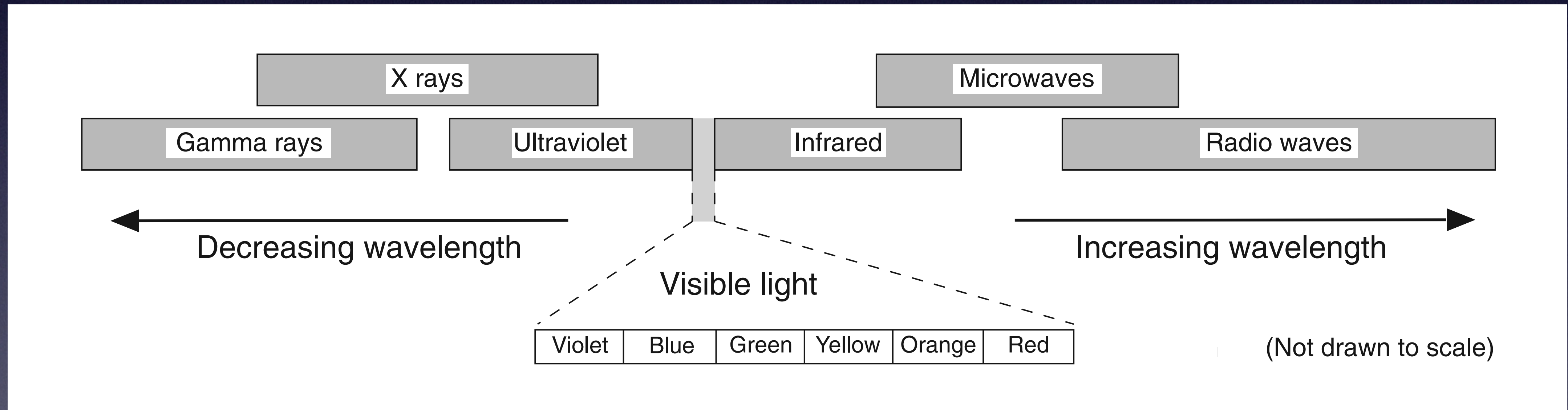


Expanding Universe



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Electromagnetic Spectrum



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Normal



Red Shift
Moving Away



Blue Shift
Moving Towards





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