

# Today

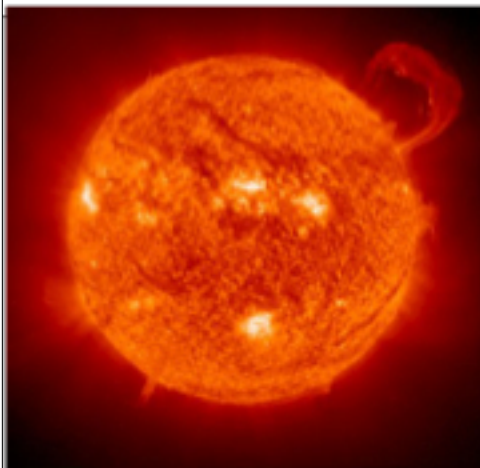
- Apparent and absolute magnitudes.
  - Distance modulus
- Blackbody radiation from outer space!
- Intervening "stuff" and effects on spectra.
  - Kirchoff's laws
  - Optical depth

1



The magnitude system is only ~2100 years old!

2



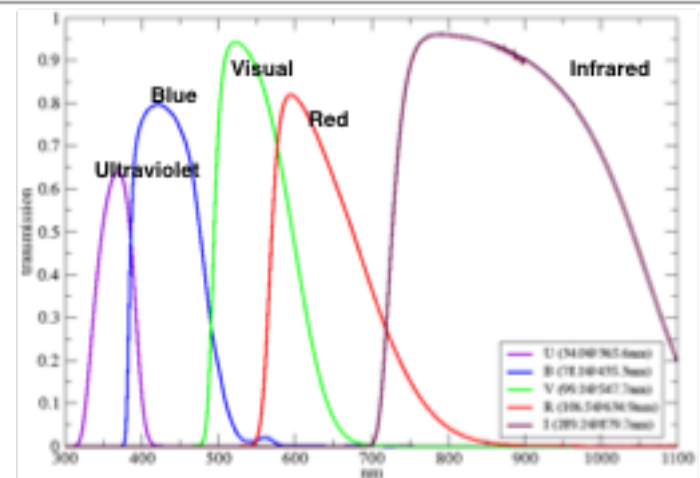
$m_V = -26.74$



$m_V = +0.03$

3

## Johnson Filters



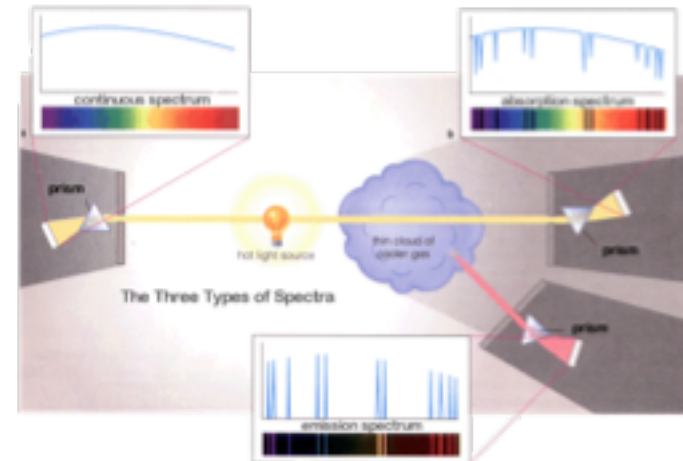
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# Kirchoff's Laws

- Dense objects produce a blackbody spectrum
- Hot diffuse gas (and plasma) produce emission lines
- Hot dense object seen through big, diffuse object makes you see absorption lines.

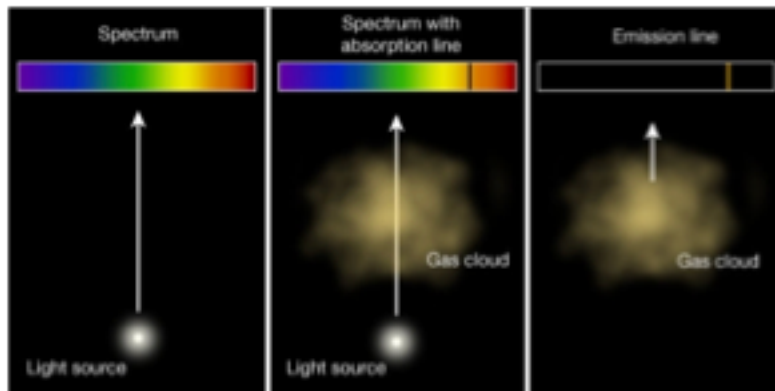
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# Kirchoff's Laws

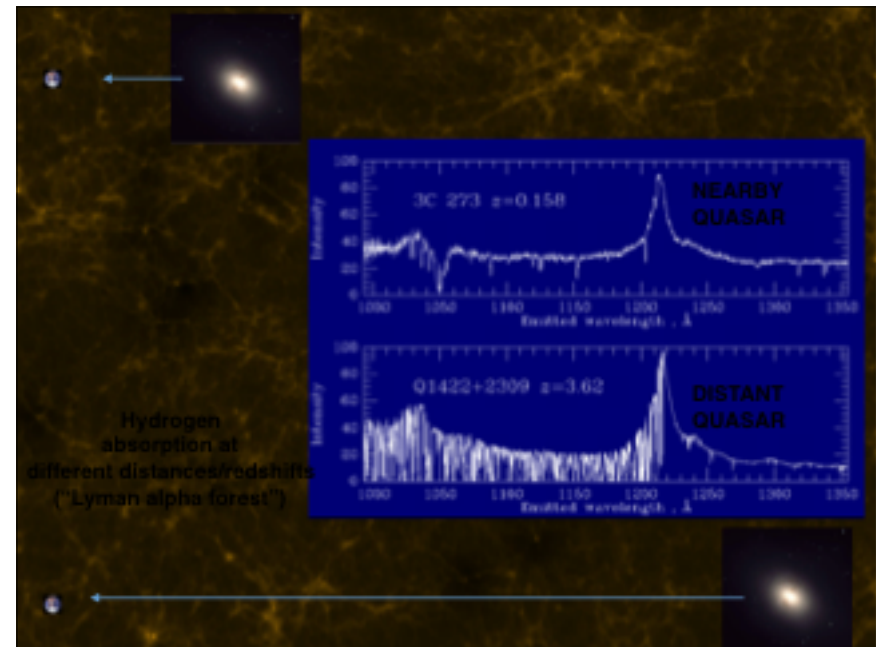


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# Kirchoff's Laws

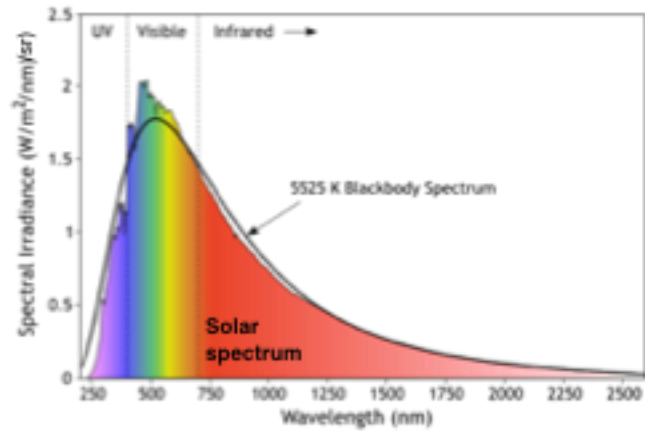


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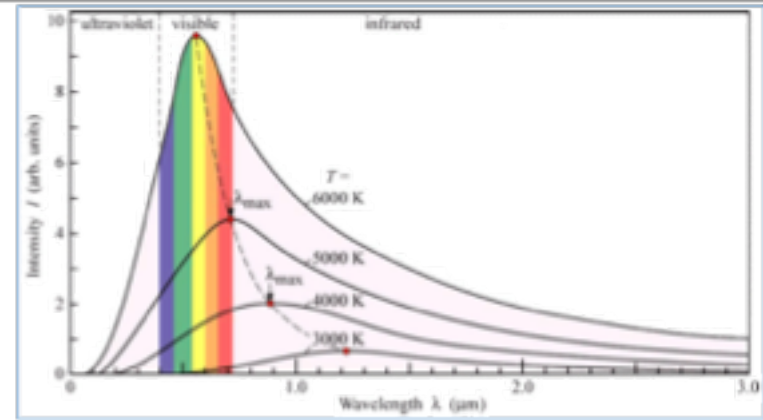


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# Blackbody Spectrum

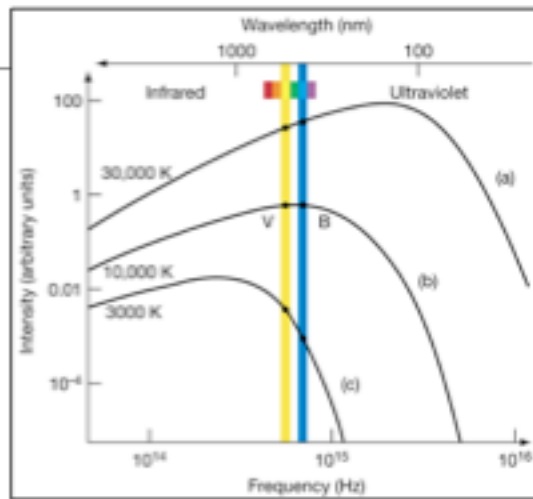


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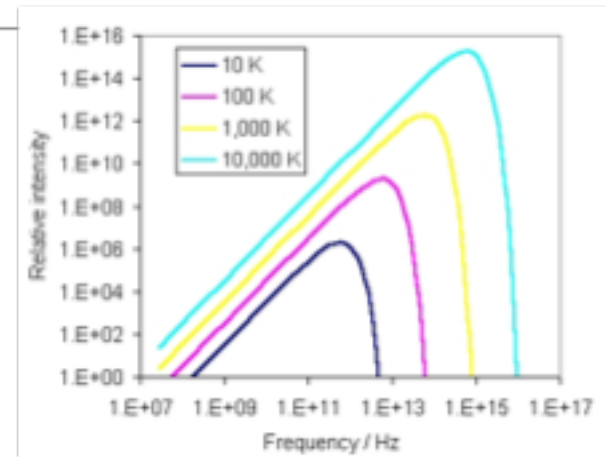
Linear scale vs. wavelength

10



Log scale vs frequency

11



12

