

Measuring Motion, Doppler Effect—25 Oct

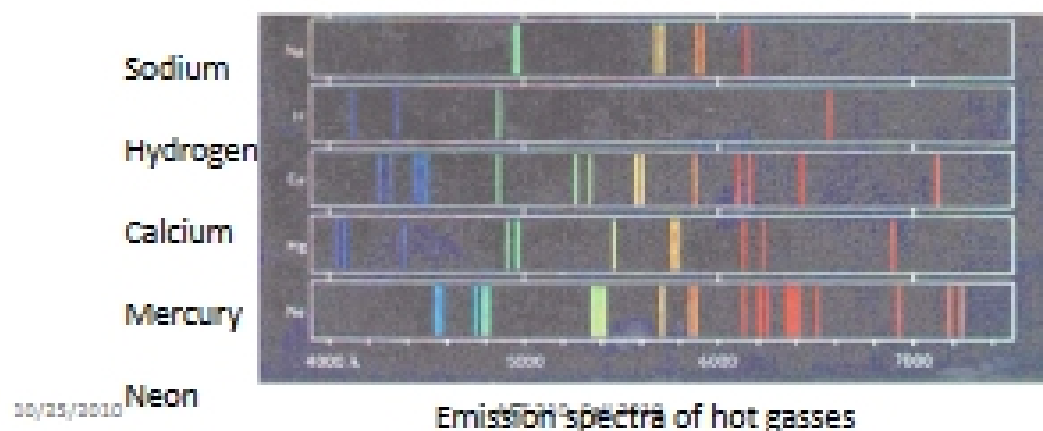
- Review Doppler effect
 - Doppler effect is the primary method for measuring speed of astronomical objects.
- Pickering's spectra of Mizar
 - What did Pickering discover?
- Modern cosmology begins in the "Realm of Nebulae" (galaxies)
 - Modern cosmology starts on Wed with Hubble's Law
- Homework 6
 - Due Mon, Nov 1.
 - If you downloaded from angel, check that the date is 2010, not 2009.
- Astronomical Horizons
 - Thurs, October 28, 7:30, Abrams Planetarium
 - Mars Meteorites: Rock Messengers from the Red Planet
 - Prof. Michael Velbel

10/25/2010

AST 210, Fall 2010

An element's fingerprint

- Spectral lines are an element's finger print. (5.4 in textbook)
- Eg, in the visible part of the spectrum, hydrogen emits and absorbs light at 656.2, 486.1, 434.0, 410.1nm.



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Doppler effect: Summary

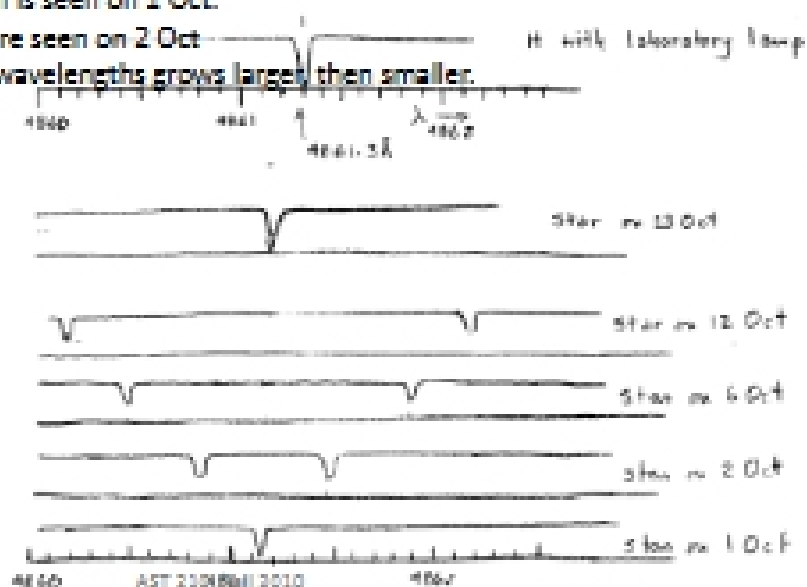
- Doppler effect: Motion is encoded in the wavelength of light
 - Observe wavelength $\lambda_{\text{observed}}$ of a spectral line from a star.
 - Measure wavelength λ_{rest} of same line in the lab, where the source is not moving.
$$\lambda_{\text{observed}} / \lambda_{\text{rest}} = 1 + v/c$$
 - v is speed, positive if star is moving away from us.
 - c is speed of light.
 - If motion is perpendicular to the line of sight, there is no change in wavelength.
 - In the formula, v is the component of the velocity towards or away from the observer.
1. Is it possible for a star to be moving and not show a Doppler shift? ____, and this is an example.
 - A. Yes
 - B. No

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Pickering's discovery

- We are interpreting E. C. Pickering's spectra of Mizar (a star in the Big Dipper) in 1889.
 - Spectra showing the H β line of hydrogen.
 - These are absorption spectra: The amount of light is high except at wavelengths where hydrogen absorbs.
- Describe the changes in the spectra. (Spectra repeat.)
 - A single wavelength is seen on 1 Oct.
 - Two wavelengths are seen on 2 Oct.
 - Separation of two wavelengths grows larger then smaller.

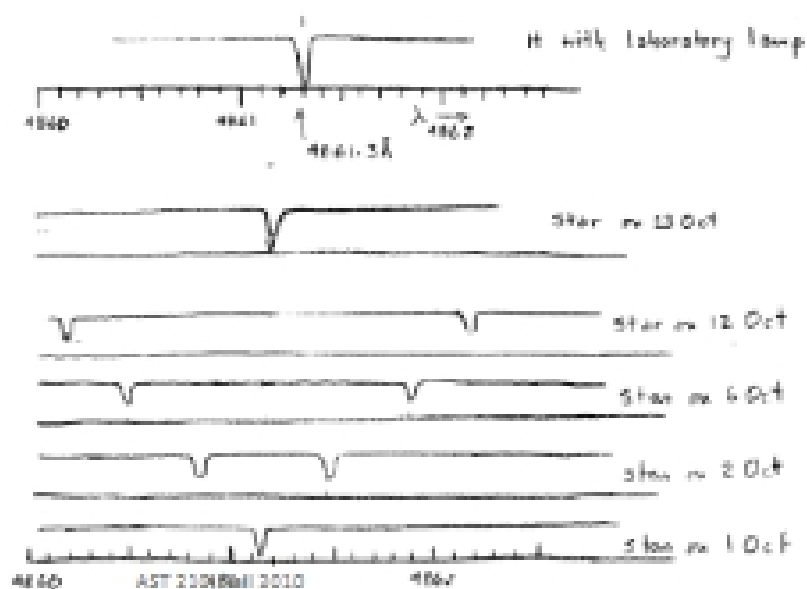


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Pickering's discovery

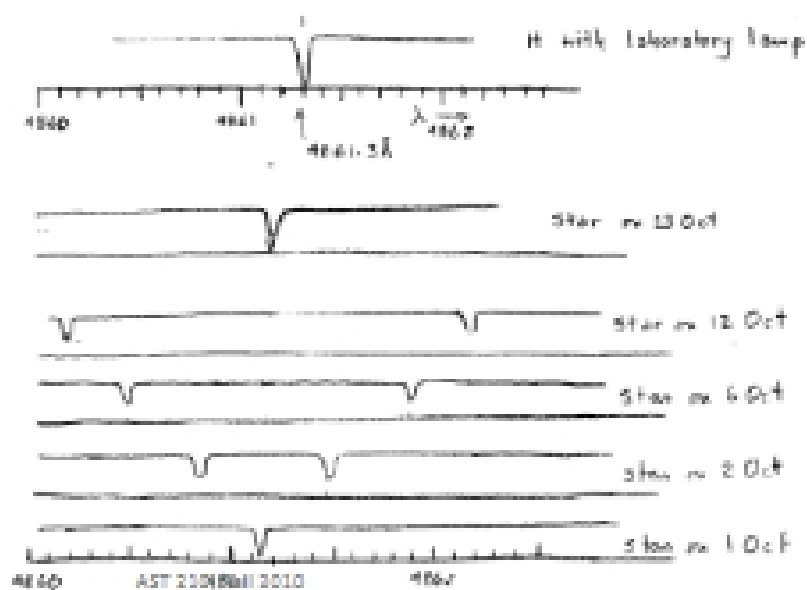
- How can the spectral line of hydrogen appear at different wavelengths?
 - The star is moving.
 - Hydrogen emits at different wavelengths at different times.
 - There was something wrong with Pickering's spectrometer.
 - Some other reason.



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Pickering's discovery

- Devise a model for Mizar that explains the data. How can a star move at two speeds?



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