

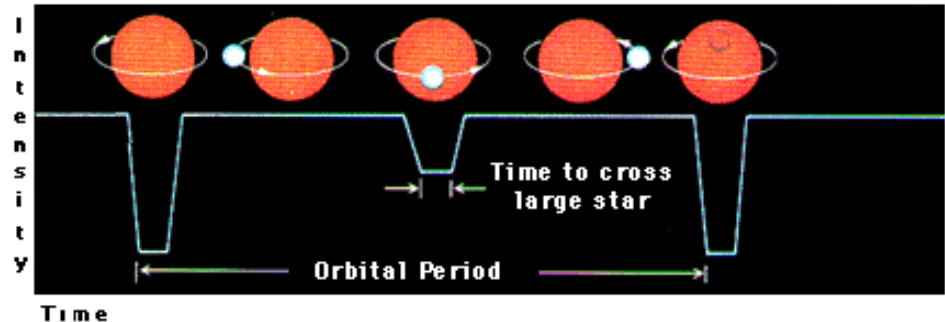
Introductory Astronomy

Week 4: Stars

Clip 13: Eclipsing Binaries

Eclipsing Binaries

- As with **planets** binaries in which one star **transits** the other provide more information
- **Light curve** tells us about **period**, **sizes**, and **temperatures**



Observing Doppler shifts
and light curve get more
complete data

Alphecca

- Alphecca is a double-line **eclipsing** binary with

$$P = 17.36 \text{ d}$$

$$v_2 = 9.9 \times 10^4 \text{ m/s}$$

- Doppler** measurements yield $v_1 = 3.5 \times 10^4 \text{ m/s}$

- Predict:
$$M_1 = \frac{P}{1 \text{ y}} \frac{v_2(v_1 + v_2)^2}{(29.78 \text{ km/s})^3} M_\odot = \frac{17.36}{365.25} \frac{99 \cdot 134^2}{29.78^3} = 3.2 M_\odot$$

$$M_2 = v_1/v_2 M_1 = 1.1 M_\odot$$

How Did We Do?

- Spectrum agrees: α CB B is G5V
- Light Curve data refine this (eccentricity 0.37)
- Best Fit:

Property	1	2
M/M_{\odot}	2.58	0.92
R/R_{\odot}	3.04	0.9
$T(K)$	9700	5800
L/L_{\odot}	74	0.81

Credits

- Astronomy Animations: University of Nebraska-Lincoln Astronomy Education Group <http://astro.unl.edu/>
- Light Curve: NASA/GSFC
<http://imagine.gsfc.nasa.gov/YBA/HTCas-size/binary-model.html>
- Alphecca Data: ESA/Hipparcos
http://www.rssd.esa.int/index.php?project=HIPPARCOS&page=Research_tools HIP 76267

SIMBAD Database, CDS, Strasbourg, France

<http://simbad.u-strasbg.fr/simbad/sim-fid>

J. Tomkin, D.M. Popper, The Astronomical Journal, **91** (6) 1986, p. 1428

[http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?](http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?db_key=AST&bibcode=1986AJ.....91.1428T&letter=.&classic=YES&defaultprint=YES&whole_paper=YES&page=1428&epage=1428&send=Send+PDF&filetype=.pdf)

[db_key=AST&bibcode=1986AJ.....](http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?db_key=AST&bibcode=1986AJ.....91.1428T&letter=.&classic=YES&defaultprint=YES&whole_paper=YES&page=1428&epage=1428&send=Send+PDF&filetype=.pdf)

[91.1428T&letter=.&classic=YES&defaultprint=YES&whole_paper=YES&page=1428&epage=1428&send=Send+PDF&filetype=.pdf](http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?db_key=AST&bibcode=1986AJ.....91.1428T&letter=.&classic=YES&defaultprint=YES&whole_paper=YES&page=1428&epage=1428&send=Send+PDF&filetype=.pdf)