

9/11/06

First Test, Chapters 1 - 5, Friday, September 22

Astronomy in the news?

Shuttle Atlantis successfully launched Saturday

Pic of the Day - lunar eclipse



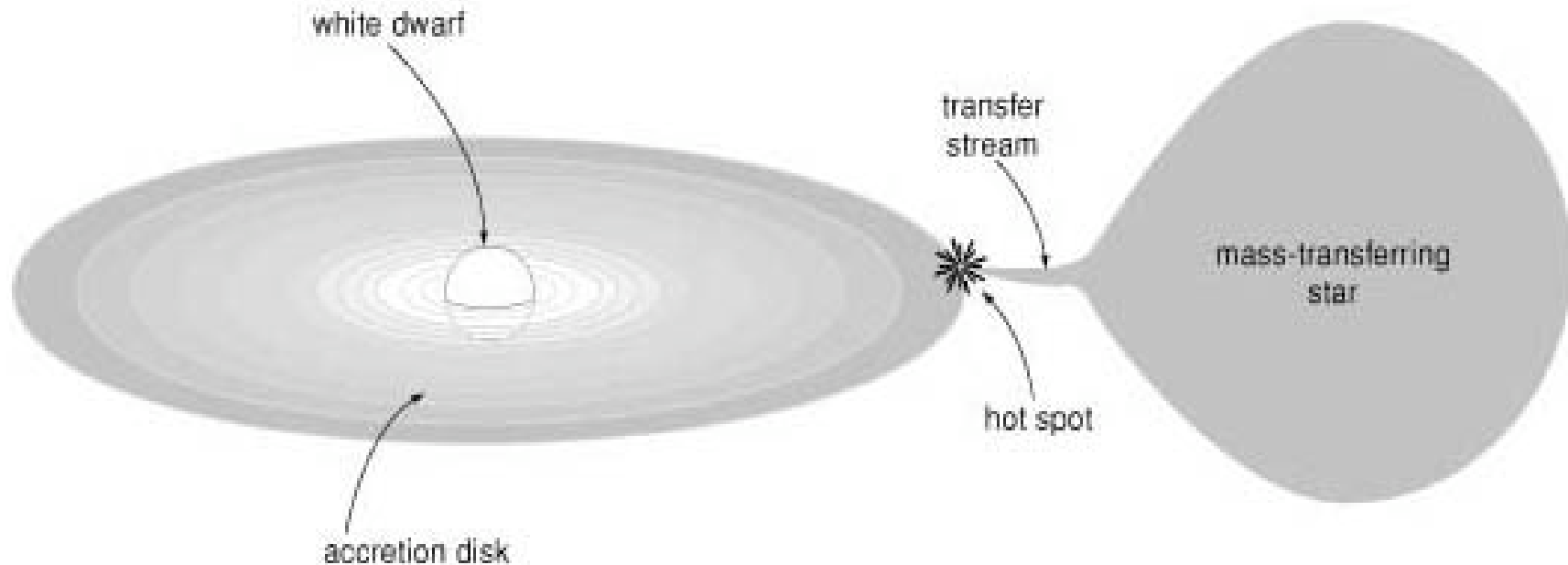
Cataclysmic Variables

Second stage of mass transfer

General Category “Novae”

“New” stars flare up, see where none had been seen before.

All CVs share same general features: *transferring star*, *transfer stream*, *hot spot*, *accretion disk*, and *white dwarf*.



Cataclysmic Variables

Dwarf Nova - flare $\times 10$ brighter

intervals of weeks to months

last days to weeks

Recurrent Nova - flare $\times 1000$ brighter

every 10-100 years

last weeks to months

Classical Nova - 10^4 to 10^5 times brighter

never observed to recur -- suspect 10^4 years

last months to years

Supernova - (one type might originate in a cataclysmic variable)

flare once 10^{10} \times brighter (10 billion times)

last months to years

Dwarf Nova

Activity in the *accretion disk*, not transferring star or central star.

Mechanism - store and flush, works when the transfer rate is low.

Disk is first cool, semi-transparent,

heat radiates away

little accretion, input more than accretion,

matter accumulates in STORAGE STATE

Disk gets denser, opaque, traps heat.

hotter disk generates *more friction and heat*

⇒ *Run away to bright, hot disk*

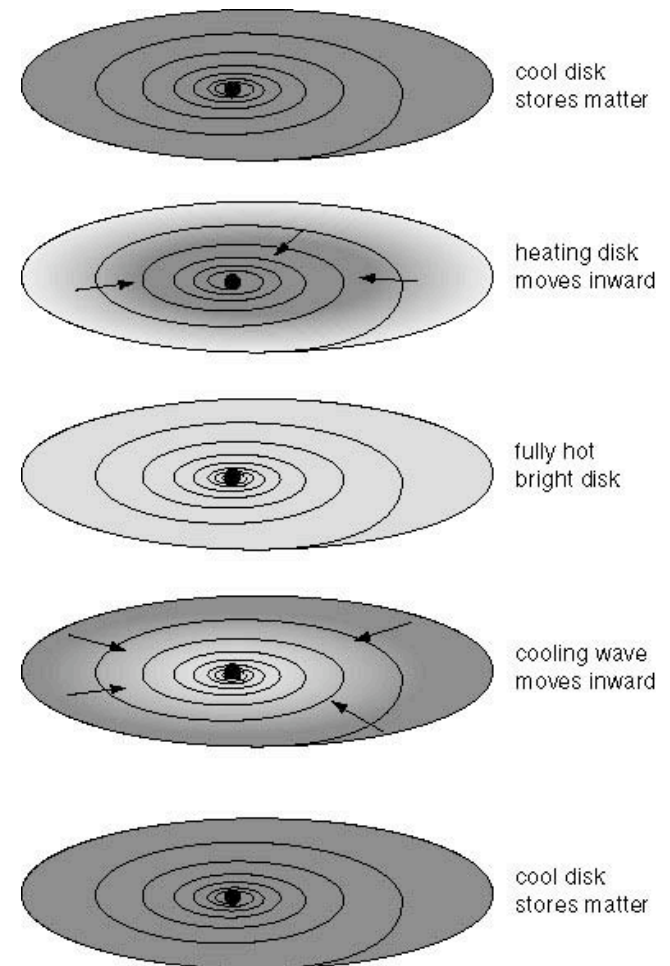
HOT, BRIGHT, FLUSHING STATE

More rapid flow through disk, faster than input

⇒ disk thins out, turns semi-transparent,

cools, returns to STORAGE STATE

REPEAT



Demonstration of Dwarf Nova

Accretion Disk Instability

Need a volunteer

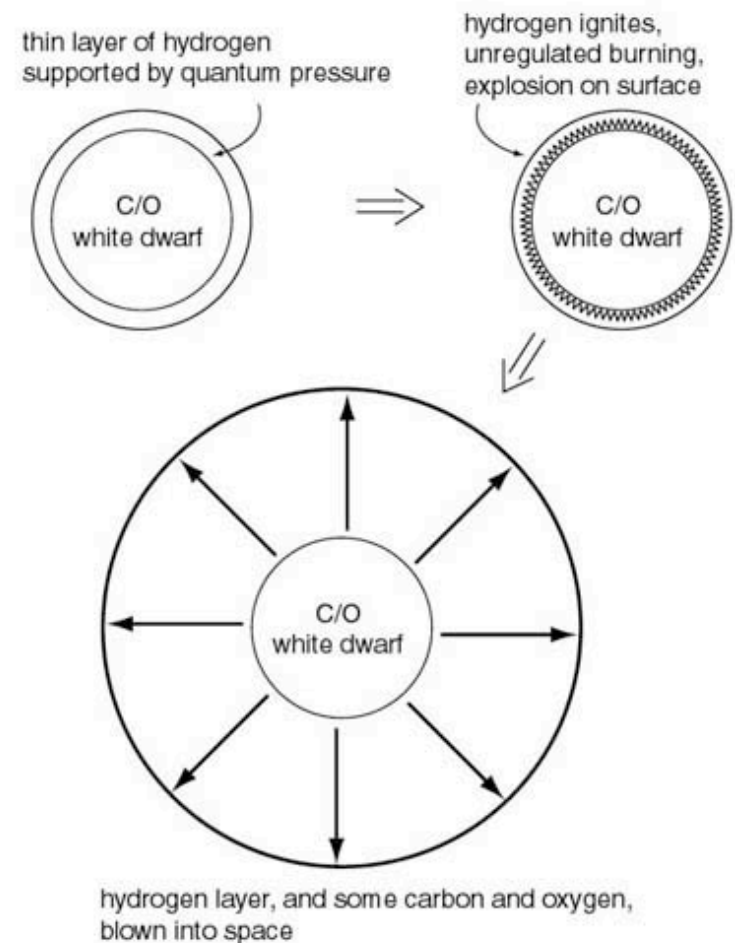
Classical Nova

Hydrogen from transfer accumulates on surface of white dwarf composed (usually) of Carbon/Oxygen (burning He \rightarrow C/O in core of red giant before envelope is ejected as a planetary nebula)

H is supported by *Quantum Pressure*
H gets denser, hotter begins to burn (to make He)

Burning is *unregulated* - explode surface layer of H

C/O core essentially undisturbed, although a little mass is ripped from the surface of the core



Recurrent Nova

Mechanism uncertain

Probably variation of Classical Nova with mass of white dwarf especially near *Chandrasekhar mass*

At *Chandrasekhar mass*, may get a Supernova (will discuss specific mechanism later, Chapter 6)

U Sco in the constellation Scorpius is a Recurrent Nova,

It may be a candidate to explode as a supernova!

Can see Scorpius. Also has neutron stars and black holes.

Self-graded pop quiz

Draw a picture of two stars with their Roche lobes and label which star has the largest mass.

Draw a picture of a Cataclysmic Variable and label all the key parts.