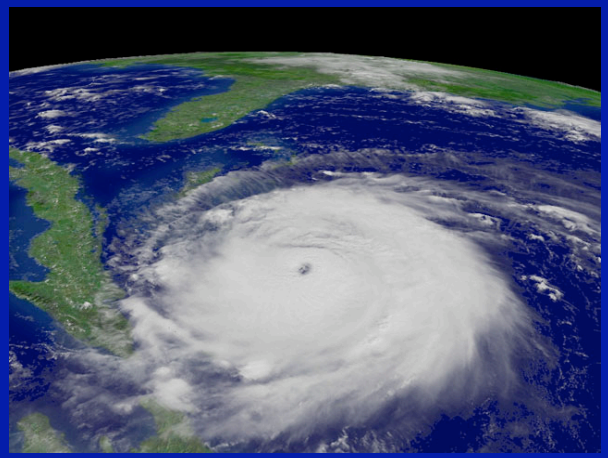
Astronomy in the news?

Fred Whipple dies at 98 - comets as dirty snowballs

Mars behind the Sun, no contact with Rovers

Pic of Day - Francis

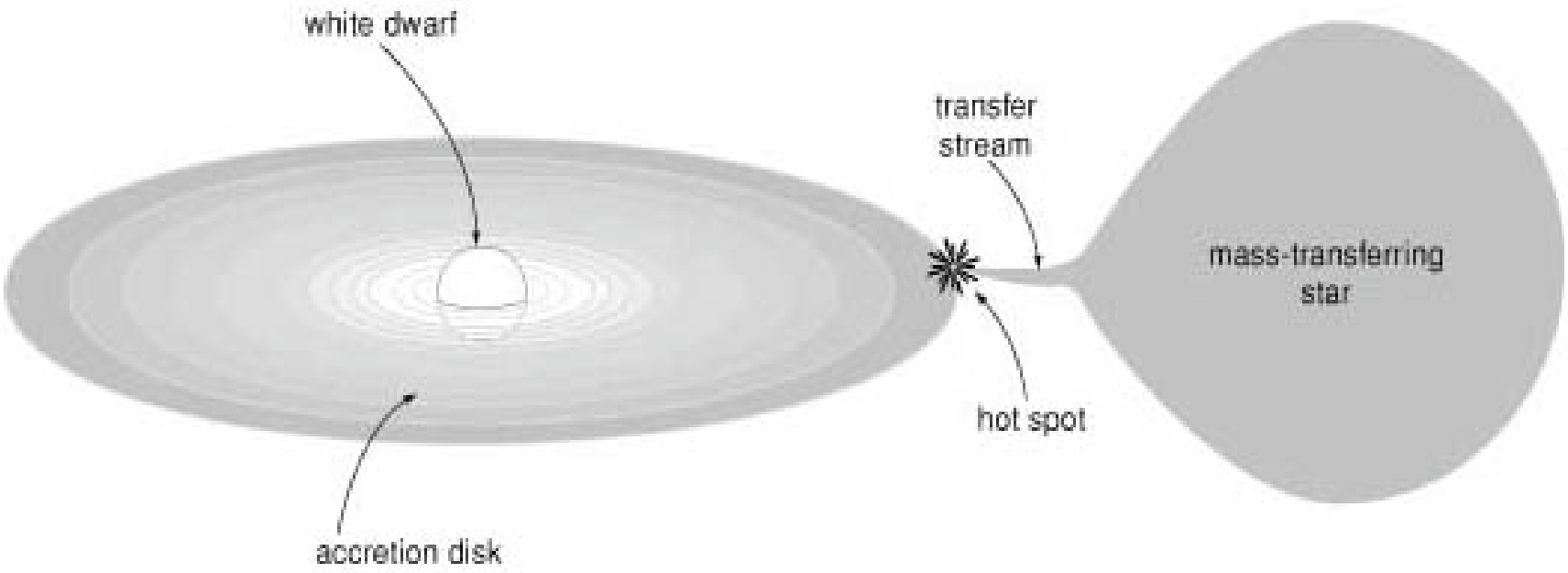


New core collapse supernova observed by Hubble, SN 2004dj, closest in a decade.

Cataclysmic Variables

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

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



Cataclysmic Variables

Dwarf Nova - flare × 10 brighter
intervals of weeks to months
last days to weeks

Recurrent Nova - flare × 1000 brighter
every 10-100 years
last weeks to months
U Sco is a Recurrent Nova

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} × 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

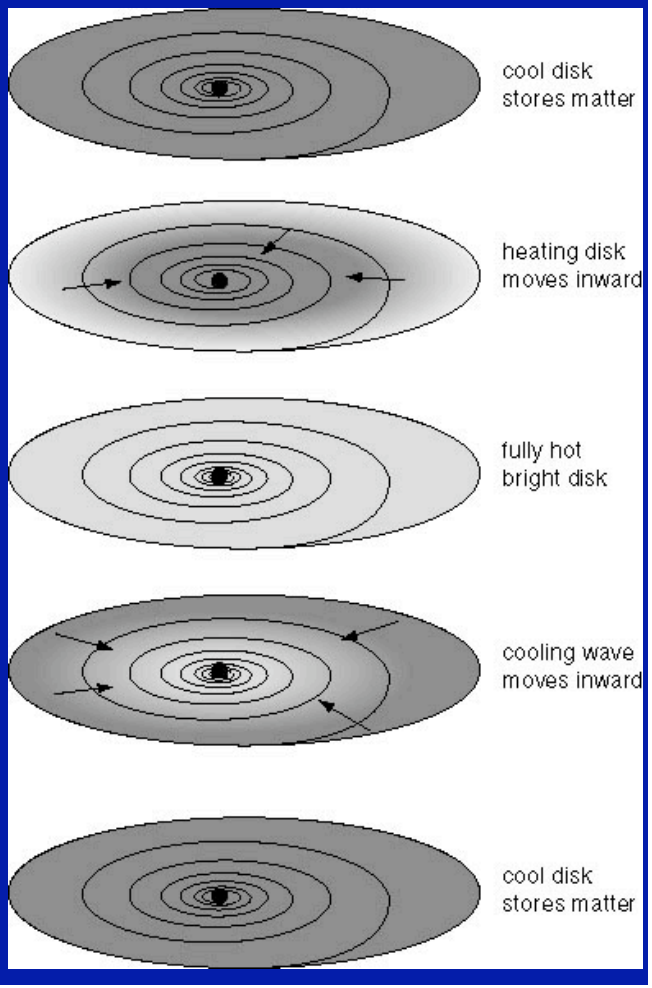
Disk gets denser, opaque, traps heat.
hotter disk generates ***more friction and heat***

⇒***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

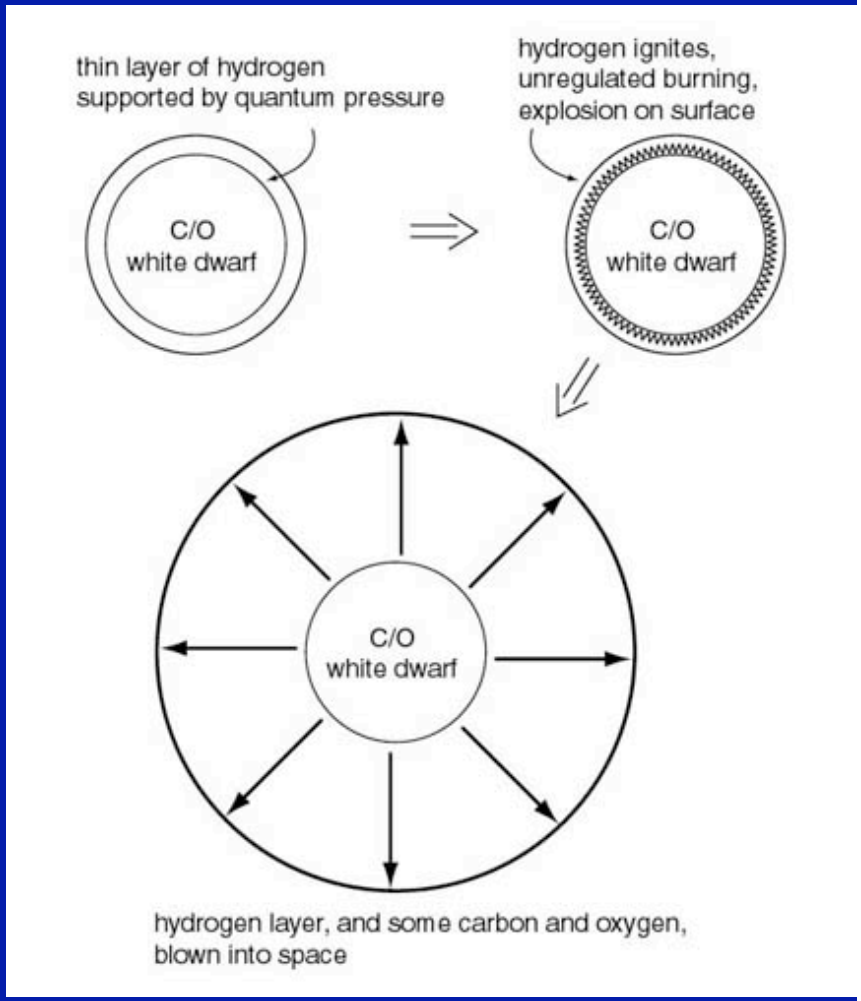
Need a volunteer

Classical Nova

Hydrogen from transfer accumulates on surface of white dwarf composed (usually) of Carbon/Oxygen
(burning He → 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!

Watch the tail of the scorpion, if it gets really bright, let me know!