Monday, February 27, 2017

Exam 2, Skywatch 2, returned Wednesday.

Reading for Exam 3:

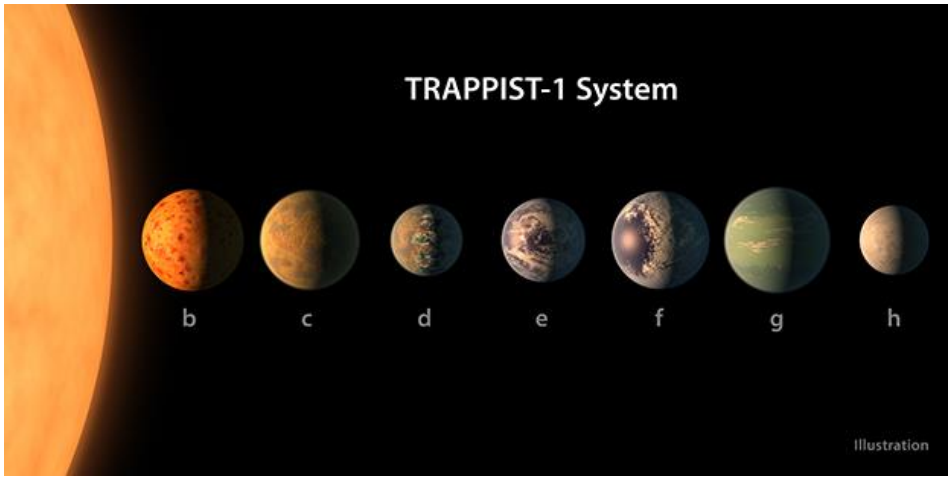
Chapter 6, end of Section 6 (binary evolution), Section 6.7 (radioactive decay), Chapter 7 (SN 1987A)

Background in Chapters 3, 4, 5.

Background: Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.8, 3.10, 4.1, 4.2, 4.3, 4.4, 5.2, 5.4 (binary stars and accretion disks).

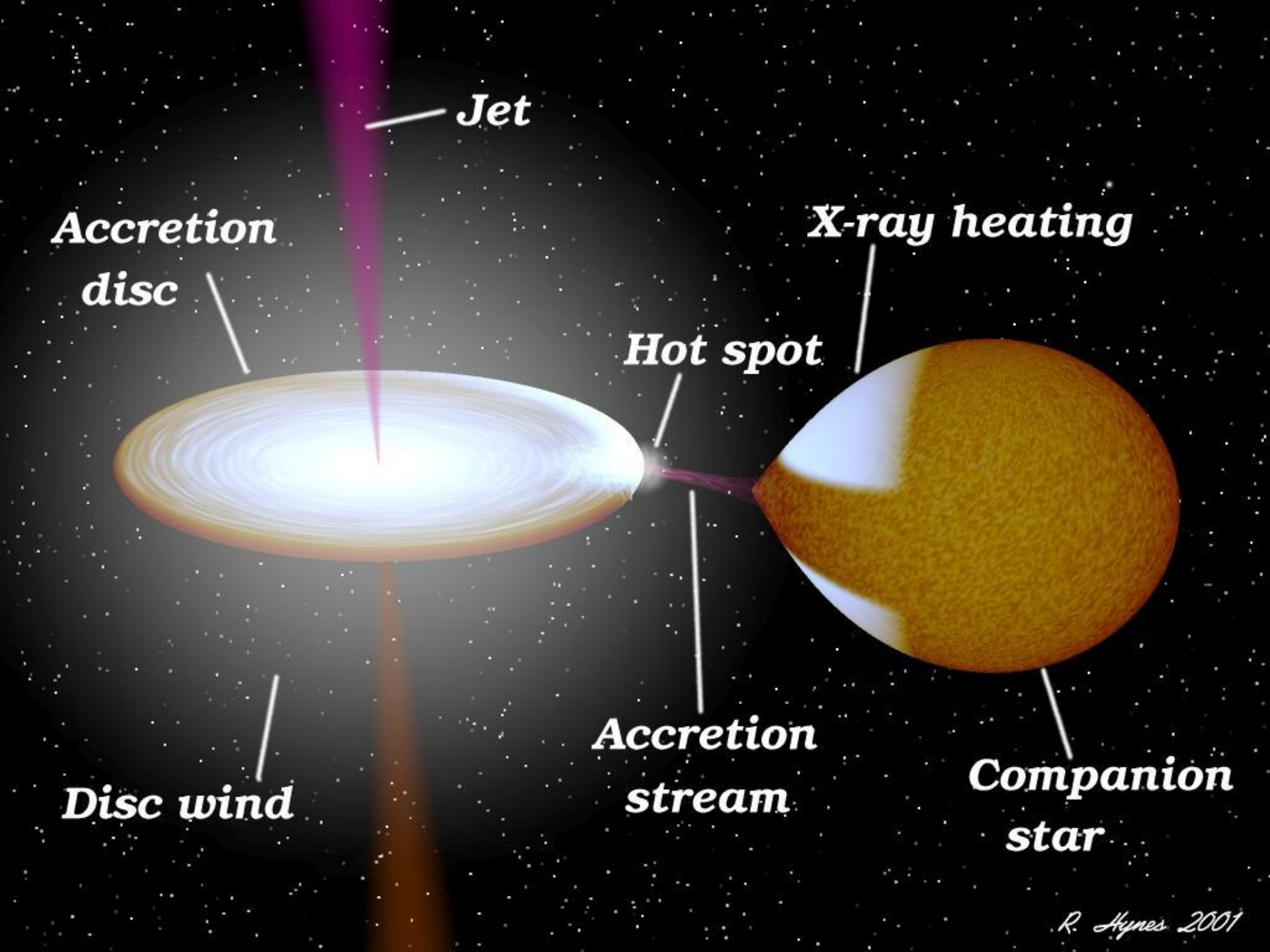
Astronomy in the news?

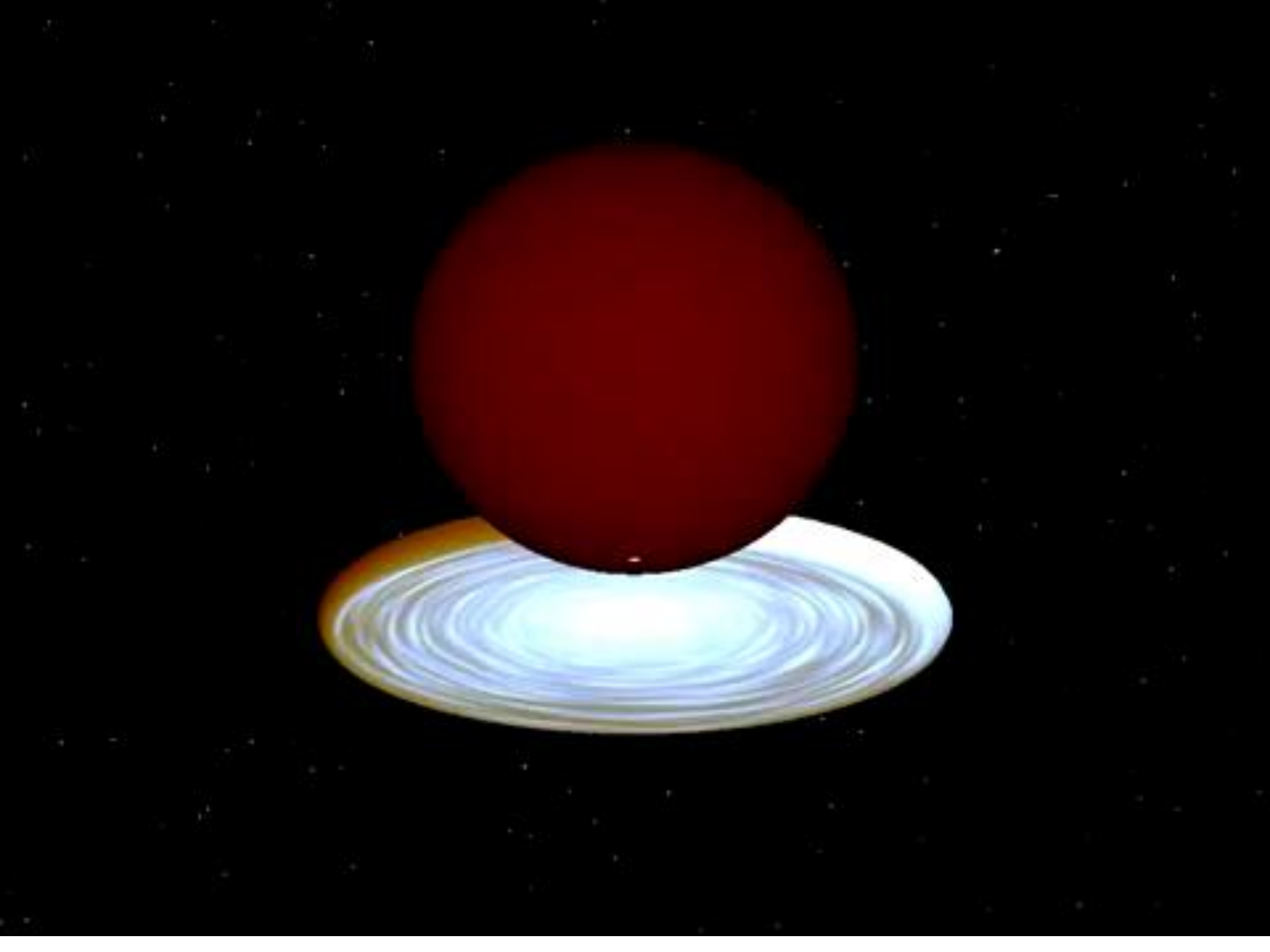
Trappist-1 system, 40 light years away, star 1/12 the mass of the Sun. Seven planets about the size of Earth, three in habitable zone, possible liquid water.



Goal

To understand how stars, and Type Ia supernovae, evolve in binary systems.


Jet
Accretion disc
X-ray heating
Hot spot
Disc wind
Accretion stream
Companion star
R. Hynes 2001

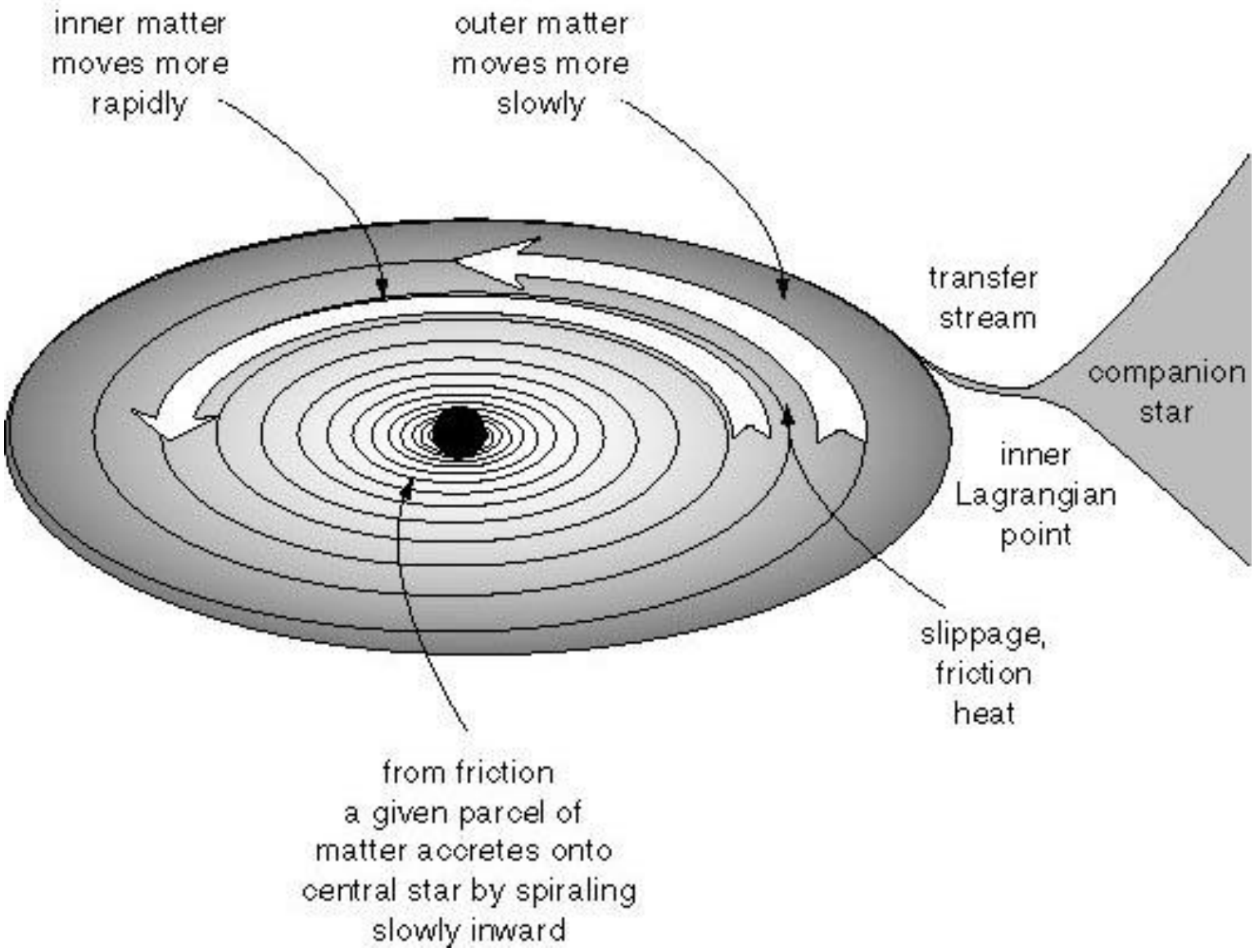


Which star is the most massive?

Goal

To understand how accretion disks shine and cause matter to accrete onto the central star.

Basic Disk Dynamics - Figure 4.1



Demonstration of Accretion Disk Dynamics

Need a volunteer

Basic Disk Dynamics

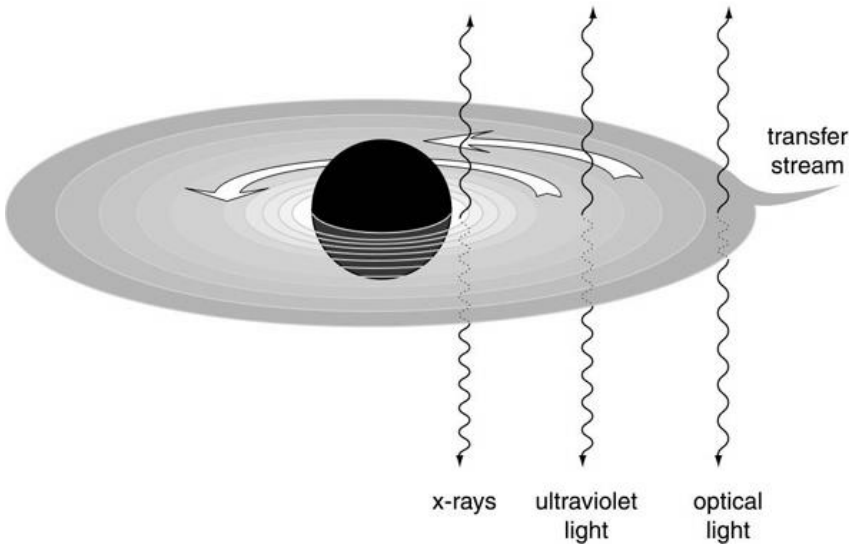
Orbits closer to the center are faster.
This creates rubbing and friction and heat, everywhere in the disk.

Friction tries to slow the orbiting matter, but it falls ***inward*** and ends up moving ***faster***.
(Just as removing heat from a normal star causes it to get hotter)
Slow settling inward by friction -- ***accretion***

Friction also causes ***heat.***

Hotter on inside, cooler on outside

Optical $\rightarrow$ UV $\rightarrow$ X-rays
WD NS, BH
size of: planet city



Goal – to understand how white dwarfs in binary star systems can, and cannot, grow to the Chandrasekar mass and explode.

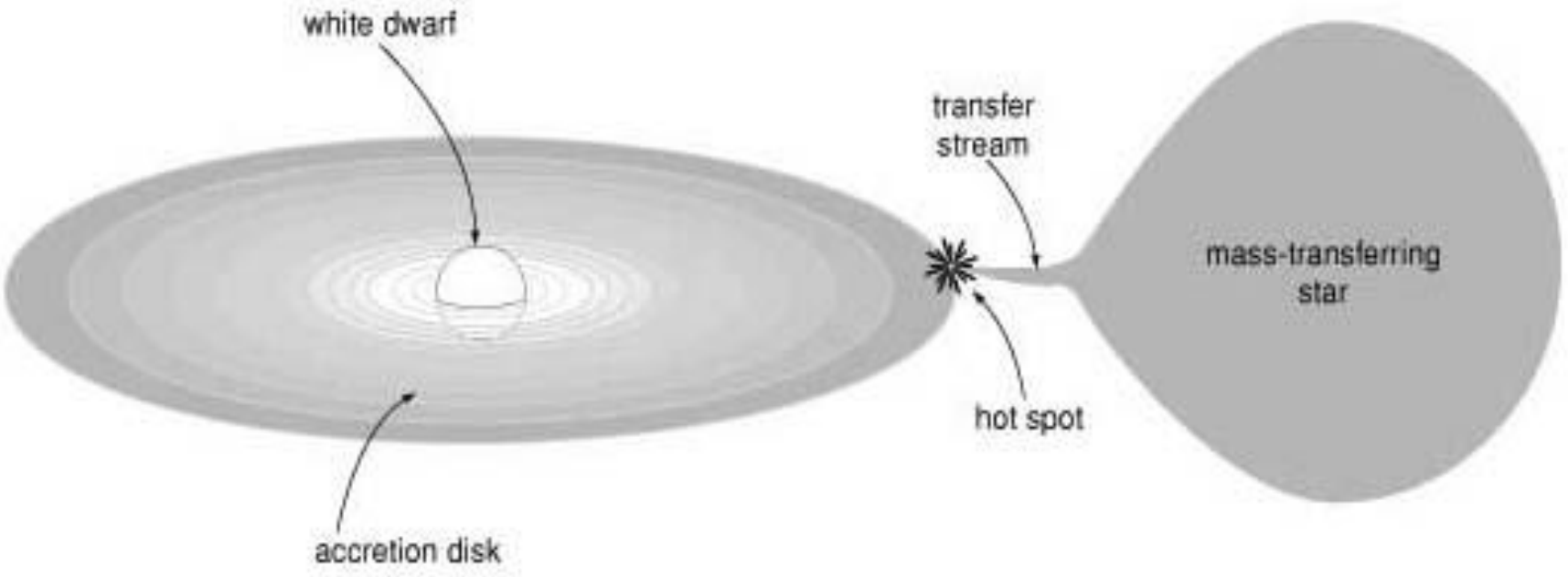
Cataclysmic Variables

Second stage of mass transfer (Section 5.2)

General Category "Novae"

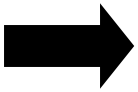
"New" stars flare up, see where none had been seen before.

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

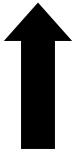


One Minute Exam:

In an accretion disk, friction causes moving matter to

 Slow down

 Speed up

 Move outward

 Pass from one Roche lobe to another

§ 5.4 Final Evolution of Cataclysmic Variables

Some cataclysmic variables have managed to reach large white dwarf masses, $M_{wd} \sim M_{ch}$ Chandrasekhar mass, 1.4 solar masses, like U Sco, RS Oph

If get close enough to M_{ch}, attain high density,
ignite carbon in center
Quantum Deregulated $\rightarrow$ violent explosion
Type Ia Supernova?!

What cataclysmic variables have white dwarfs that reach M_{ch}?