Astronomy in the news?

Shuttle Atlantis launch scrubbed again. Saturday or two weeks to avoid conflict with Russian Soyuz.

Pic of the day, Messier 110, dwarf elliptical galaxy, shaped by dark matter.

Sky Watch

Objects mentioned so far:

Lyra - Ring Nebula, planetary nebula in Lyra

Sirius - massive blue main sequence star with white dwarf companion

Algol - in Perseus

New suggestions:

Vega - massive blue main sequence star in Lyra

Antares - red giant in Scorpius

Other examples of these sorts of objects…

Solution to the ***Algol Paradox***, how the evolved star can be the least massive - ***Mass Transfer*** through the ***Roche Lobe*** of the initially more massive, evolving star.

Stable: no mass transfer

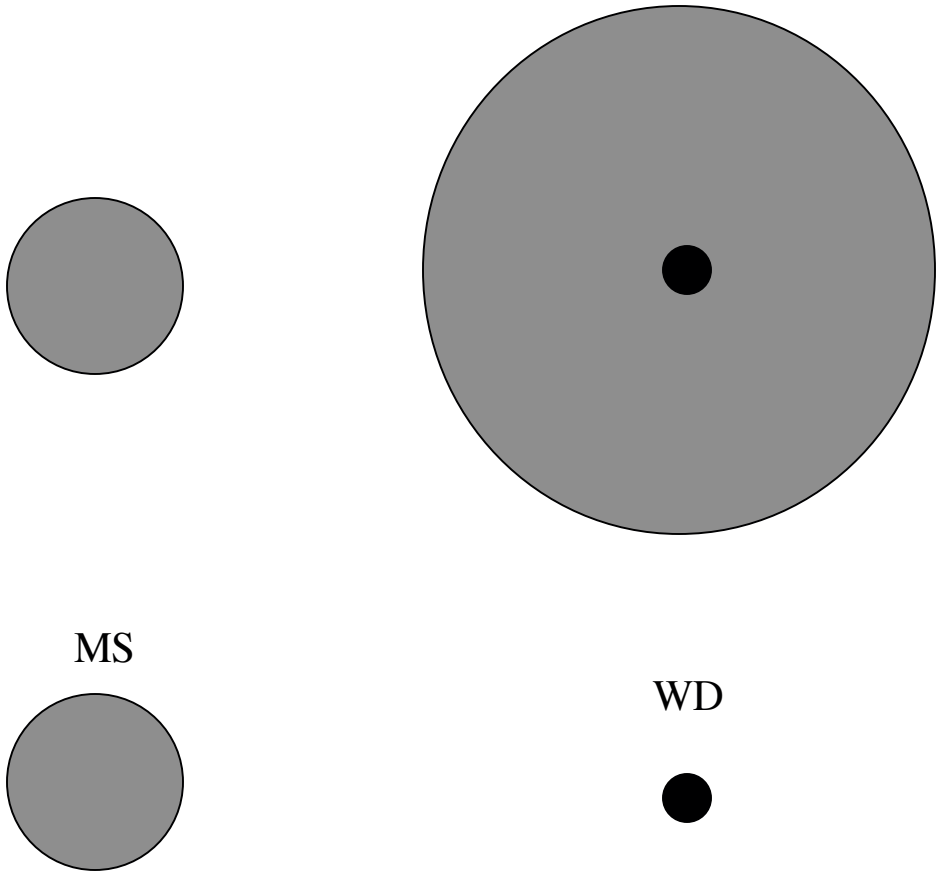
Unstable: mass transfer

Side view

Equatorial slice

http://www.phys.lsu.edu/astro/movie_captions/motl.binary.html

In common circumstances, all the hydrogen envelope is transferred to the companion (or ejected into space), leaving the core of the red giant as a white dwarf orbiting the remaining main sequence star



First star evolves, sheds its envelope, leaves behind a white dwarf.

Then the second star that was ***originally*** the less massive evolves, fills its Roche Lobe and sheds mass onto the white dwarf.

The white dwarf is a tiny moving target, the transfer stream misses the white dwarf, circles around it, collides with itself, forms a ring, and then settles inward to make a flat disk.

Matter gradually spirals inward, a process called ***accretion.***

$\Rightarrow$ the result is an ***Accretion Disk*** (Chapter 4).

An accretion disk requires a transferring star for supply and a central star to give gravity, but it is essentially a separate entity with a structure and life of its own.

One Minute Exam:

Two stars are born orbiting one another in a binary system. Which star will transfer matter first?

A The most massive star

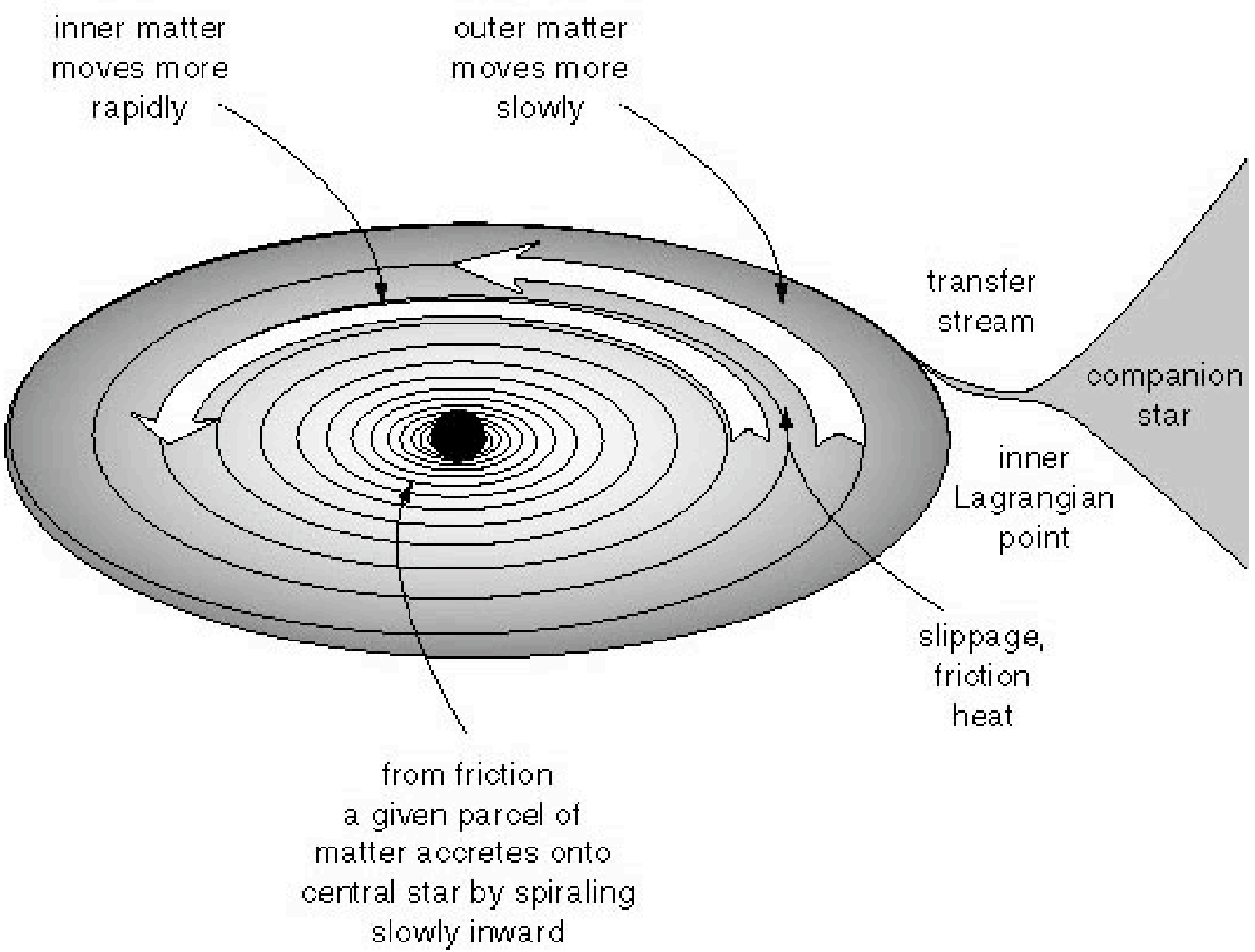
B The least massive star

C The one with the smaller Roche lobe

Ring of transferred matter evolves into an accretion disk

http://www.astro.virginia.edu/~jh8h/nraf/

Basic Disk Dynamics - Figure 4.1



Basic Disk Dynamics

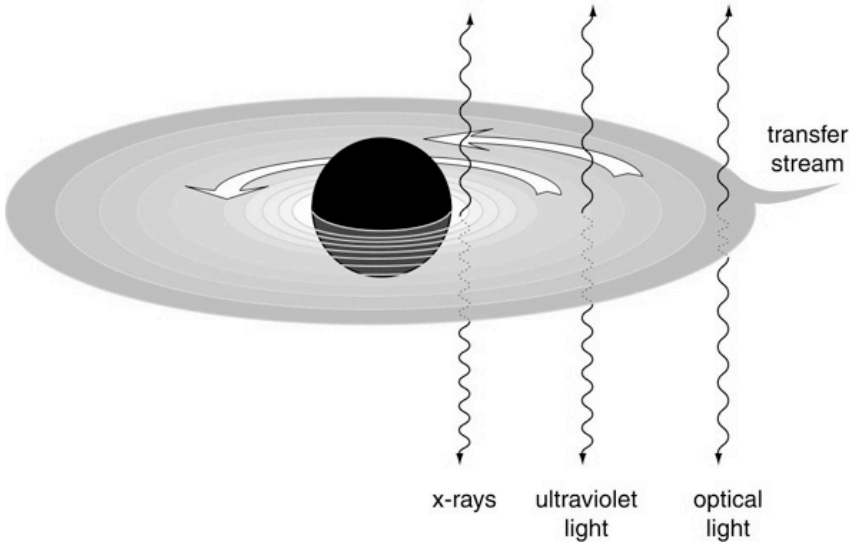
Orbits closer to the center are faster.
This creates rubbing and friction and heat, everywhere in the disk.

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 → UV → X-rays
WD NS BH



One Minute Exam:

In an accretion disk, friction causes moving matter to

A Slow down

B Speed up

C Pass from one Roche lobe to another