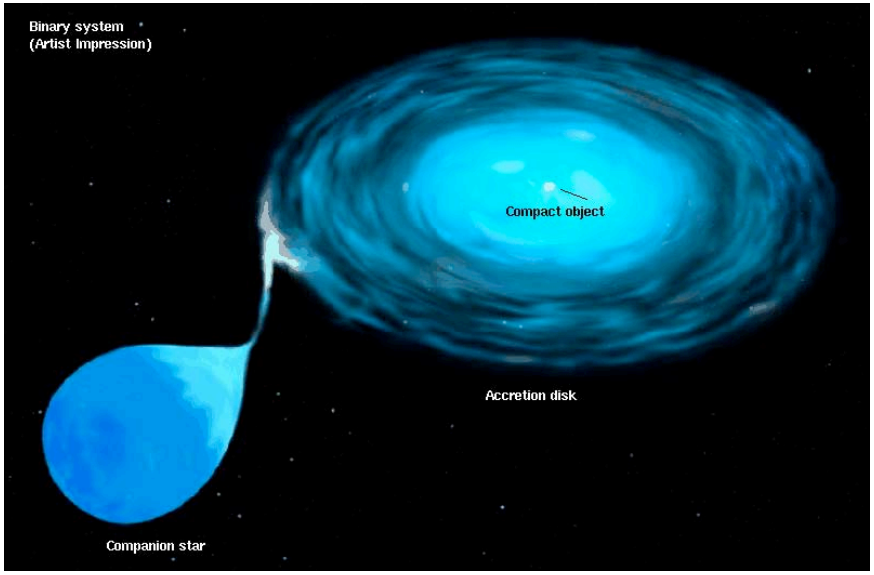
1/30/06

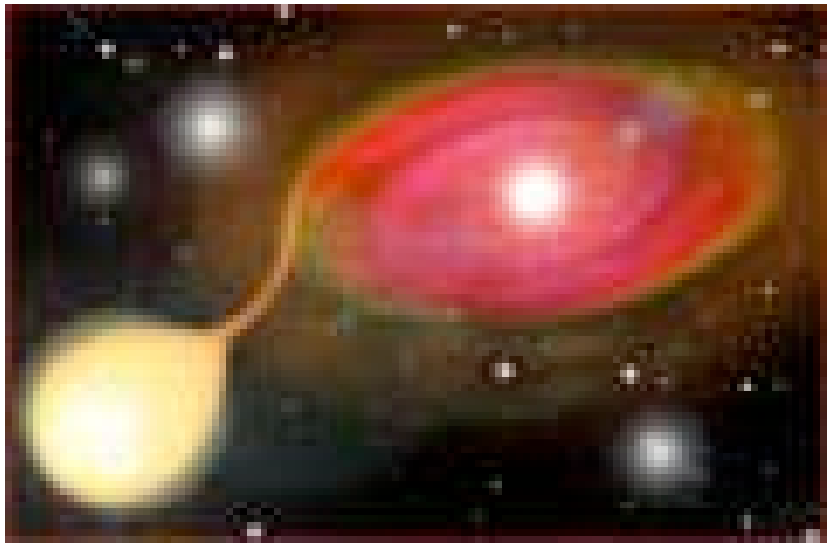
First Test, Chapters 1 - 5, Friday, February 10

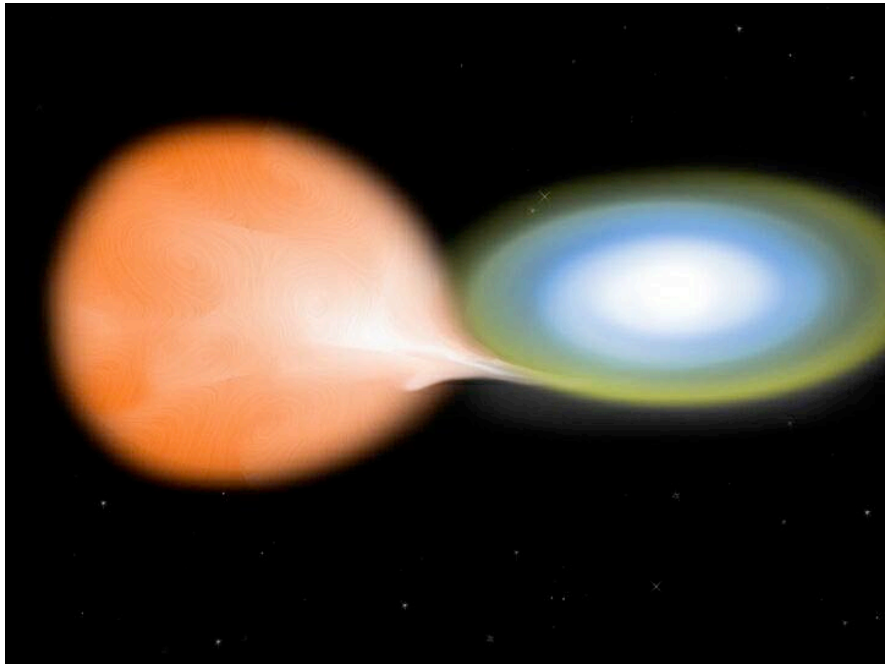
Some luck with ordering book from Barnes and Noble.

Astronomy in the news?

Pic of the Day - reflection nebula in constellation of Orion







§5.3 Origin of Cataclysmic Variables

Cataclysmic variables often have a ***main sequence companion transferring mass*** -- how can this be?

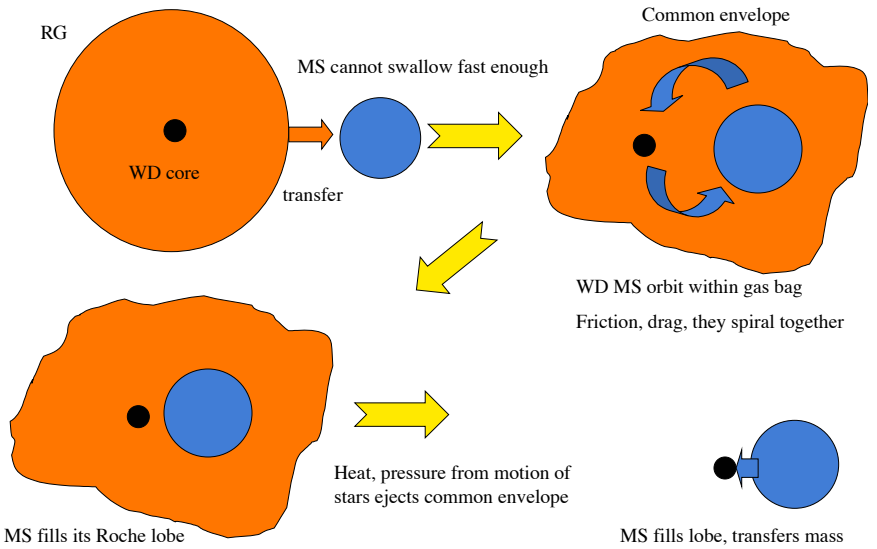
The two stars must once have been far apart to allow the originally more massive star to make a red giant with a white dwarf core.

Need room!!

The stars are observed now to be close together with the main sequence star filling its Roche lobe.

The main sequence star has not expanded to become a red giant, how come it is filling its Roche lobe?

Answer: § 3.9 Common Envelope Evolution



§ 5.4 Final Evolution of Cataclysmic Variables

Some CVs have managed to reach large masses
$M_{wd} \sim M_{ch}$ Chandrasekhar mass, 1.4 solar masses, like U Sco

If get close enough to M_{ch}, attain high density,
ignite carbon in center
Quantum Deregulated → violent explosion
Supernova (Chapter 6)

What CVs have white dwarfs that reach M_{ch}?

Not classical novae
explosion of surface H shell also rips off a bit of the white dwarf mass - we see excess carbon & oxygen in ejected matter
white dwarf shrinks in mass rather than grows.

Likely outcome in this case - 2nd star finally burns out H, tries to form red giant, likely makes a 2nd common envelope => ***Two WDs!***

One Minute Exam

In most dwarf nova systems, the star transferring mass is a main sequence star. This means:

A The main sequence star was once a red giant, but lost mass

B The main sequence star used to be further away from the white dwarf

C The main sequence star and the star that made the white dwarf were born close together.

Clearly some systems like U Sco escape this fate - How?

Recent work suggests that transfer of mass at just the right fast rate allows the H layer to stay hot, ***thermal pressure, regulated***

H burns to He, He to C and 0 that are added to white dwarf

M_{wd} grows in C/0 mass

A binary system could be a classical nova for some time then accrete faster, grow to M_{ch}

Some white dwarfs grow to near the Chandrasekhar mass and explode, some don't

We still don't fully understand why…

One Minute Exam

We expect classical nova systems to end up making two white dwarfs orbiting one another because:

A The first white dwarf loses mass and hence cannot grow and explode

B The first white dwarf will accrete mass until it reaches the Chandrasekhar limit

C The main sequence star transfering mass must eventually make a white dwarf