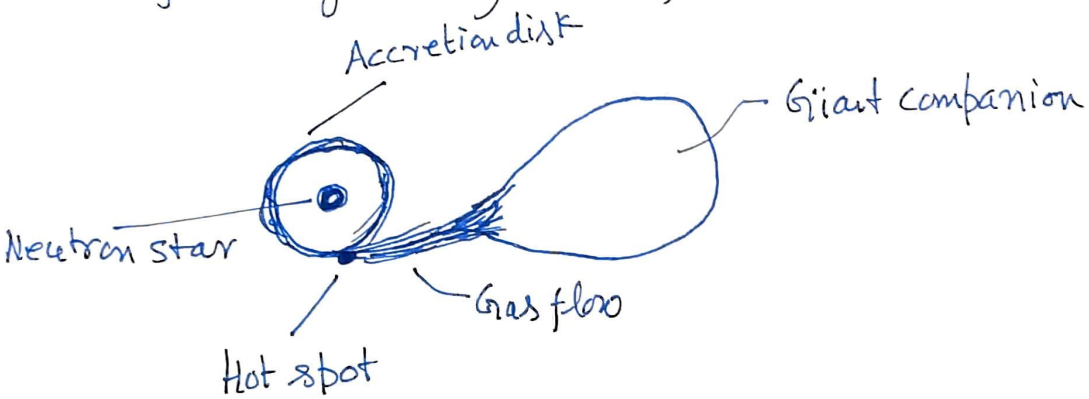
X-ray binaries

These are like ordinary binaries in which two stars are going around each other about their common center of mass. The difference being that one of the components is a neutron star or even a blackhole while the other companion is in the giant phase of evolution. A schematic diagram of X-ray binary is shown below:



Several such X-ray binaries have been discovered in our own galaxy as well as in LMC & SMC. Their binary nature has been evident through the occurrence of X-ray eclipses and radial velocity variation of their visible companion. (X-ray eclipses ⟶ Eclipse in X-ray flux).
They contain a compact object and accretion of matter coming from the visible companion produces X-rays on account of its fall into the deep gravitational potential well of the compact object.

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The compact object is generally a neutron star with mass less than equal to $2M_\odot$. In Cyg-X3 and similarly in LMC-X3 it is considered to be a black hole as its mass is found to be exceeding $6M_\odot$.

These systems emit X-ray luminosities of $L_x \backsimeq 10^{35}$ to 10^{38} erg/sec. and they show fast and periodic changes in intensity in the form of pulses, fluctuations, fade outs or rapid burst. It has been calcalated that an accretion rate of $10^{-8} M_\odot$ per year on a neutron star will produce X-ray fluxes within the range of 10^{35} to 10^{38} erg/sec.

X-ray binaries are divided into two main types

1) Massive X-ray binaries (MXBs)
2) Low mass X-ray binaries (LXBs)

MXB - MXB have a hard X-ray spectrum with temperature $T > 10^8 K$, they show pulses with period between 0.7 and 885 seconds, they also have luminous and massive ($20M_\odot$) early type companion with optical luminosity greater than X-ray luminosity, i.e $L_{opt.} > L_x$. The are concentrated in the galactic plane like young pop-I objects.

LXB - LXBs are found in the disk and the bulge of the galaxy as well as in globular clusters like old pop-II objects. They have a softer spectrum with temperature $T \simeq 10^7$ K, show no pulses and have optically faint low mass ($\simeq 1 M_\odot$) companion. Also they have low optical luminosity compared to X-ray luminosity i.e approximately $L_{opt} < 10^{-2} L_x$. Most of LXBs in globular clusters and some in the bulge show rapid bursting activities, hence they are called x-ray bursters.

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