lecture 28 Not too heavy stars evolution ($< 10 M_\odot$)

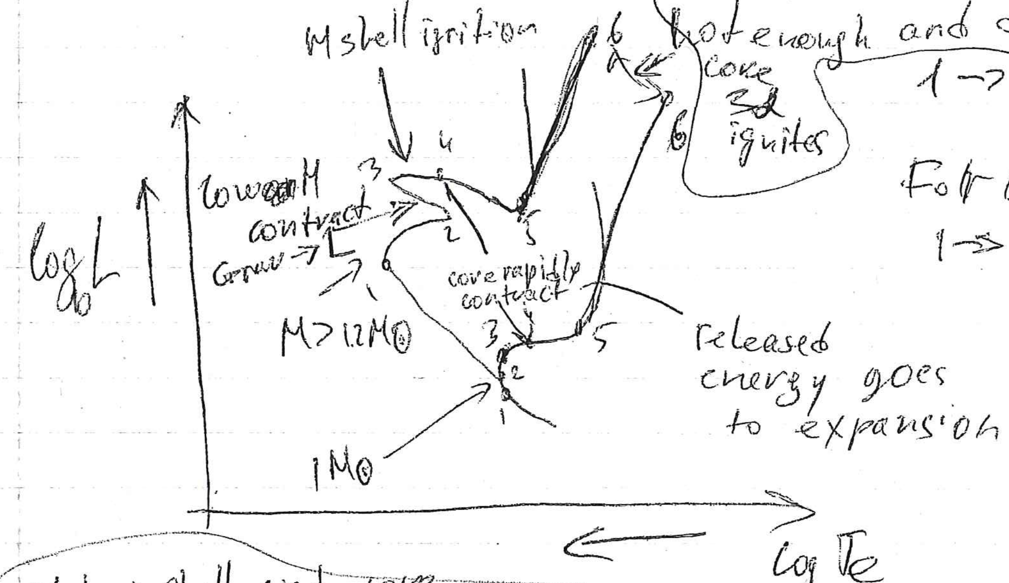
General Idea ⇒ fusion consumes and transforms H → He → ... "metals"
heavy elements

Stars with $M < 10 M_\odot$ have deed convection and thus He core remixed with H at the outside

hot enough and dense in the core 3α ignites

1 → 2 H burning

For low mass $\sim 1 M_\odot$
1 → 3 H burn.



Note: shell and core ~~somewhat decoupled~~ one contracts another expands

4 → 5 convection develops
so very efficient delivery of energy to surface ⇒ L↗ RGB
→ Elements past He seen in the photospere

p.6. $M < 1.8 M_\odot$ core collapse
a lot of ν escape and cary energy from the core so its T ↘ but shells ignites! with He, He flash $L = 10^{11} L_\odot$!

Heavier stars burn He and switch to CNO $\Rightarrow$ horisontal Branch (HB)

Thermal pulsating shell He drops at core $L \nearrow$ $R_{shell} \nearrow$ then $R_{down} \searrow$ new chunk of He to core, and cycle repeats

For $M > 2 M_{\odot}$ 3rd dredge up (remix) Carbon ~~burning~~ ~~stare~~ mixed to photospere

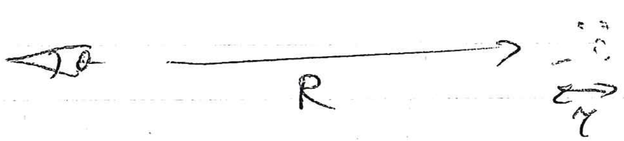
Eventually shell seize burning and pushed away (planetary nebula) opaqness drops and we see central core (white dwarf)

Stars reuse the previous star materials

So we have

Population	III	- ~~metal pure~~ ~~young~~ after BBang
— " —	II	metal pure
— " —	I	metal rich

If we have a cluster

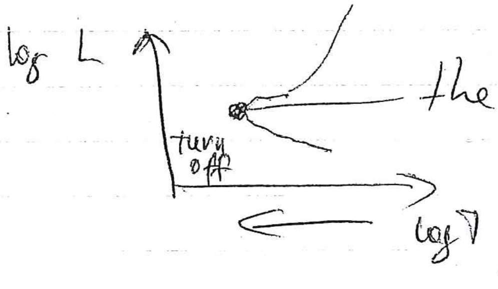


$\frac{r}{R} \ll 1$

We can make HR diagram which shifted along L so by scaling to our galaxy HR we can find the distance to cluster

$\Longrightarrow$ spectroscopic parallax

Age of cluster by turn off - isochrones in HR diagram



the lighter star the older the cluster