Star Clusters

- Eventually, photons and stellar winds clear out the remaining gas and dust and leave behind the stars.
- Reflection nebulae provide evidence for remaining dust on the far side of the Pleiades

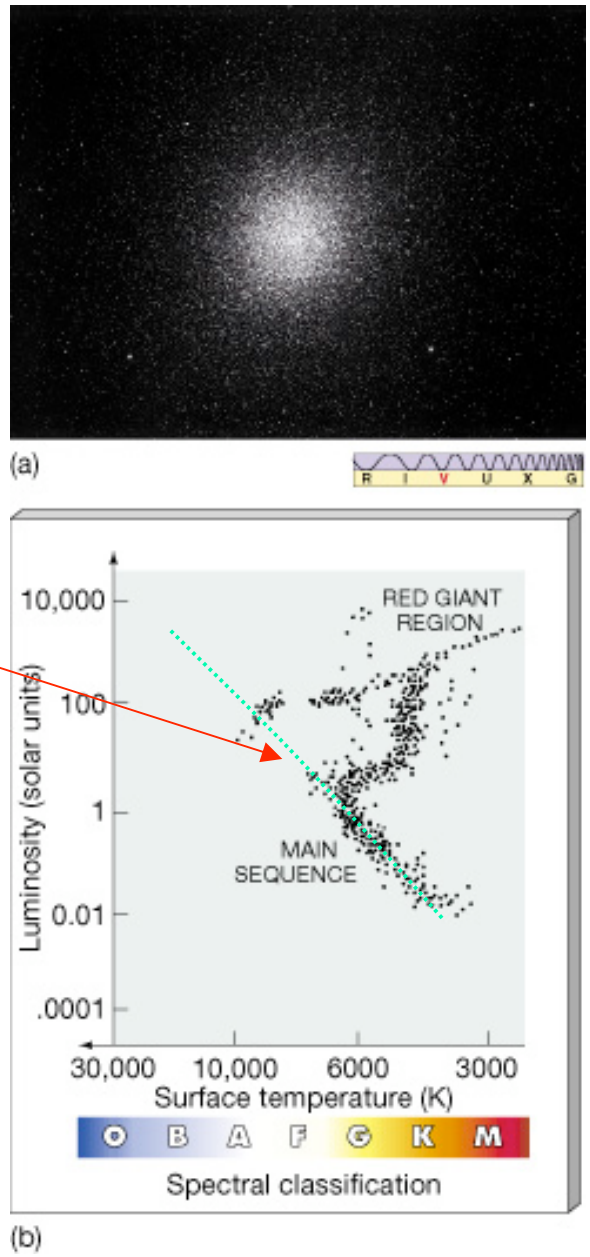
Star Clusters

- It may be that all stars are born in clusters.
- A good question is therefore why are most stars we see in the Galaxy not members of obvious clusters?
- The answer is that the majority of newly-formed clusters are very weakly gravitationally bound. Perturbations from passing molecular clouds, spiral arms or mass loss from the cluster stars `unbind' most clusters.

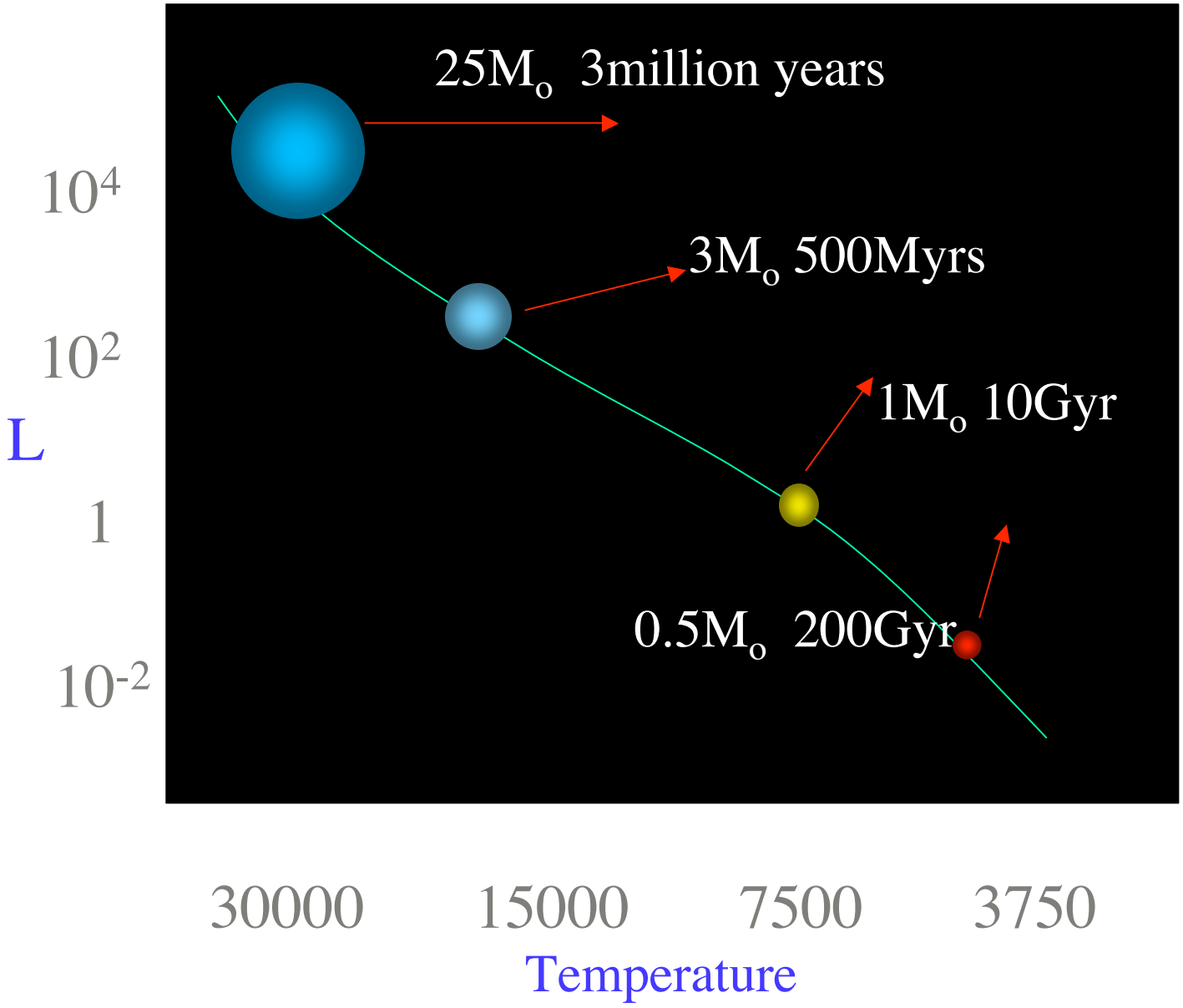
Star Cluster Ages

- We can use the H-R Diagram of the stars in a cluster to determine the age of the cluster.
- A cluster starts off with stars along the full main sequence.
- Because stars with larger mass evolve more quickly, the hot, luminous end of the main sequence becomes depleted with time.
- The `main-sequence turnoff' moves to progressively lower mass, L and T with time.

- Young clusters contain short-lived, massive stars in their main sequence



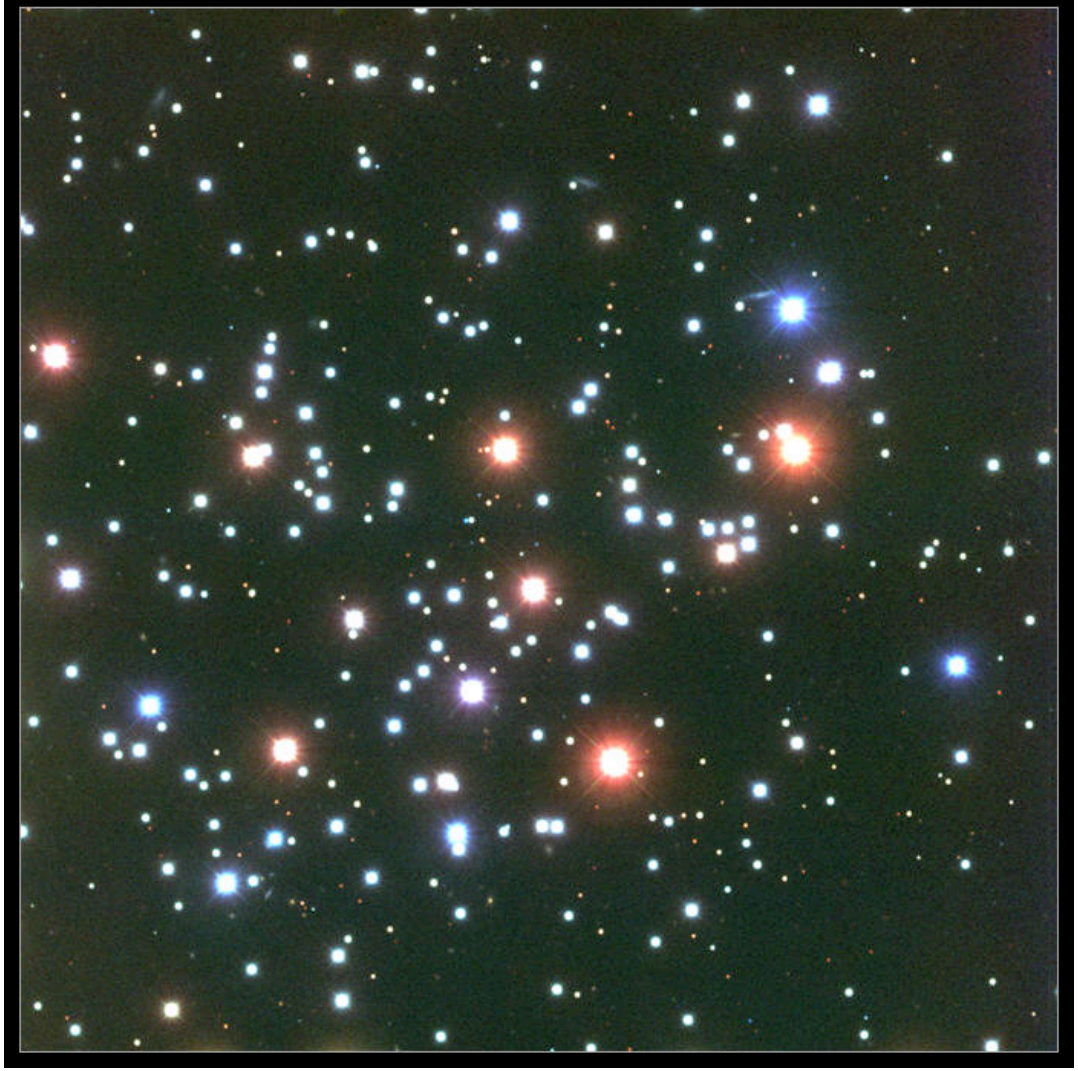
- Other clusters are missing the high-mass stars and we can infer the cluster age is the main-sequence lifetime of the highest mass star still on the main-sequence.


25M$_o$ 3million years
3M$_o$ 500Myrs
1M$_o$ 10Gyr
0.5M$_o$ 200Gyr
10^4
10^2
L
1
10^{-2}
30000
15000
7500
3750
Temperature

Star Clusters Sidetrip

- There are two basic types of clusters in the Galaxy.
- Globular Clusters are mostly in the halo of the Galaxy, contain >100,000 stars and are very ancient.
- Open clusters are in the disk, contain between several and a few thousand stars and range in age from 0 to 10Gyr

M67



Galaxy Ages

- Deriving galaxy ages is much harder because most galaxies have a star formation history rather than a single-age population of stars.
- Still, simply by looking at color pictures it is possible to infer that there are many young stars in some galaxies, and none in others.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AAT 60