May 1, 2023
MSE 2100 topics

- What happens when hydrogen is depleted in a star's core?
  - it depends on the mass of the star!

- A new concept: electron-degenerate gas

- Core contraction causes electron degeneracy

- Hydrogen shell fusion
  - pressure increase
  - luminosity increase
  - radius increase (expansion)
  - temperature decrease (due to expansion)
  - core radius decrease

- Helium fusion in the core
  - the triple alpha process: $3\ {}^{4}\mathrm{He} \rightarrow {}^{12}\mathrm{C}$
  - the quadruple alpha process: $4\ {}^{4}\mathrm{He} \rightarrow {}^{16}\mathrm{O}$
  - the helium flash
  - the horizontal branch

- Helium shell fusion
  - asymptotic giant branch
  - mass loss → planetary nebula
  - degenerate core → white dwarf