Appendix: Q&A

A. Timescales of stellar evolution

B. Equations for stellar evolution

Summary so far

- **Stellar structure and properties**
  - Hydrostatic equilibrium
  - Central temperature of the star $kT \sim GMm_p/R \Rightarrow R \sim M$
  - Nuclear burning
  - Luminosity of the star $L \sim M^{3\text{-}5} \Rightarrow$ Life time
- **Stellar evolution**
  - Virial theorem $U = -(1/2)\Omega$, $E_{tot} = U + \Omega = (1/2)\,\Omega$
  - No burning => contract => temperature rise $T \sim M^{2/3}\rho^{1/3}$
  - Equation of states (ideal gas, degenerate gas, radiation) => final fate of the stars

Thank you for your questions!

- **This week**
  - Why is the stellar evolution “quasi-static”?
  - How to calculate stellar evolution?
  - What is the Rosseland mean opacity (assignment 1)?

- **Next week**
  - What is the properties/fate of low mass stars (< 1 Msun)?

- **After lectures on supernovae**
  - How to read/interpret [Mg/Fe] vs [Fe/H] plot?

Changes in contents

2020/06/12	Appendix A. Q&A on the first half Appendix A. 前半の内容の質問や補足
2020/06/19	6. White dwarfs and thermonuclear supernove 6. 白色矮星と核爆発型超新星
2020/06/26	7. Core-collapse supernovae 7. 重力崩壊型超新星
2020/06/27 (Sat)	No lecture, although this date is counted as Friday 金曜日に読み替える日ですが休講にします。
2020/07/03	8. Radiation from explosive phenomena (I) 8. 爆発現象からの電磁波放射 (I)
2020/07/10	9. Radiation from explosive phenomena (II) 9. 爆発現象からの電磁波放射 (II)

Appendix. Q&A on the first half Appendix. 前半の内容の質問や補足
6. Low mass stars and white dwarfs 6. 低質量星と白色矮星
7. Supernova explosions 7. 超新星爆発
No lecture, although this date is counted as Friday 金曜日に読み替える日ですが休講にします。
8. Mechanism of core-collapse supernovae 8. 重力崩壊型超新星のメカニズム
9. Radiation from explosive phenomena 9. 爆発現象からの電磁波放射