Summary of lecture 18

- White dwarves cannot be more massive than ~1 solar mass (Chandrasekhar mass) otherwise the degenerate electron gas becomes relativistic and the pressure exerted by it is not sufficient to balance that due to gravity.

$$P_{\text{electrons}} \sim \frac{M^{4/3}}{R^4} \qquad P_{\text{gravity}} \sim \frac{M^2}{R^4}$$

$$\text{i.e. } P_{\text{gravity}} > P_{\text{electrons}} \text{ if } M \text{ too big}$$

If mass is below Chandrasekhar mass then star is stable otherwise it continues to collapse until e+p annihilation to neutrons initiates, whence the star either becomes a gas of degenerate neutrons or a black hole.

- Bose Gas: classical arguments would say that all the bosons in a system will congregate into the lowest energy state at the temperature tends to zero. But in practice this occurs only at very low temperatures, e.g.

$$T < 10^{-14} \text{ K for } 1\text{cm}^3 \text{ of } {}^4\text{He}.$$