The ionization parameter

- U, the ratio of ionizing photon to hydrogen densities
- See Davidson & Netzer 1979

2.7 Photoionization of Heavy Elements

Finally, let us examine the ionization of the heavy elements, of which O, C, Ne, N, Si, and Fe, with abundances (by number) of order 10^{-3} to 10^{-4} that of H, are the most abundant. The ionization–equilibrium equation for any two successive stages of ionization i and $i+1$ of any element X may be written

$$n(X^{+i})\int_{\nu_i}^{\infty}\frac{4\pi J_\nu}{h\nu}a_\nu(X^{+i})d\nu = n(X^{+i})\Gamma(X^{+i}) = n(X^{+i+1})n_e\alpha_G(X^{+i}, T), \quad (2.30)$$

where $n(X^{+i})$ and $n(X^{+i+1})$ are the number densities of the two successive stages of ionization; $a_\nu(X^{+i})$ is the photoionization cross section from the ground level of X^i

U and T(star) determine ionization

- No matter how intense the radiation field, how large the U, ions with ionization potentials higher than the highest energy in the SED cannot be produced

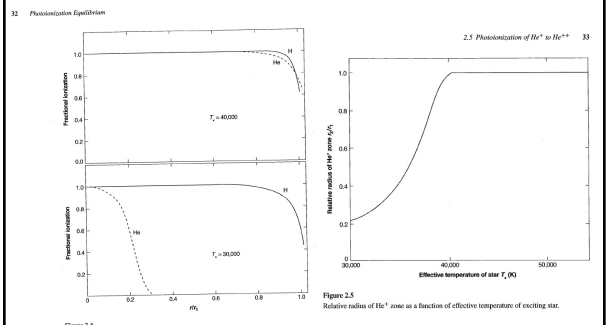

Figure 2.4
Ionization structure of two homogeneous H^+ He model H II regions.

Figure 2.5
Relative radius of He^+ zone as a function of effective temperature of exciting star.

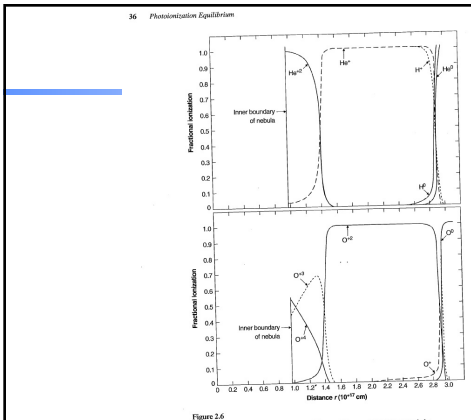

Figure 2.6
Ionization structure of H, He (top), and O (bottom) for a model planetary nebula.