SOME STATISTICS OF NEBULAR CHEMICAL COMPOSITIONS

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ABSTRACT. Data from a survey of 51 planetary nebulae (PN) observed with the image tube scanner on Shane Telescope at Lick Observatory are combined with those for a comparable number of objects previously reported. For nearly all of the PN included in the later program, it was possible to obtain adequately accurate plasma diagnostics and line intensities to derive ionic concentrations for He, N, O, Ne, S, Cℓ, and Ar. To get ionization correction factors we calculated theoretical nebular models to fit the excitation level and the intensities of individual important lines. Final model parameters include the stellar radius, emergent flux, $F_\nu(*)$, from Husfeld *et al.* (1984, *Astron. Astrophys.*, 134, 139), nebular size, the optical depth at the hydrogenic Lyman limit, and chemical abundances. Many PN do not appear to be optically very thick in the Lyman continuum.

Before statistics of PN chemical compositions can be discussed, we must assess likely sources of error. Uncertainties in the electron temperature, together with possible fluctuations thereof can adversely affect derived ionic concentrations, e.g., for certain ions of neon whose lines come from metastable levels at 3eV or more. We must reinterpret lines of [Ne IV], [S II], [Cℓ III], and [Ar IV], with the aid of newly available, improved atomic parameters, and best available electron densities.

With these caveats in mind, we examine the correlation between chemical composition and distance from the center of the galaxy for PN of population Type II. The analysis differs from that by Faundez-Abans and Maciel (1986, *Astron. Astrophys.*, 158, 228), not only because of differing input data, but also because of different criteria for Pop. Type II membership. We used the lists by Kaler (1970, *Ap. J.*, 160, 887), Barker (1978, *Ap. J.*, 219, 914), and by Heap and Augensen (1987, *Ap. J.*, 313, 268), and also adopted a galactic center distance of 8500 pcs. Uncertainties in distances of individual PN is the largest source of error. We find:

$$\log N(O)/N(H) + 12 = 8.69 - 0.0156\ R(kpc)$$

S. Torres-Peimbert (ed.), Planetary Nebulae, 219.