THE EMISSION SPECTRA OF PLANETARY NEBULAE

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ABSTRACT

Photometrically standardized and calibrated wide slit spectra of 48 planetary nebulae have been obtained with the quartz Cassegrain spectrograph attached to the 82-inch reflecting telescope at the McDonald Observatory in Texas. The spectra on panchromatic emulsions are in good definition from λ 6563 to λ3133. Accurate intensities of the emission lines of *H*, *He I*, *He II*, [*O III*], [*O II*], *O III*, [*Ne III*],[*Ne V*], and of the continuous emission will be reduced from the spectra. From a preliminary examination of the material it has been possible to classify the nebulae of normal surface brightness (about 7 mag. per square minute of arc) according to the excitation shown by their spectra. High-excitation spectra show strong *He II*, stronger [*O III*] than [*O II*], and relatively strong continuous emission. There is a continuous sequence down to the low excitation spectra showing no *He II*, no continuous emission, and stronger [*O II*] than [*O III*]. This is a temperature sequence involving both the temperature of the nuclear star and the electron temperature in the nebula. The low-surface-brightness nebulae (about 11 mag. per square minute of arc) have strong [*O II*] as well as strong *He II* and do not fit into the sequence. Fig. 1 shows this effect on a 20-fold enlargement of one hour's exposure of the spectrum of NGC 6853 (the "Dumbell Nebulae", 12.7 mag. per square minute of arc) compared with a 4 minute exposure of the spectrum of NGC 6818 (7.3 mag. per square minute of arc). Pecularities are noted in the monochromatic images of several nebulae: in particular the λ3727 image of [*O II*]often shows quite a different structure of the nebula from the other line images.