

## Unveiling Geometrical and Chemical Structures of Elliptical Planetary Nebulae

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Bright planetary nebulae (PNe) have been studied in the optical wavelengths (370 - 1,050nm) with the high dispersion spectra secured with the Hamilton Echelle Spectrograph on the 3 m Shane Telescope at Lick Observatory; the measurements have gone deep but give only a cross-section of the PN at one (bright) point. More recently, these data have been supplemented with Keck-I HIRES long-slit spectrograph enabling us to study, point by point, line intensity, and profile variations over the nebular image. The P.A. were chosen along the major and minor axes of the selected PNe, NGC 7027, 7662, 6818, and 7009. Thus, data usable for plasma diagnostics, chemical abundances, and kinematical studies are available for strips along the major and minor axes.

The near UV spectrum (300 - 370nm) of high excitation PNe secured by image tube scanner contains a number of interesting lines, including those of the Bowen fluorescent mechanism, He II and [Ne V]. The stronger lines have been studied adequately with low dispersion photoelectric spectrophotometry but problems of weaker lines have not been adequately addressed. Thus, these near UV spectra of the elliptical PNe, have also been updated with our recent Keck HIRES observation. The identified spectra by our recent visit include high excitation permitted lines of Ne II, O III, O IV, and N IV. Can their intensities be explained by a photo-ionization model or are stellar winds needed? We try to answer that query.