

An Imaging and Spectroscopic Survey of the Abell Planetary Nebulae

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The Abell catalogue of planetary nebulae (PN) are distinguished by their large size, low surface brightness and generally faint central stars. They are thought to be old PN approaching the White Dwarf cooling track. A number have evidence for late thermal pulses (H-poor ejecta near the central star, e.g. A78) and binary central stars.

A variety of imaging and spectroscopic observations of the Abell PN have been obtained in a programme still in progress to study all the members of the Abell catalogue. ESO 3.6m and 2.2m telescopes have been used for imaging and 2.2m and 1.5m for spectroscopy. Imaging shows that many of the Abell PN have complex non-spherical nebulae, with knots and other features seen in, for instance, Abell 70. Two examples of the objects studied are:

A 14: has a diameter of $\sim 30''$ and a bipolar morphology. The central star is of late type around F5; the Balmer lines are strong and the G-band is weak. The measured V magnitude from broad slit spectrophotometry is 15.24 and $B-V=+0.54$, in agreement with Abell (1966). For an F8V star, $B-V=+0.52$, there can be little reddening. There are a few spectral peculiarities including stronger flux below 3500\AA than expected for a late F star. The central location of the star relative to the emission leaves little doubt it is the central star of the nebula. The nebula is of low excitation with strong [N II] and [S II] emission.

A 65: The morphology is unusual with a dark 'lane' crossing the region of the obvious central star and with no increased dust extinction. The nebula edge to the NE has high ionization, implying a steep density decrease or interaction with the ISM. The nebula is of high excitation and high He/H abundance ($\text{He}/\text{H}=0.2$). The central star is unusual with strong (stellar) H and He lines *in emission* (Walsh & Walton 1996). This is the second PN central star, after HFG 1 (Acker & Stenholm 1990), to show such a spectrum, closely resembling that of a cataclysmic binary. Both stars show light curve eclipses (Bond & Livio 1990); A 65 has a period ~ 1 day, whilst HFG 1 0.58 days (Bond et al 1989). A 65 and HFG 1 demonstrate that the transition to a close binary can occur after ejection of most of the envelope of one or both stars.

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