HIGH VELOCITY OUTFLOWS IN POST-MAIN SEQUENCE NEBULAE

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ABSTRACT. We have observed a broad range of post-main-sequence, type I and irregular nebulae using the intermediate dispersion spectrograph of the Isaac Newton Telescope (La Palma, Spain). Many of these show evidence for high velocity mass outflow, and in particular we find: (i) High velocity ($\sim$ 500 km s^{-1}), and appreciable mass loss outflows within $\cong$ 10 arcsecs of M2-9 and SH 2-71; (ii) Substantial shell expansion velocities in NGC 7026 ($\sim 10^2$ km s^{-1}) with evidence for an appreciable driving wind at the central star, velocity $\cong 10^3$ km s^{-1}; (iii) Jet outflows extending over a range 260 km s^{-1} in Hb 5, with a distinctly tilted line structure suggestive of shock compression at the edges of an outflow cavity; and finally (iv) similarly strong winds (2×10^3 km s^{-1}) from each member of a WC binary in the nucleus of NGC 6905. The binary separation is approximately 3.6 arcseconds, and the core is further enveloped by two, apparently co-spatial shells, expansion velocity 90 km s^{-1}, and separation $\Delta V \cong 130$ km s^{-1}. The [N II] emission for the shells is extraordinarily weak, although ansae located outside of the shells, and perpendicular to the binary major axis, possess I([N II]λ6584) > I(HIλ6563). We propose that the two shells were ejected at differing phases of binary evolution.

The source NGC 2392 was also re-observed. Whilst the peculiar [N II] line structure at P.A. 159° is confirmed, we do not interpret this as reflecting jet outflow. Rather, it seems likely that we are witnessing high velocity shell ejection, an unusual (asymmetric) pattern of shell excitation and/or mass distribution, and a trend for increasing velocities at larger radii.

S. Torres-Peimbert (ed.), Planetary Nebulae, 194.