IS THERE ANY CONNECTION BETWEEN PLANETARY NEBULAE AND SYMBIOTIC STARS ?

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Symbiotic stars have sometimes been misidentified as planetary nebulae, because their line spectra are similar to those of planetary nebulae particularly in the ultraviolet L.(Houziaux 1982 in "The Nature of Symbiotic Stars", M. Friedjung & R. Viotti eds., Reidel. p 229), while the infrared shows the presence of the spectrum of a cool star. The similarity is not complete; when H. E.Schwarz (1988 in "The Symbiotic Phenomenon", J.Mikolajewska et al eds., Kluwer, p 123) plotted a graph of two ratios derived from emission line fluxes, symbiotic stars did not occupy the regions of the diagram occupied by planetary nebulae and H II regions.

In fact almost all specialists believe for very good reasons that symbiotic stars are interacting binaries (M Friedjung 1982 in "The nature of Symbiotic Stars, M. Friedjung & R. Viotti eds., Reidel. p 253). A cool giant (surrounded by much dust when a mira variable) appears to transfer mass to a more compact companion, through its wind, or through Roche lobe overflow. The companion seems usually to be a white dwarf, but sometimes a main sequence star or even perhaps in a few cases a neutron star. Symbiotic stars go through stages of activity, believed to be associated with thermonuclear flashes of the companion if it is a white dwarf, or to an instability of the accretion process (mass losing star or more probably disk), if the companion is a main sequence star.

Optical and radio observations at high spatial resolution, show in a number of cases the presence of nebulosity, often with deviations from circular symmetry and signs of the presence of bipolar flows and jets. Perhaps the most sriking example is R Aqr, which has a nebula with double bipolar structure and a jet with several components, indicating ejections at different times. The measured ionized masses of such nebulosity are always much less than those of planetary nebulae, being around $10^{-4}M_O$ For R Aqr, HM Sge and RX Pup and much less for CH Cyg. It may be noted that the nebulosity seen around He 2-104, once claimed to be protoplanetary, appears also to belong to this class, resembling that around R. Aqr (D. Bugarella et al 1991: A&A, **249**, 199).

We can now ask whether there is any evolutionary link between planetary nebulae and symbiotic stars. When there is a white dwarf companion in the binary, previous evolution could in principle have led to the formation of a planetary nebula, but no signs of such a nebula have been seen up to now. In addition later evolution of the non Roche lobe filling cool giant of a widely separated symbiotic binary could lead to ejection of its envelope, with a white dwarf being left behind. In this last case if the companion was also a white dwarf, the planetary nebula would have a double white dwarf nucleus and unusual features. Separate bipolar structure would have been formed during each phase of activity of the symbiotic, leading to the existence of multiple bipolar features in outer regions.