

THE SYSTEMATICS AND DISTRIBUTION OF MOLECULAR HYDROGEN IN PLANETARY NEBULAE.

P.W. Payne, J.W.V. Storey, and B.L. Webster
University of New South Wales, Australia
M.A. Dopita and S.J. Meatheringham
Mount Stromlo and Siding Spring Observatory, Australia

ABSTRACT. The infrared S(1) line of molecular hydrogen has been searched for in twenty-two planetary nebulae using the imaging mode of the Anglo-Australian Telescope. The line was detected and mapped in eleven objects. It has been demonstrated that all those with strong excited molecular hydrogen belong to a subclass of the Type I planetary nebulae, morphologically consisting of an equatorial toroid with faint bipolar extensions. Furthermore, nearly all planetaries with these characteristics have strong molecular hydrogen. The molecular line ratios in the 2.0 to 2.5 micron window are consistent with shock excitation. The observations suggest that the morphology of these planetaries has been controlled by a fast stellar wind interacting with a disc of gas concentrated in the equatorial plane.

In bright planetaries with well defined toroids the molecular hydrogen is located outside the ionized region, while in those with less regular and fainter toroids the ionized and molecular components are more closely coincident. This is interpreted in evolutionary terms.