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OBSERVING FAINT NEBULAE AND HALOS WITH SMALL TELESCOPES

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Detecting faint structures around Planetary Nebulae (PNe) and/or galaxies offers a variety of challenges. While their apparent sizes are normally small enough to fit within a telescope's field of view, their distances reduce their brightness and requires long exposures to gather the data. Unfortunately, competition for large telescope time limits the possibility of extended observations. We proposed the use of small telescopes (<1 m) and long observation times for detecting weak emission in these objects.

Deep visual imaging of the shells of planetary nebulae (PNe) has shown that many (perhaps most of them) consist of tripartite structures: an inner bright rim caused by interaction between the stellar wind and asymptotic giant branch (AGB) envelope; a less bright but more extended shell, possibly arising from the early expansion of D-type ionization fronts; and very much larger, fainter halos, likely the result of 'flash' ionization of the AGB mass-loss envelope. This will be the case of the PN NGC 7293 (the Helix). A comparison between the NGC 7293 deep optical image taken with the 0.84 m telescope OAN-SPM and the GALEX UV satellite image, shows emission along the major axis of the source, in particular at both ends of the structure. In particular, there is a sharp feature at the eastern side of the source, which is probably indicating motion of the PN through the interstellar medium (ISM). This lead to a variety of observational consequences, including the formation of bright rims, deformation and fragmentation of the shells (on the western side) and in some cases, a shift of the central stars away from the geometric centers of the envelopes.

Our new images confirm the presence of these different structures using exposures of only 2.5 hrs per image. These features would evidently be very much clearer where exposure times were longer.

Alternatively, in deep imaging of galaxies, it is also possible to distinguish very diffuse outer halos and/or rings. Much of this material is probably produced by tidal destruction of satellite galaxies during gravitational disruption by larger companions.

It therefore follows that the use of small telescopes for these types of observation, where acquiring telescope time is not a problem, enables us to undertake observations of objects which are faint and highly extended – the types of observation which would normally be acquired using very much larger facilities. Such observations are important for understanding the nature of these sources, and the mechanisms responsible for the strucures.

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