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Tests of Hierarchical Accretion in the Virgo Cluster

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Large concentrations of mass are now understood to be the products of a Hubble time's worth of merging and accretion. This history is preserved in the outer regions of galaxies' halos, where the dynamical scales are longer. This makes it possible to preserve fossil records of these events in the form of longlasting substructures imprinted in the physical properties of their stellar populations. In practice, this information is often hidden at surface brightness values below the sky.
Planetary Nebulae (PNe) can solve this observational challenge: owing to their strong [OIII] emission line —they are easily detected—PNe offer a unique tool to investigate low surface brightness regions and gather detailed observational proof of the structures' evolution.

In order to search for hierarchical processes, I analysed data from the Virgo Planetary Nebula Survey (VPNS) with the aim to study physical properties of its PN population and how they relate to the cluster properties as well as tracing variations in metallicity as a consequence of the presence of accretion events.

As a result, the different values of the PN α-parameter are consistent with a gradient from more metal rich stars in the galaxies' centres towards more metal poor populations of stars at large radii until the galaxy stellar population mixes with the IC component, consistent with a late built-up of the galaxies' halos. By comparing the α-parameter values of galaxies subject to environmental effects with those in close regions of intracluster (IC) regions, this work has shown that the Virgo intracluster light (ICL) is built up over time as a consequence of the tidal forces acting on both late- and small early-type galaxies. This, in turn, causes the ICL to be characterised by different metallicity values, especially in the north-west region where the IC component is highly unrelaxed.

With this work I also provided evidence for an unknown accretion event in the halo of the central galaxy, M87, that has caused an important modification of the metallicity of its outer stellar populations.

Author: Ms TRIANTAFYLLAKI, Aikaterini Niovi (Tartu Observatory, Tõravere, 61602 Tartu maakond, Estonia)

Presenter: Ms TRIANTAFYLLAKI, Aikaterini Niovi (Tartu Observatory, Tõravere, 61602 Tartu maakond, Estonia)

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