Tracing Galaxy Evolution through Interactions in Robert's Quartet with MUSE and Multiwavelength Observations

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Galaxy interactions and mergers are key drivers of galaxy evolution, particularly in shaping morphology and regulating star formation. Compact groups offer an ideal environment to study these processes in detail with their high galaxy densities and frequent interactions. We present a multiwavelength analysis of Robert's Quartet (RQ), a nearby compact group comprising four (possibly five) galaxies, each exhibiting distinct morphological, kinematic, and star formation properties.

We investigate star formation, gas dynamics, and tidal features within RQ using MUSE integral field spectroscopy, complemented by imaging from GALEX, DECALS, 2MASS, and WISE. NGC 88, a barred S0 galaxy, displays active star formation and a kinematic misalignment between its stellar and ionized gas components. NGC 89 hosts a central AGN with biconical outflows and a star-forming nuclear ring. In NGC 92, an early-type spiral, we identify two central clumps (~10^8 M$\odot$ each) with emission peaking at different wavelengths and velocities—indicative of an ongoing merger. This galaxy also shows a prominent ~90 kpc tidal tail and extended FUV emission beyond the optical disk. Meanwhile, SED analysis suggests that NGC 87 is a UV-bright dwarf galaxy with ongoing star formation.

NGC 87 and NGC 92 exhibit enhanced star formation rates relative to isolated systems, whereas NGC 89 shows signs of quenching. The diversity in star formation activity, the presence of AGN-driven feedback, and complex tidal structures within RQ underscore the dynamic interplay of interactions and environmental processes in galaxy transformation. Our results highlight the power of IFU spectroscopy combined with multiwavelength data in disentangling the physical mechanisms governing galaxy evolution in group environments.