

The thermally-pulsing Asymptotic Giant Branch (TP-AGB) stars are considered tracers of the intermediate-to-old populations in a galaxy, as they cover a broad range of stellar masses ($M \sim 1-8 M_{\odot}$). Moreover, and even more importantly, their classification in oxygen- (O-) and carbon-rich (C-rich) stars can serve as useful galaxy diagnostics. Indeed, the efficiency of the physical mechanisms that occur during this evolutionary stage and affect their surface chemical composition (i.e. third dredge-up, convective overshooting, mass loss, hot bottom burning) depends, among others, on the stellar mass and the metal abundance. This means that the population ratio between C- and O-rich stars can be used to estimate the metallicity of the environment from which they formed. Besides, they play a key role in the dust production process and in the chemical enrichment of galaxies, since they produce CNO and neutron capture (s-process) elements.

I plan to discuss the pros and cons of the different diagnostics adopted in the literature to identify AGB stars and the new solid optical/NIR/MIR color-color diagrams we developed for the identification and characterization of the O- and C-rich stars in the Local Group dwarf irregular galaxy NGC 6822 (Tantalo et al. 2022). I will also deal with the comparison of the new photometric diagnostics with evolutionary prescriptions either including or neglecting the presence of the dust.