

WST - the Wide-field Spectroscopic Telescope: surveying the Universe in the 2040's and beyond



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RR Lyrae Guiding WST in Unraveling Local Universe History

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The RR Lyrae stars have proven to be a fundamental tool for investigating the history of the Universe, serving as both distance indicators and witnesses to ancient merging events that shaped the Milky Way.

Thanks to the large diameter, field of view and multiplexing of WST, it will be possible to observe for the first time in high-resolution spectroscopy a large number of distant (>100 kpc) RR Lyrae stars both in the extreme periphery of the Galaxy and in many dwarf satellites of the Local Group. These observations will be the perfect follow-up for the upcoming large photometric optical (e.g. Rubin LSST) and space (Euclid/Roman Telescopes) facilities which will discover and characterize thousands of new RR Lyrae variables in the quoted environments.

The WST products, including abundance measurement of iron, alpha and neutron capture elements, as well as accurate radial velocities, will be fundamental to determining the three positional and three velocities for these objects thanks to precise proper motions up to $G=20.5-21.0$ provided by Gaia DR5 in 2030 and accurate distances through Period-Luminosity-Metallicity relations. This wealth of data will allow us to determine more accurately the orbits of the RR Lyrae variables and study the dynamics of these objects, linking them to ancient merging events. At the same time, the alpha and neutron capture elements will allow us to use chemical tagging to confirm such associations.

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