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The binary fraction of carbon/oxygen-rich Wolf-Rayet stars (WC/WO) in the Large Magellanic Cloud: Uncovering the companions of immediate black-hole progenitors

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Since the first detection by LIGO in 2015, gravitational-wave detectors observe mergers of black holes which formed in the low-metallicity, high-redshift Universe. A main uncertainty in our understanding of these mergers is the evolution of the progenitor stars of these black holes –stars more massive than ~20 solar masses. WC/WO stars are hot, post main-sequence stars with powerful winds that have lost their outer layers through processes related to stellar winds or binary interactions. They are thought to represent the final phase prior to core-collapse into black holes. However, it remains unknown how often they reside in binary systems and it is unclear what role companions play in forming them. Especially in lower metallicity environments such as those of the Magellanic Clouds, where stellar winds are weak, the majority of WC/WO stars were proposed to be the products of binary interaction. However, out of all 28 WC/WO stars in the Large Magellanic Cloud only 3 have been confirmed as binaries, while ~70% of their massive-star progenitors host a close companion. Should we revise our theories, or did we miss some companions in our search?

I will present results from a modern radial-velocity survey of the complete sample of WC/WO stars in the LMC to derive their bias-corrected multiplicity properties. Over 18 months, 6 spectra were taken with the X-SHOOTER spectrograph on the Very Large Telescope. In my talk, I will describe the monitoring spectroscopic survey and present preliminary conclusions on the production of Wolf-Rayet stars at subsolar metallicity environments.

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