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Determining the Stellar Ages of Galaxies in the Reionisation Era (Guido Roberts-Borsani)

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The enterprise of finding, confirming and characterising z>7 galaxies in the era of Cosmic Reionisation has developed rapidly in recent years, due to the combined power of HST, Spitzer and ground based-telescopes. An important development has been the discovery and study of luminous 7<z<9 galaxies with a red [3.6]-[4.5] micron colour whose prominent Lyman-alpha emission might indicate they lie in accelerated ionised bubbles. A key untested assumption, however, is that the IRAC [4.5] micron band in these sources is boosted by strong [O III] emission indicative of young stellar populations. However, recent observations of a galaxy at z=9.1 reveal a similar red IRAC colour which can, at such a high redshift, only arise from a strong Balmer break, indicative of an evolved stellar population. This discovery raises the question as to whether the IRAC colours at lower redshift may, in part, be due to evolved stars. To address this we use detailed SED modelling with strong spectroscopic priors of the ISM (e.g., [OIII] 88 micron line strengths, dust masses, non-thermal emission) from ALMA observations, with the aim of determining the primary driver of the early ionised bubbles. Ultimately this will enable us to provide new constraints on the timing of Cosmic Dawn prior to the arrival of the ELT and JWST.

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