

The Bimodality of Galaxy Populations Revisited Through Spectral Synthesis

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Abstract. We revisit the bimodality of the galaxy population seen in the local universe. We address this issue in terms of physical properties of galaxies, such as mean stellar ages and stellar masses, derived from the application of a spectral synthesis method to galaxy spectra from the SDSS. We show that the mean light-weighted stellar age of galaxies presents the best description of the bimodality seen in the galaxy population. The stellar mass has an additional role since most of the star-forming galaxies present in the local universe are low-mass galaxies. Our results give support to the existence of a ‘downsizing’ in galaxy formation, where nowadays massive galaxies tend to have stellar populations older than those found in less massive objects.

Keywords. galaxies: stellar content—galaxies: evolution—stars: formation

We applied the spectral synthesis approach presented in Cid Fernandes *et al.* (2005) to a volume-limited sample containing about 50 thousand luminous galaxies from the Sloan Digital Sky Survey Data Release 2. We obtain, for each galaxy, the mean age of their stars, the stellar mass and the stellar extinction. Galaxies are classified according to their emission line properties in three distinct spectral classes: star-forming galaxies (with young stellar populations), passive galaxies (dominated by old stellar populations), and hosts of active nuclei. We show that the extremes of the distribution of some galaxy properties, like colours, 4000Å break index, and mean stellar ages, are associated to star-forming galaxies at one side, and passive galaxies at another. We show that the mean stellar age of galaxies presents the best description of the bimodality seen in the galaxy population. The stellar mass, in this view, has an additional role since most of the star-forming galaxies present in the local universe are low-mass galaxies. Our results also give support to the existence of a ‘downsizing’ in galaxy formation, where massive galaxies seen nowadays have stellar populations formed at early times.

Additionally, our analysis allows to demonstrate that the bimodality of the galaxy population, commonly seen in colour-magnitude diagrams, is related to the presence of a young and luminous stellar component in galaxies currently undergoing star formation, in contrast with the older stellar content of passive galaxies. We also show that AGN-hosts have intermediate properties between star-forming and passive galaxies. A detailed discussion is presented in Mateus *et al.* (2006).

Acknowledgements

We would like to acknowledge the support of IAU, FAPESP and CNPq.

References

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