Resolving the building blocks of galaxies in space and time
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Stellingen

Behorend bij het proefschrift
"Resolving the building blocks of galaxies in space and time"

I Variations in the initial mass function (IMF) inferred from stellar motions through integral field spectroscopy could very well be due to an underestimation of modelling and measurement errors.

(Chapter 2)

II Variations in the high-mass end of the IMF could have dramatic implications for the interpretation of observed galaxy properties and the derived relations between those properties.

(Chapter 3)

III The fast transition from "blue cloud" galaxies to "red sequence" galaxies could be assisted by a late phase of dwarf-star formation.

(Chapter 3)

IV It is very difficult to distill the typical evolution of individual galaxies in a model-independent way from the observed evolving galaxy population.

(Chapters 4 and 5)

V Although the growth of massive galaxies as inferred from observations from the UltraVISTA and CANDELS surveys occurs in an inside-out manner, for the last 10^{10} year this growth is remarkably close to self-similar.

(Chapter 5)

VI Galaxy formation is a three-phase process.

(Chapter 6)

VII Although bulge formation in galaxies is triggered to a large extent by merger activity, not many accreted stars actually end up in the bulge.

(Chapter 6)

VIII The morphological evolution from massive disk to elliptical galaxies is almost entirely due to mergers, with significant contributions from major, minor and tiny mergers.

(Chapter 6)

IX The large bias and errors in the stellar mass estimates resulting from applying the Jeans anisotropic multi-gaussian expansion technique to galaxies from the Illustris simulation, as reported by Li et al. (2016), imply that our understanding of kinematic galaxy mass estimates and the resulting estimates of IMF variations would benefit greatly from future high-resolution simulations of galaxy structure in a cosmological setting.

Li et al.: MNRAS, Volume 455, p.3680-3692 (2016).

X The initial mass fraction in dwarf stars as introduced by La Barbera et al. (2013) is not the parametrisation-independent measure for observed IMF variations that it is assumed to be in later works. In order to study the whole parameter space of possible IMF variations it is crucial to include IMF parametrisations that vary the low- and high-end slope independently.

La Barbera et al.: MNRAS, Volume 433, p.3017-3047 (2013).

XI In addition to investigating the low-number statistics of observed planes of satellites, it would be good to increase the statistical sample of distant "planes of satellites" from Ibata et al. (2014) by including for example data from the GAMA survey.

Ibata et al.: Nature, Volume 511, Issue 7511, pp. 563-566 (2014).

XII The "de Broglie relation" (1925) is exactly such that the angular momentum, and hence the stability, of atoms is preserved under an intrinsic expansion of "empty" space as captured by the cosmological constant (Einstein 1917) and observed by Riess et al. (1998); Perlmutter et al. (1999). This suggests an intricate relation between the foundations of quantum mechanics and gravity.

Einstein: Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften, pp. 142-152, Berlin (1917).
de Broglie: Annales de Physique (10) 3, 22, Paris (1925).
Riess et al.: The Astronomical Journal, Volume 116, pp. 1009-1038 (1998).
Perlmutter et al.: The Astrophysical Journal, Volume 517, pp. 565-586 (1999).

XIII Virtually all papers in the field of galaxy evolution assume a ΛCDM cosmology. Hence, they assume that our understanding of gravity, although not complete in a fundamental sense, is complete in a practical sense. However, if the expansion history of the Universe turns out to be different, many of the observed properties of galaxies (e.g. sizes, masses, star formation rates, number densities) will have to be revised.

XIV In much the same way that the gravitational interaction causes mass to flow in the direction of the highest mass concentration, human interaction causes money to flow in the direction of the highest monetary concentration. Without a strong force to balance this flow neither interaction leads to a particularly pleasing end result.

XV It is most unfortunate that we use the same word "law" to describe the laws of physics and the laws of men, because it presupposes a similarity that does not exist. The laws of physics are simple and apply to everything without exception, whereas the laws of men are cumbersome and apply to nothing without exception.

XVI Since a voyage to the nearest star would take of the order 100,000 years, for all practical purposes we are alone in the Universe. This means that if we mess up our local part of the Universe, no one will clean up after us.

XVII One day the question "why the Universe is?" will be the same as the question "what the Universe is?" in much the same way that we do not question the existence of a circle when we calculate its circumference.

Bart Clauwens
Leiden, 6 December 2017