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ILT 3 WEEKS 3–4

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1. WHAT IS A GALAXY?

Galaxies are enormous conglomerations of stars and interstellar material. The qualifying morphological properties of these objects, however, remain flexible due to two principal factors: continuity and irregularity. The first classification scheme (the "tuning fork") introduced by Hubble (1936) in his own book implies certain continuity among different galaxy types. Elliptical galaxies vary smoothly from circular E0 to the most flattened E7 whereby the integer only denotes that the fraction is simply omitted by the scheme. In his earlier paper on statistical investigation of 400 extragalactic nebulae Hubble (1926) writes that "the structural transition [of spiral galaxies] is so smooth and continuous that the selection of division points for further classification [beyond the relative size of their nuclear regions and the extent to which their arms are unwound] is rather arbitrary." Subsequent classification schemes developed by de Vaucouleurs (1959) and Sandage (1961) extended the idea of continuity via three-dimensional classification volumes. A very small circular galaxy with no spiral arms, thus, could be morphologically very similar to a large globular cluster, sans the luminous nucleus. Not all galaxies have visible nuclei, however, and the situation is further complicated by distinct class of irregular galaxies that satisfy this criterion.

Among the possible explanations for the recently discovered ultra-compact dwarf galaxies (UCDs) are them being unusually luminous globular clusters (GCs). The investigation of UCDs in the Fornax cluster of galaxies and GCs in the central galaxy NGC 1399 (Mieske et al. 2002) revealed no significant gap in the magnitude space or metallicity between those objects. The velocity dispersions of the stellar populations in Fornax UCDs overlap the most luminous GCs in M31 and that they are likely to be the high-luminosity tail of the GC system of NGC 1399 (Jones et al. 2006). Similar investigations were performed by Haşegan et al. (2005) in the immediate vicinity of M87 reaching similar conclusions. In the Coma cluster, Chiboucas et al. (2011) has found strong support for the star cluster origin of the UCDs. With UCDs generally being larger than both GCs and nuclei of dwarf galaxies and with a continuum of luminosities and metallicities, they are likely a bright extension of metal-rich globular clusters, forming a continuous sequence between GCs, UCDs and elliptical galaxies (Wehner & Harris 2007; Evstigneeva et al. 2007).

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