

CHAPTER 7C.

Galaxy Formation & Evolution: Poster papers

The morphological types of galaxies in the Local Supercluster

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Abstract. On the basis of the Hyper – Leda Catalogue (HyperLeda) 8293 galaxies with heliocentric radial velocities below 2500 km s^{-1} were selected; 4570 had known morphological types (4366 had calculated b/a ratio). We checked the frequency of the distribution of various types in the LSC, finding spirals and irregulars most numerous, in accordance with expectations. The axial ratio of galaxy diameters of various types was studied, and the dependence of this parameter on the morphological type was noted.

1. Introduction

Galaxy parameters are used in many astrophysical investigations. Usually, it is accepted that in any larger structure the value of the parameters for all galaxies are equal and mean values are adopted. It is interesting to look in more detail at galaxies in such a structure. In this paper we are trying to look for morphological types of galaxies in the Local Supercluster (LSC), as well as the dependence of the galaxy inclination angle on the morphological type. Assuming an oblate galaxy, the value of the inclination angle i (that is, the angle between the galactic plane and line of sight) is usually determined from the formula (Holmberg 1946):

$$\cos(i) = \left[\frac{\left(\frac{b}{a}\right)^2 - \left(\frac{b_0}{a_0}\right)^2}{1 - \left(\frac{b_0}{a_0}\right)^2} \right]^{-1} \quad (1.1)$$

where a , b are the observed lengths of the major and minor axes of the galaxy image, while a_0 and b_0 are the theoretical values of these parameters. The ratio $q_0 = b_0/a_0$ depends on the morphological type of the galaxy (Heidmann *et al.* 1972). (The value $q_0 = 0.2$ is usually adopted when the morphological type is unknown.) Current huge databases permit the estimation of this relation based on a much greater sample than previously.

2. Observational data

The Hyper – Leda Catalogue of galaxies was used as our observational basis. From the Catalogue, we extracted galaxies with heliocentric radial velocities $V_r < 2500 \text{ km s}^{-1}$. We obtained the sample of 8293 galaxies which are presumed to be members of the LSC. The Catalogue listed morphological types for 4570 of these galaxies. This set formed the basic sample for our studies.

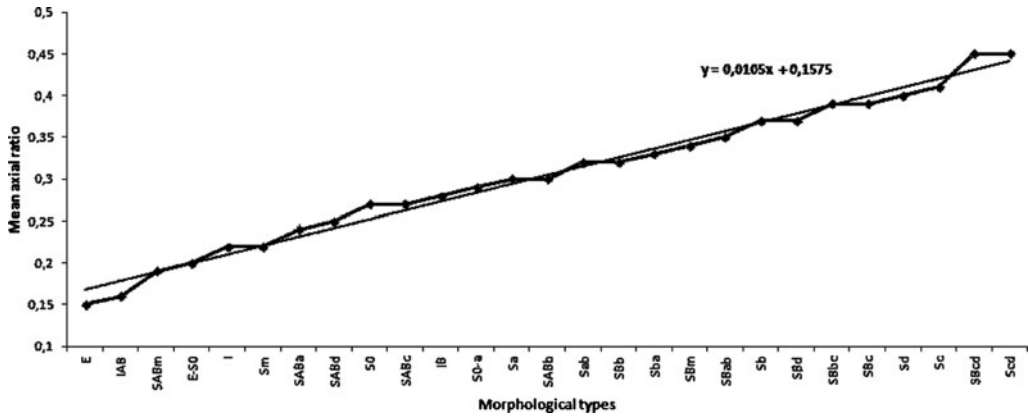


Figure 1. The dependence of mean axial ratio on morphological types, with a fitted line.

3. Results

In the huge volume of the LSC analysed by us, the majority of galaxies are spirals and irregulars. Ellipticals and lenticulars constitute less than 5 % of the population. This finding is in agreement with Dressler's relation (Dressler 1980) that ellipticals are more frequent in the dense region of a structure, while spirals dominate in less populated regions.

We studied the distribution of the galaxy axial ratio for each morphological type in a sample containing only galaxies of known morphological types and given b/a ratios (4366 objects). We considered the value of $\log R_{25}$ (Paturel *et al.* 1991), where R_{25} is the photometric axial ratio of the major to minor diameters (a/b) of the galaxy image at the 25 mag arcsec⁻² isophote. The existence of a dependence of axial ratio on morphological types is clear: fig. 1 presents the dependence of the mean axial ratio on morphological types with fitted line.

4. Conclusions

Our investigations are based on a large sample of galaxies.

- We confirm the Dressler relation that, in a structure, the galaxy morphological type depends on the space density of galaxies.
- The axial ratio $\log R_{25}$ is function of morphological type. It is greater for late types than early types.
- Spirals with well-established type have the value of this parameter greater than suspected spirals. This is probably due to erroneous identification of these objects as spirals.
- The real ratio q_0 used for calculation of the inclination angle i also depends on the morphological type. This relation is rather weak within 1σ .

References

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