# Local Redshift Surveys and Galaxy Evolution

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**Abstract.** We present observations of galaxy environmental dependencies using data from the 2dF Galaxy Redshift Survey. From a combined analysis of the luminosity function, Butcher-Oemler effect and trends in H$\alpha$ line strengths we find support for a model where galaxy properties are mainly set by initial conditions at the time of their formation.

## 1 Introduction

Local redshift surveys, undertaken to map the three-dimensional distribution of galaxies and therefore address topics in cosmology, are also useful to derive a sample of local galaxies and analyze their properties, such as luminosity functions and star formation rates. Although the current generation of surveys is too local to be useful for galaxy evolution studies (but see descriptions of the DEEP2 and VIMOS surveys in the present volume), the 2dF and SDSS are adequate to obtain an in-depth description of the local world of galaxies.

## 2 The Galaxy Luminosity Function

This is sometimes regarded as a $0^{th}$ order statistics, the simplest characterization of galaxy populations. It is essential to reproduce its shape as a first step towards a consistent model of galaxy formation. A review of this topic is presented in Driver & De Propris (2003). Here we compare luminosity functions for the field, clusters and as a function of local density from the 2dF galaxy redshift survey: since these luminosity functions are derived from the same catalogue of redshifts and photometry, they should share most of the selection biases and therefore should be fairly comparable to gain a picture of environmental effects on galaxy luminosities.

Figure 1 shows a schematic view of the behaviour of the two relevant parameters of the luminosity function as a function of density, $\delta_8$, which is the density, for each galaxy, measured within an 8 Mpc sphere. We see that:

- $M^*$ becomes brighter in higher density regions
- $\alpha$ becomes steeper in these regions

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- This is essentially due to evolution in the $M^*$ and $\alpha$ of early-type galaxies (i.e. spectroscopically quiescent objects)
- There is little or no evolution among late-type galaxies

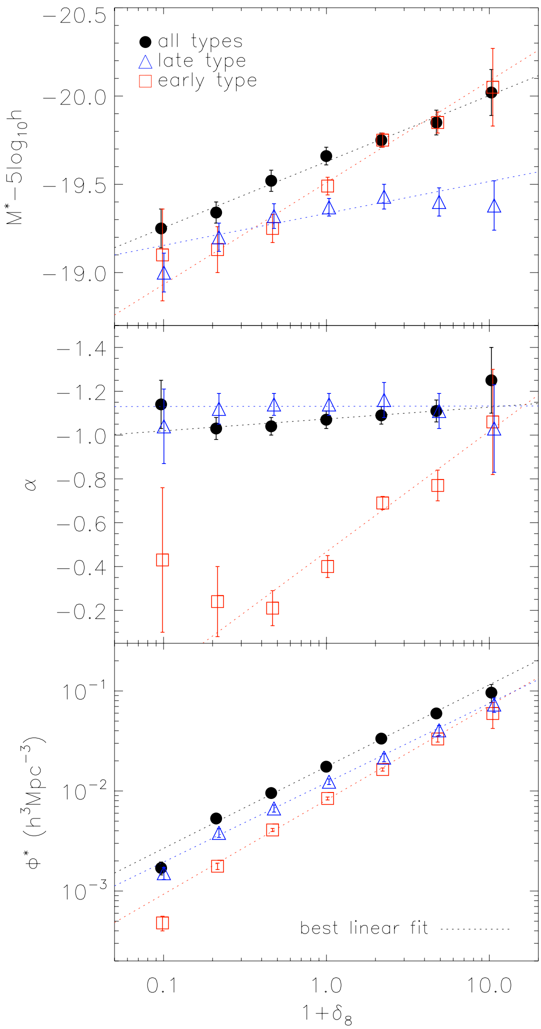


**Fig. 1.** The best Schechter fit parameters to the luminosity functions in the density regimes considered by Croton et al. (2003) for early-type galaxies (squares) and late-type galaxies (triangles),

This is reminiscent of the simple model for galaxy evolution presented in De Propris et al. (2003), where galaxies were simply assumed to move from star-forming to quiescent with little luminosity or density evolution. Although