THE GENERAL GALAXY LUMINOSITY FUNCTION

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The general luminosity function of galaxies is believed to be well represented by the Schechter function with exponent $\alpha \simeq -1$ and $L_* \simeq 10^{10} L_\odot$, but with a wide range of variation from one sample to another. This function decreases exponentially at high luminosities and has a power law behaviour increasing towards low luminosities with no present evidence of turn over or cut-off.

We obtain the mass function of the regions which are above a certain threshold in a filtered Gaussian random field. In order to do that, we first calculate the distribution of intervals between sucessive crossing points along a line; for high levels ($\nu \gtrsim 2.5$) all the regions tend to be spherical and then we are able to obtain the diameter distribution of the spherical objects from the interval distribution of crossing points. The mass of any of these objects is simply $m = \pi D^3 \rho_b / 6$ where ρ_b is the background density. Finally, assuming a constant m/L ratio we have a relation between the luminosity function and the mass function.

Our results for cold dark models (adiabatic or isocurvature fluctuations) and scale-free spectra differ substantially from the observations related to all the galaxies. This is not surprising since the use of a single filter and threshold to cover the whole range of masses is very unrealistic. Moreover, for scales very much smaller than the filter everything is erased ending up with a luminosity function smaller than the one observed for the faint end where the dwarf galaxies are dominant.

We conclude that every morphological type must be studied separately to account for different physical processes involved in their formation. The next step will be to consider different thresholds and smothing radii to account in a first approximation for the complex phenomena related to galaxy formation.

J. Audouze et al. (eds.), Large Scale Structures of the Universe, 582.