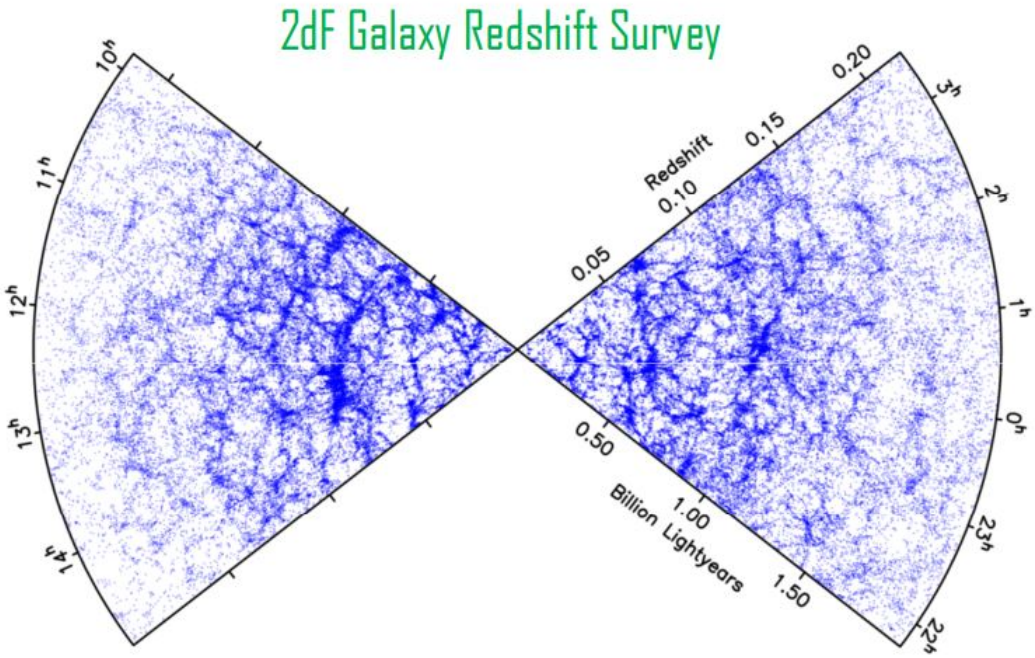
Galaxy Redshift survey

- Galaxy Redshift Survey:Galaxy redshift survey is survey of a section of the sky to measure the redshift of galaxies.This gives an idea about the distribution of luminous mass in the universe.



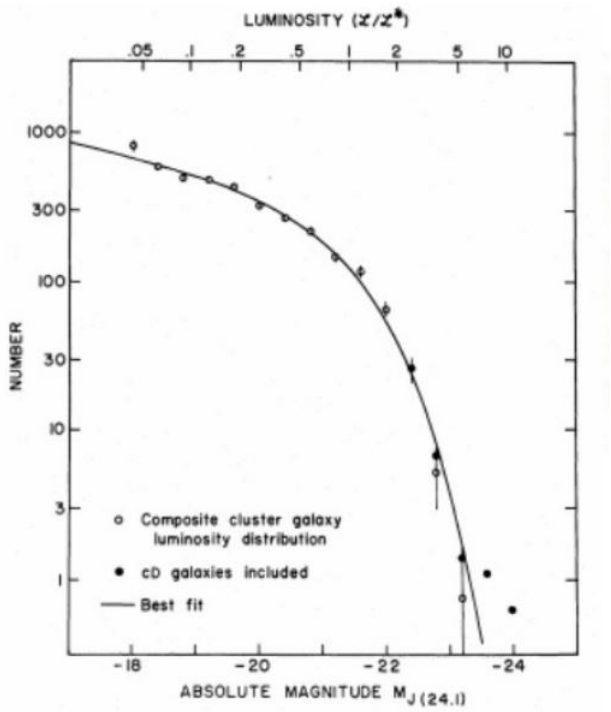
Morphological-density relationship:The morphology-density relationship is an observationally determined relationship between Morphological type(Hubble type) of galaxies and the environment in which they are located.(number of galaxies per megaparsec cube). This relationship is a result of observation that early type galaxies(Elliptical and S0 type) are found in high density region of the cluster,while late type galaxies are preferentially found in low dense regions.

It is also observed that higher red shift galaxies are bluer(i.e. Late type/Spiral galaxies) while lower red shifts are populated by redder galaxies(Early type/Ellipticals and S0).

At higher red shifts the density of the galaxies is lower.This is also due to limitations of the observation at such high distances that the density is lower.

Galaxy Luminosity function

- Galaxy Luminosity function,$\phi(M)dM$ is defined to be the number of galaxies in a particular sample having absolute magnitude between M and M+dM.
- Fainter end of the plot: dSp,dE; Luminosity$\sim 10^6 L_{sun}$
  Brighter end:cD; Luminosity$\sim 10^{11} L_{sun}$



Observed luminosity distribution of galaxies from a sample of 13 clusters in the local universe.

- Galaxy distribution function:In an attempt to find a general analytical fit to galactic luminosity function,Paul Schechter proposed the functional form:

$$\phi(L)dL \sim n_o(L/L_*)^{\alpha}e^{-L/L_*}dL$$

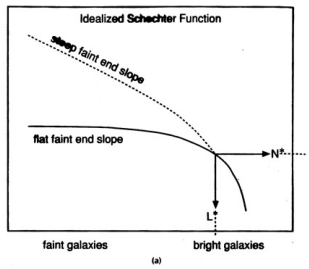
  n_o is number of galaxies/Mpc^3 at the faintest end of the luminosity function
  α is slope at the faint end of the luminosity function.

- What is L_*?

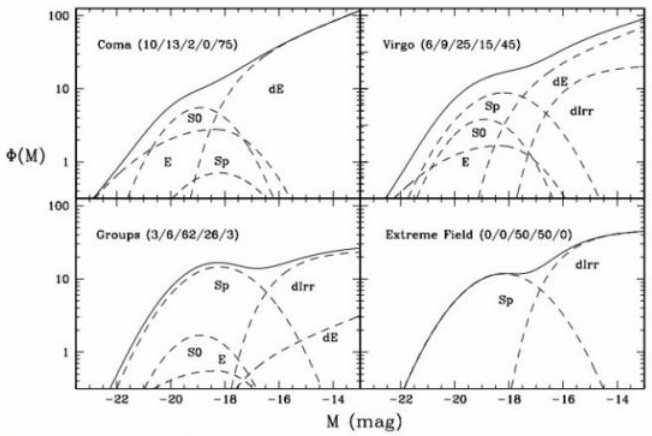
Here L_* and α are the free parameters that are used to obtain the best fit to the available data.

$$\phi(L = L_*) = \frac{n_o}{eL_*}$$

L_* is the point where LF declines exponentially.



- $\phi(L)$ is best determined near L_*
  Few galaxies have $L >> L_*$ because they are rare
  Few galaxies have $L << L_*$ because they are too faint to be detected.



The figure shows the observed luminosity distribution of galaxies in a range of environments from a typical galaxy over-density region like the Coma cluster, the dense Virgo cluster, to loose groups of galaxies and galaxies in the field. In each case the distribution of galaxies of the various Hubble morphology types are shown (dotted lines). The solid line is the total observed luminosity distribution. The numbers in parentheses are the percentages of Ellipticals, S0, Spirals, dIrr, dE. The inference to be drawn from the figure is that the relative mix of Hubble type changes with environment, and the sum of these gives the integrated LF.

- As can be seen in the plot,dE and dIrr represents a large fraction of total number of galaxies,even though S's and E's are most prominent in terms of cluster luminosity and mass.If we compare both the graphs we see that relative number of Elliptical and Spiral changes dramatically in the two clusters.This is an evident that environment plays an important role in galaxy formation and/or evolution.