# OBSERVED DISTORTIONS (FROM LINEARITY) OF THE HUBBLE FLOW AND BIAS IN THE DATA

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**1. TESTS FOR MALMQUIST EFFECT:** Several tests can be made to get a rough idea of the Malmquist effect in a given set of galaxies. They are: (1) The progressive loss of late type spirals (Scd or later), of low luminosity classes, of objects with small rotation velocity, or small internal dispersion, as we go to larger distances. (2) The variation of the slope of the Tully-Fisher relation, of the Faber-Jackson relation or of the $\Lambda$ index with distance (differential bias).

**2. EXAMPLES OF MORE OR LESS BIASED SAMPLES:** The following samples give a positive response to at least one of these tests: (1) The sample of faint ScI galaxies of Rubin et al. (1976). No Tully-Fisher relation is observed for this set of data suggesting that the low rotating objects are at several $\sigma$ from the mean of galaxies having the same rotation[1]. (2) A set of data used by Buta and Corwin (1986) to deduce the distance to the Hercules Supercluster. Again no Tully-Fisher relation. (3) The field samples used by de Vaucouleurs et al. (1981a,b) to derive the mean Hubble ratio from the $\Lambda$ index (differential bias) and the blue Tully-Fisher relation (loss of low rotating objects and late types). (4) The field sample of Aaronson et al. (1982) and the cluster sample of Bothun et al. (1985) (Change in the slope of the H-band Tully-Fisher relation with distance, loss of low rotating objects).

While the samples of Rubin et al. and Buta and Corwin would give disastrous results if they were used to deduce a value of the Hubble constant, the consequence of the Malmquist effect seems to be less serious for the other samples.

**3. DISTORTIONS AND ANISOTROPIES OF THE FLOW:** In principle a non-homogeneous sample may lead to erroneous dipoles if the correction for bias is not taken into consideration. A preliminary test is to check whether the dipole is not made to go away when massive galaxies are used. This test applied to the infall of the Local Supercluster toward Hydra-Centaurus discovered by Bothun et al. (1985), indicates that the anisotropy is at the limit of detection (i.e. the effect from galaxies such that $2V_M > 250$ km $s^{-1}$ is 0.20 mag for 3 clusters near the antapex while a typical error for a cluster is $\sigma/\sqrt{n-1} = 0.13$ mag).

1) There is also a bright cutoff.



*J. Audouze et al. (eds.), Large Scale Structures of the Universe, 586.*