

THE COMPILED CATALOGUE OF GALAXIES IN MACHINE-READABLE FORM
AND ITS STATISTICAL INVESTIGATION

N.G. Kogoshvili
Abastumani Astrophysical Observatory
Georgia - U.S.S.R.

The compilation of a machine-readable catalogue of relatively bright galaxies was undertaken in Abastumani Astrophysical Observatory (Kogoshvili 1972 ; 1975) in order to facilitate the statistical analysis of a large observational material on galaxies from the Palomar Sky Survey. This catalogue is mainly based on the data from the MCG catalogue (Vorontsov-Veljaminov et al, 1962-1968) supplied with information from the UGC (Nilson, 1973), RCBG (De Vaucouleurs and De Vaucouleurs, 1964), CGCG catalogues (Zwicky et al, 1961-1968) and from other sources.

In compiling the catalogue of galaxies the following problems were considered :

1. the collection of existing information for each galaxy ;
2. a critical approach to data aimed at the selection of the most important features of the galaxies ;
3. the recording of data in computer-readable form, and
4. the permanent updating of the catalogue.

Thus the Abastumani Catalogue comprises about thirty three thousand galaxies most of them brighter than $15.^m1$ and located in the area north of -33° .

The catalogue provides for each galaxy : MCG and NGC numbers, equatorial coordinates, integrated magnitude, diameters and surface brightnesses for the internal and external areas of the galaxy, inclination and detailed description of the galaxy by symbols. All these data are given according to MCG. Also for some galaxies the following data are given : different morphological classifications of galaxy types, integrated colour indices, radial velocities, the occurrence of a galaxy in some lists of galaxies, the membership of a galaxy in binary and multiple systems and other parameters.

A broad range of statistical investigations was undertaken by means of the Compiled Catalogue of Galaxies revealing some systematic data errors of the catalogues used.

In particular, as a result of the statistical investigations of the dependence between the visibility of a galaxy and its position on the Palomar Sky Atlas maps, on the basis of MCG and UGC data, the "boundary field effect" was studied. The analysis of counts of galaxies in the MCG catalogue showed a deterioration of the visibility of galaxies all over the eastern half of the field and particularly in the east boundary region as compared with the western region. This effect is most appreciable in the distribution of galaxies with brightness fainter than the limiting magnitude of MCG, as well as in the distribution of elliptical galaxies. Most likely this effect comes from a weak asymmetry of the photographic field of the 48" Schmidt telescope.

Data from the UGC catalogue, which similarly to the MCG catalogue is based on the Palomar Sky maps, confirm the reality of the field effect studied. This supports the view that the boundary effect is possibly due to the optical system of the Palomar Schmidt telescope.

A computer made analysis of the irregularities in the distribution of the numbers of galaxies in neighbouring fields made it possible to estimate the value of the relative mean plate-to-plate fluctuation of the number of galaxies for the MCG data. This fluctuation corresponds approximately to the contribution of observing condition variability into the values of the two-point correlation function of the galaxy numbers obtained by Peebles.

Data of the Compiled Catalogue made it possible to study some features of Zwicky's compact galaxies and compare them with those of galaxies from MCG and UGC, selected by the compactness criterion.

An investigation of the surface brightness of Zwicky's compact galaxies showed that only 2 % have the surface brightness brighter than $20. m_0''$ and it is hardly possible to regard the considerable number of Zwicky's objects as compacts based on the compactness criterion suggested by Zwicky.

The study of the mean value of the surface brightness for the galaxies of MCG showed that about thousand galaxies in the catalogue have small dimensions, high surface brightness (brighter than $21. m_0''$) and spherical appearance, suggesting thus that these objects could belong to the class of compact galaxies.

We also investigated the problem of the small-scale clustering of compact galaxies on the basis of the Zwicky and MCG lists. With this aim the frequency distribution of the apparent angular separations between compact galaxies and their nearest neighbours as projected on the celestial sphere was studied by means of a statistical technique.

The analysis of the counts showed that the clustering tendency among Zwicky's galaxies is connected with eruptive activity rather than with surface brightness. With regard to the galaxies with high surface brightness in the MCG catalogue, it is hardly possible to assume now that compact galaxies occur more frequently in systems of galaxies than normal galaxies, due to systematical errors in estimating the angular dimensions and magnitudes for fainter objects.

Using the MCG data, the problem of small-scale clustering of the spiral and elliptical galaxies was studied for different intervals of magnitude, as well as the problem of the coiling of spiral components of apparent pairs based on a larger amount of data than in previous publications.

Thus we summarize the conclusions as follows :

1. A catalogue of galaxies was compiled on magnetic tape, which is to be permanently updated. This catalogue may be useful as a basis for solving a wide range of statistical extragalactic problems.
2. On the basis of the data of the Compiled Catalogue of Galaxies the value of the irregularity in galaxies distribution within a single plate of the PSA, as well as the plate-to-plate irregularity was statistically estimated. The significant distortions of the apparent distribution of galaxies up to 15^m should be considered in constructing models of space distribution of galaxies.
3. Selection of compact galaxies by the surface brightness criterion leads to systematic overestimates of the number of compact galaxies as their brightness decreases, and to increase therefore their tendency of clustering.
4. The analysis of the vast data of MCG confirms the opinion, that E-galaxies occur more frequently in pairs as compared with spirals, and also the opinion concerning a larger frequency of pairs with opposite directions of coiling as compared with pairs whose components have the same spiral arm coiling direction.

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