MORPHOLOGY OF ISOLATED AND GROUPED GALAXIES

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Most galaxies with UV-continuum avoid clusters of galaxies (Lipovetsky 1986). Until recently, however, it was difficult to compare spatial distribution of galaxies with UV-continuum with galaxies of other morphological types, since the number of galaxies with known distances was too small. Rapid accumulation of complete redshift samples in large areas of sky (Huchra 1985) makes such study now possible.

In the present paper we have investigated the morphology and luminosity of galaxies in the Local Supercluster. This is the only supercluster where both intrinsically bright and faint galaxies can be studied. The comparison of morphological distributions in the Local, Coma and Perseus superclusters (Einasto and Einasto 1986) confirms the dependence of the morphology of **grouped galaxies** on the spatial density, found by Dressler (1980) and Postman and Geller (1984). The morphological distribution of **isolated galaxies** is completely different, only slightly depending on the degree of isolation. To see the contrast of the morphology and luminosities of galaxies in high and low density environments we give in Table 1 data on the core of the Virgo cluster and on isolated galaxies in peripheral regions of the Local Supercluster, respectively: numbers of galaxies of four principal morphological types (E - ellipticals, S0 - lenticulars, S - early spirals, I - irregulars, late spirals and nonclassified dwarfs), M_1 - blue absolute magnitude of the brightest galaxy (for the Hubble constant H = 100 km/s/Mpc), M_B and M_F mean absolute magnitudes of three brightest and three faintest galaxies, respectively, and N_{UV} - the number of galaxies with UV-continuum. Both samples have approximately equal size.

Differences between galaxy samples from high and low density environments are evident. Among isolated galaxies there are no ellipticals and no supergiant galaxies. The brightest isolated galaxy is by 2 magnitudes fainter than the brightest cluster galaxy. The actual difference between first ranked clustered and isolated galaxies is even larger because the Virgo cluster contains no supergiant cD galaxies. Most isolated galaxies are late type spirals and irregulars. There are four

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TABLE 1
Data on grouped and isolated galaxies

Type	E:S0:S:I	M_1	M_B	M_F	N_{UV}
Grouped	4: 7:11: 3	-21.1	-20.2	-15.6	0
Isolated	0: 3: 7: 8	-18.9	-18.7	-15.3	4

galaxies with UV-continuum, two of them are compact lenticulars, and two interacting galaxies from the Vorontsov-Velyaminov (1977) list.

Striking differences found between highly clustered and isolated galaxies cannot be explained by evolutionary effects. Some changes in morphology are, of course, possible. An example of such processes is the possible transition of dwarf irregular galaxies to dwarf spheroidals due to sweeping of their gas by the ram pressure of external gas (Einasto et al. 1974, Faber and Lin 1983). But it is impossible to build up giant spirals by merging dwarf isolated galaxies, since giant spirals possess strong bulges absent in dwarfs. Dwarf irregulars are most vulnerable to destruction by galaxy collisions. The large number of dwarf galaxies observed in cores of clusters makes the merging hyphothesis as the principal mechanism for producing the differences discussed above unlikely.

The main conclusion of this study is that the morphology and luminosity differences found between clustered and isolated galaxies must reflect differences of galaxy formation processes in high and low density environments.

REFERENCES

Dressler, A.: 1980. Astrophys. J., **236**, 351.
Einasto, J., Saar, E., Kaasik, A. and Chernin, A.: 1974. Nature, **252**, 111.
Einasto, M. and Einasto, J.: 1986. Preprint.
Faber, S. M. and Lin, D. N. C.: 1983. Astrophys. J., **266**, L17.
Huchra, J.: 1985. Redshift compilation (unpublished).
Lipovetsky, V. A.: 1986. Thesis.
Postman, M. and Geller, M.: 1984. Astrophys. J. **281**, 95.
Vorontsov-Velyaminov, B. A.: 1977. Astron. Astrophys. Suppl., **28**, 1.