First Ranked Galaxy Morphology and Morphological Content in Groups of Galaxies

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V. Ambartsumian (1956) has shown that the observable quantity of double and multiple galaxies much exceeds that expected, based on the assumption about dissociative balance. He has concluded that the members of double and multiple systems, as well as the clusters, could not arise independently of each other, and only then to be united in systems, by mutual capture. They should arise in common. Moreover, when in a group are large luminous central galaxies, the origin of the weak members of the group should be caused by activity of a nucleus of the central galaxy (Ambartsumian 1962). On the other hand, recently, there was widespread the opinion that the properties of central galaxies of groups and clusters are caused by interactions with environmental galaxies.

Mahtessian et al. (1995) has confirmed the earlier result (Mahtessian 1982, Tikhonov 1987), that there is not sufficiently strong influence on the morphology of galaxies from the environment.

Hickson et al. (1984) deduced that in compact groups in which the first-ranked member is a spiral galaxy, the relative number of spirals is higher than in the other groups.

The population of ellipticals in the group with a first-ranked elliptical member turns out to be significantly higher than in the other groups (Ramella et al. 1987, Wirth 1983).

Hickson et al. (1988) has shown that the distributions of morphological types of first-ranked galaxies and all galaxies in compact groups do not differ from each other. The relative quantity of spiral galaxies for all of the sample is 0.49, which almost coincides with the relative quantity of spiral galaxies among the first-ranked members of groups (0.48). Besides in these groups is found morphological concordance. As has appeared, in 20 of 58 quartets, all four galaxies have the same general type (early or late). The probability of such an event, counted from the assumption of independence of morphological types, is small (10^{-5}).

Mahtessian (1982) found that in groups with higher relative number of elliptical and lenticular galaxies among spiral members early spirals meet more often.

A study of double galaxies (Karachentsev, Karachentseva 1974, Noerdlinger 1979) determined, that the tendency of pairs have galaxies with close morphological types. Similar conclusion have come by Yamagata (1989), where 16930 pairs of nearest neighbor galaxies were investigated.

Dependence of morphological types of non-first-ranked and second-ranked galaxies from a morphological type of the first-ranked galaxy in loose groups (Mahtessian 1988, 1997, 1998) has been studied. Compared also are distributions

of morphological types of first-ranked, second-ranked and ordinary (not first-ranked) galaxies.

There is a significant tendency that second-ranked and ordinary galaxies of groups have similar morphological types as the first-ranked member.

There are not significant differences between distributions of morphological types of first-ranked, second-ranked and ordinary galaxies of groups.

These results allow us to conclude, that the observable morphological types of galaxies can be a consequence of the initial conditions (for example, mass, its density, moment of rotation of protogroup) in the epoch of their formation.

Two occurrence following mechanisms of galaxies in groups are possible:

a) At first, the protogroup disintegrates to parts, hereafter from which are formed galaxies.

b) At first, the first-ranked galaxy of the group is formed, from which later on by means of ejection (or disintegration) are formed other members of the group.

In both cases is expected a correlation between morphological types of the members of groups (in particular between morphological types of first-ranked galaxies and other galaxies). And the prevailing morphological type in the group should "remind" of the initial conditions present in the protogroup at the moment of occurrence. For example, if rotational moment per unit mass of the protogroup is small, there can arise many elliptical galaxies.

References

Ambartsumian, V. A. 1956, Izv. Akad. nauk Arm. SSR, seria fiz.-mat. nauk, 9, 23

Ambartsumian, V. A. 1962, in Transaction of the IAU, vol. XIB, Academic Press, London, New York, 145

Hickson, P., Kindl, E., & Huchra, J. 1988, ApJ, 331, 64

Hickson, P., Ninkov, Z., Huchra, J., & Mamon, G. 1984, in Clusters and Groups of Galaxies, F. Mardirossian, G. Giuricin, & M. Mezzetti, Dordrect: Reidel, 367

Karachentsev, I. D., & Karachentseva, V. E. 1974, AZh, 51, 724

Mahtessian, A. P. 1982, Comm. of Byurakan obs., 53, 102

Mahtessian, A. P. 1988, Astrofizika, 28, 255

Mahtessian, A. P. 1997, Astrofizika, 40, 45

Mahtessian, A. P. 1998, Astrofizika, 41, 473

Mahtessian, A. P., Movsessian, V. H., Khachikian, E. Ye., & Tiersch H. 1995, Astron. Nachr., 316, 143

Noerdlinger, P. D. 1979, ApJ, 229, 877

Ramella, M., Giuricin, G., Mardirossian, F., & Mezzetti, M. 1987, A&A, 188, 1

Tikhonov, N. A. 1987, Comm. of Special astr. obs., 52, 51

Wirth, A. 1983, ApJ, 274, 541

Yamagata, T., Nogouchi, M., & Iye, M. 1989, ApJ, 338, 707