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# The Environment of Very Luminous Galaxies

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The analysis of the Southern Sky Redshift Survey 2 has shown that the galaxy correlation length increases with galaxy luminosity for $L > L_*$. The correlation length of Very Luminous Galaxies (defined as $M_B \leq -21$, $L > 4L_*$), $r_0 \sim 16 \pm 2h^{-1}$ Mpc, is even comparable to $r_0$ of clusters. Nevertheless, we have shown that most VLGs are not early type galaxies in clusters, and that in many cases they appear to interact with nearby fainter galaxies. Visual inspection of fields around VLGs suggests that many VLGs are the brightest members of systems with much fainter galaxies; this seems an effective way of identifying galaxy systems which cannot be selected by traditional group finding algorithms. The study of VLGs may contribute to our understanding of the halo–galaxy connection and galaxy evolution. Here we resume their main properties and present some results from our observations of a few VLG systems.

## 1 Peculiar properties of VLGs

Through a statistical analysis of volume–limited samples extracted from the SSRS2 catalogue (da Costa et al. 1998), Benoist et al. (1996) have shown that the amplitude of galaxy clustering increases significantly as a function of galaxy luminosity, when $L > L_*$ (see also Willmer et al. 1998); moreover, the analysis of high–order moments shows that the bias is not linear (Benoist et al. 1999). Cappi et al. (1998) have investigated the properties of the Very Luminous Galaxies (i.e. galaxies having $M_B \leq -21$). A particularly intriguing aspect of luminosity segregation is that the clustering length of VLGs, $r_0 \sim 16\ h^{-1}$ Mpc, approaches the cluster correlation length, following the so–called universal dimensionless correlation function. These results might simply indicate that VLGs are in clusters, as already suggested by Hamilton (1984); in this case, most of them should be ellipticals.

However, VLGs are not mainly found in rich clusters or known loose groups, and the fractions of morphological types are consistent with those observed for field $L_*$ galaxies. However, visual inspection of the Digitized Sky Survey images has shown the presence of fainter companions and/or evidence of interaction, but spectroscopic confirmation is required to verify the reality of these associations.

Table 1: VLG systems

| Iden. | $N_{gal}$ | $< V >$ (km/s) | z | $\sigma_r$ (km/s) |
|---|---|---|---|---|
| VLGN 0716+5323 | 9 | 19324 | $0.06446 \pm 0.00072$ | $609^{+234}_{-109}$ |
| VLG061 | 7 | 5782 | $0.01929 \pm 0.00044$ | $318^{+177}_{-67}$ |

If VLGs are within massive halos, as suggested by their high correlation amplitude, and the fainter galaxies seen in the same fields are physically associated to the VLGs, then we should conclude that the luminosity function of galaxy systems has significant variations. Moreover, most of the VLGs being spirals, they could not accrete most of their mass by merging (which heating their disk would have destroyed their spiral structure, see Tóth & Ostriker 1992).

Another interesting issue concerns the definition and selection of galaxy groups. The algorithms used to select groups require the detection of at least three neighbouring galaxies above the limiting magnitude of the catalogue. For this simple reason, such catalogs do not include typical galaxy systems like our Local Group.

## 2 Observations of selected VLG fields

In order to confirm if faint galaxies are physically associated to VLGs, and to estimate the velocity dispersion of these systems, spectroscopic observations in the fields of three SSRS2 VLGs (VLG061, VLG068, VLG074) and one VLG selected from the CfA north were carried out at the Observatoire de Haute Provence, using the spectrograph *Carelec* at the 1.93m telescope. We could confirm that most of the fainter galaxies around VLG061 are at the same redshift: the velocity dispersion of this system is $\sigma \sim 300$ km/s. VLG068 forms an interesting triplet with two Markarian galaxies. VLG074 is an interacting binary system of two spiral galaxies, but their magnitude has probably been overestimated. The northern VLG was selected as representative of the minority fraction of elliptical VLGs, being the brightest galaxy of the Zwicky poor cluster Z1261. We find a velocity dispersion $\sigma \sim 600$ km/s, in excellent agreement with the X–ray temperature of the cluster ($kT = 2.8$ keV). Data concerning the systems associated to VLG061 and Z1261 are shown in table 1. In Cappi et al. (1998) we have listed also the velocity dispersion of systems already known in the literature. The observed range of velocity dispersions is between 100 and 600 km/s.

It is clear that the observation of fields centered on VLGs reveals galaxy systems which are not selected by traditional group finding algorithms. The clustering amplitude of VLGs is significantly higher than that of typical loose or compact groups, suggesting the presence of massive haloes. It would be important to determine their M/L ratios, but further, more detailed observations of a larger subsample of these systems are required.

## Acknowledgements

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Figure 1: VLG061: finding chart.

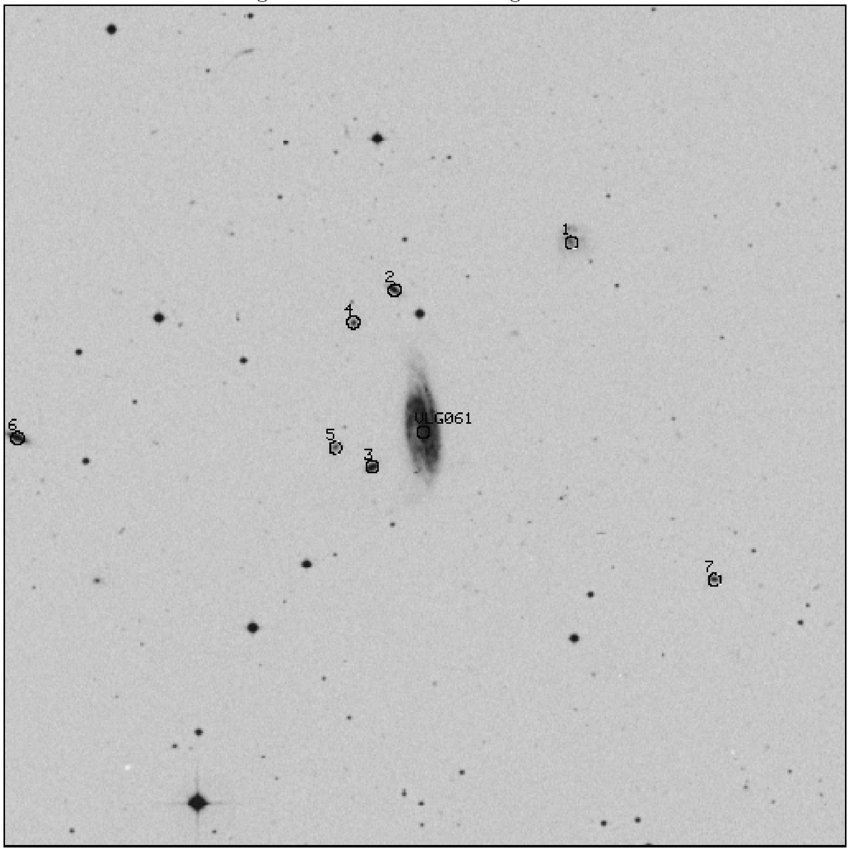


Figure 2: VLG068: finding chart.

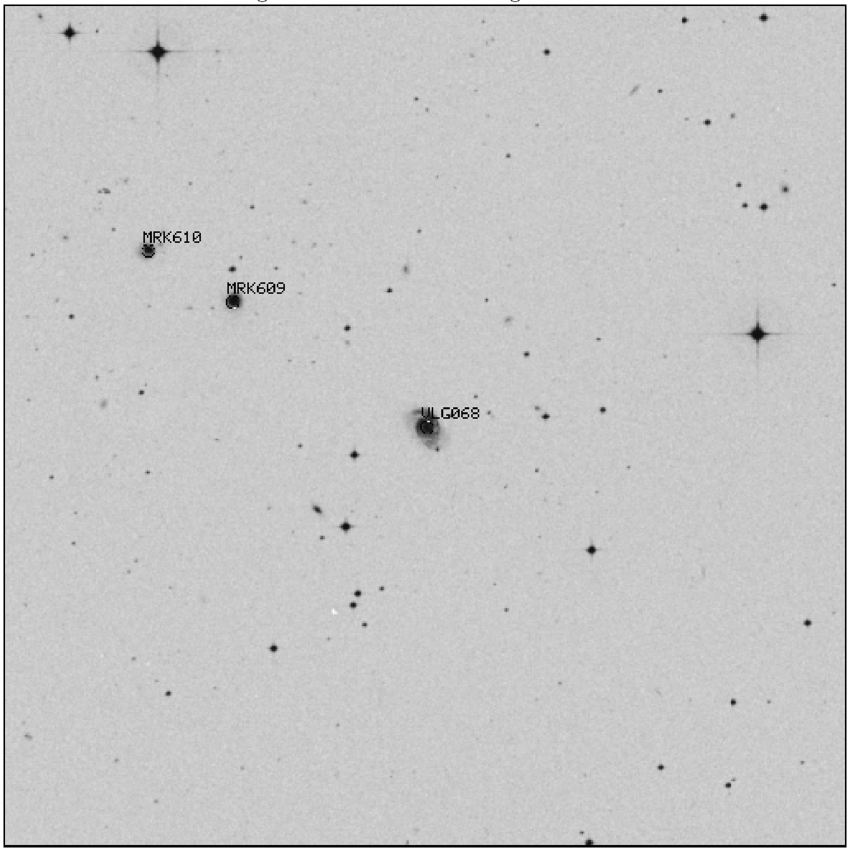


Figure 3: VLG074: finding chart.

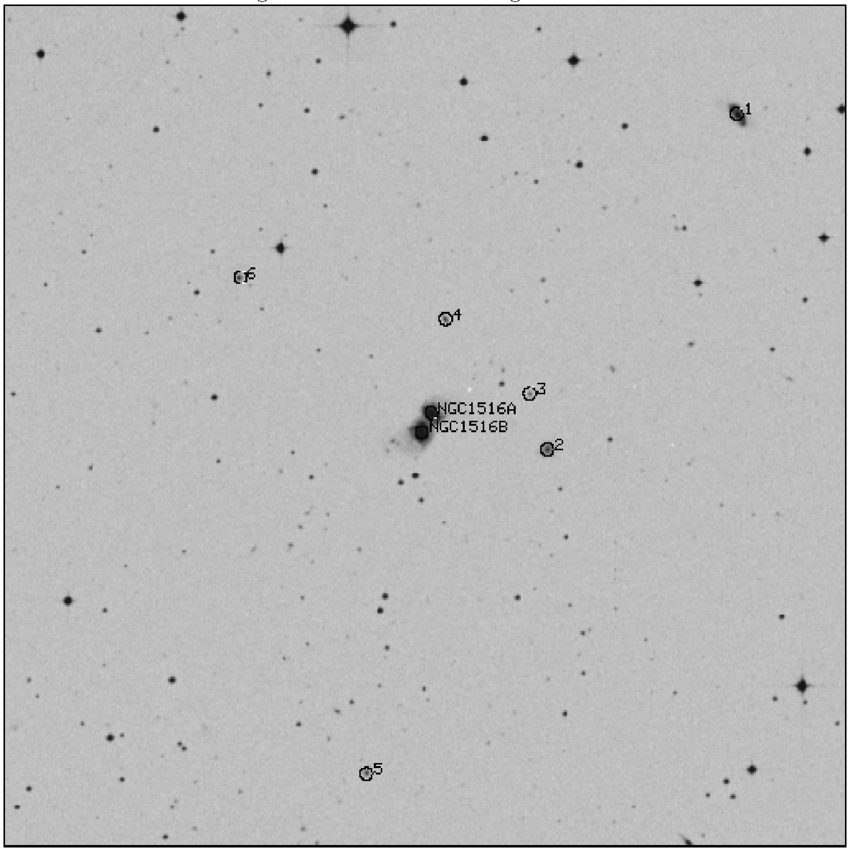
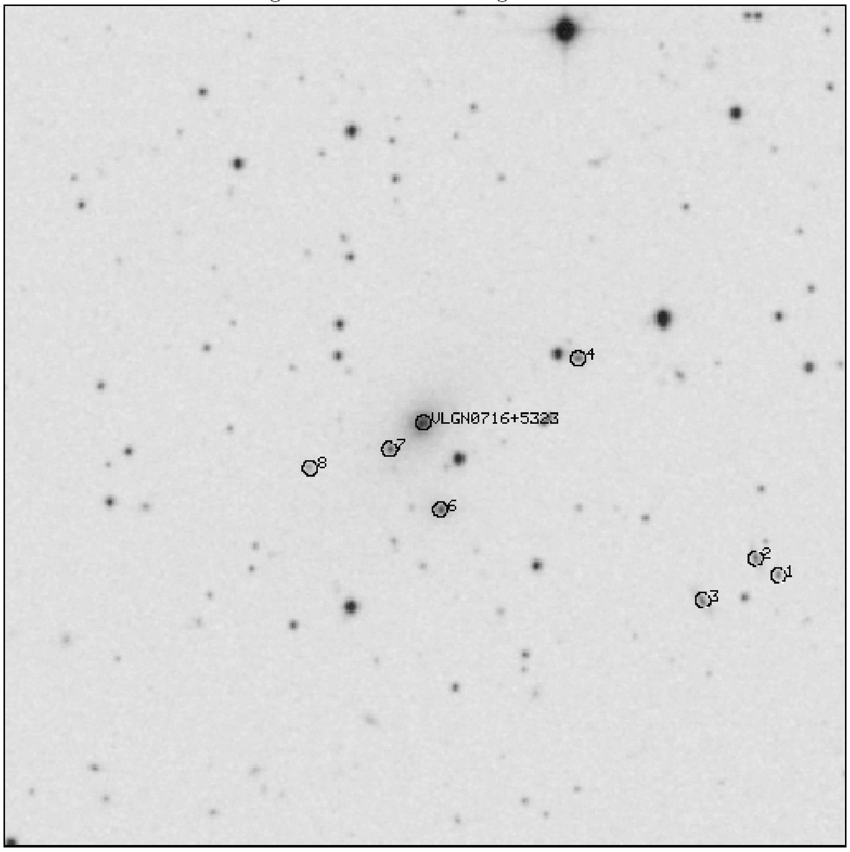


Figure 4: Z1261: finding chart.



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