

# Galaxy populations in rich and poor environments

Heidi Lietzen

Tuorla Observatory, University of Turku, Finland,  
in collaboration with:

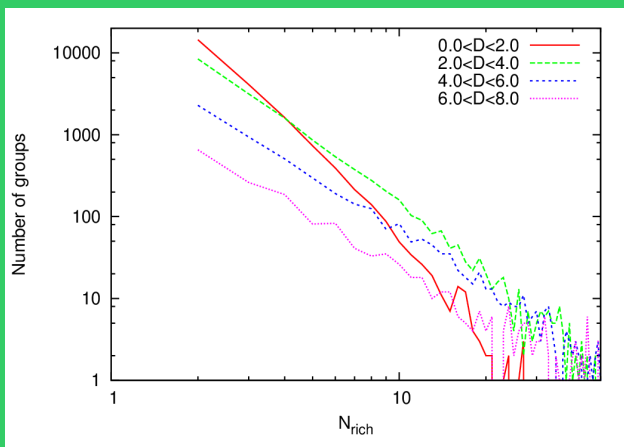
Elmo Tempel, Pekka Heinämäki, Pasi Nurmi, Maret Einasto, and Enn Saar

## There are more galaxies, where there are less galaxies

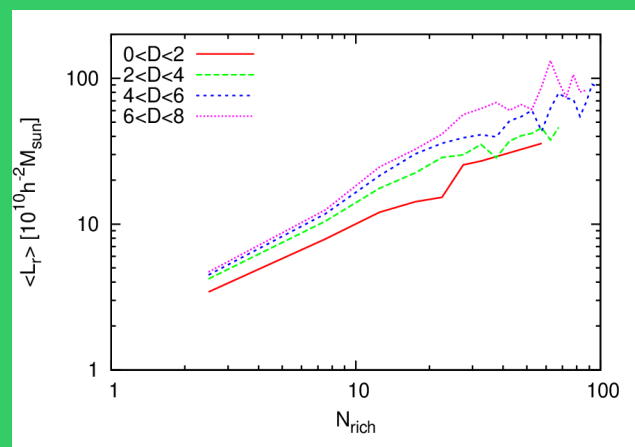
- We use a luminosity-density field to estimate environments of galaxies on large,  $\sim 10$  Mpc scales.
- Four density bins:  $0 < D < 2$  (voids),  $2 < D < 4$  (filaments),  $4 < D < 6$  (supercluster edges), and  $6 < D < 8$  (supercluster cores)
- Most galaxies are in small groups and low-density large-scale environments (Fig. 1).

## How do the properties of clusters, groups, and galaxies depend on their large-scale environment?

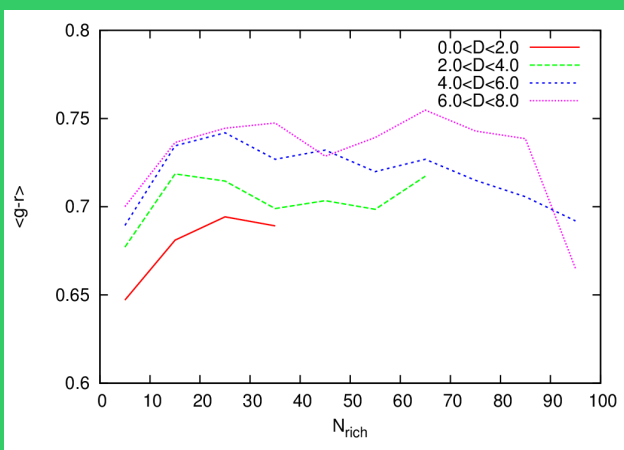
- With the same group or cluster richness, but higher density large-scale environment:
  - The group/cluster is more luminous (Fig. 2).
  - Average color of galaxies is redder (Fig. 3).
  - The fraction of passive galaxies is higher (Fig. 4)
- Conclusion: The large-scale environment affects galaxies independently of group richness.



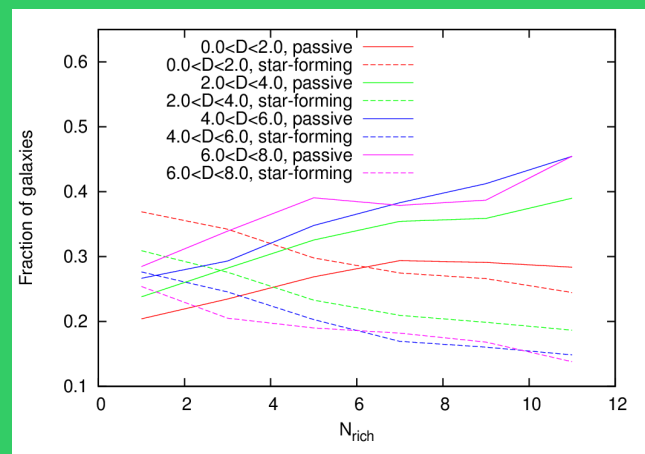
**Fig. 1.** Number of groups as a function of richness in the four large-scale density bins.



**Fig. 2.** Average luminosity of groups and clusters. Void groups are fainter than equally rich groups in superclusters.



**Fig. 3.** Average color of galaxies. The denser the large-scale environment, the redder the galaxies even with the same group richness.



**Fig. 4.** Fractions of passive and star-forming galaxies in small groups. Passive fraction grows higher in superclusters.