

# The Evolution of Galaxies in Compact Groups

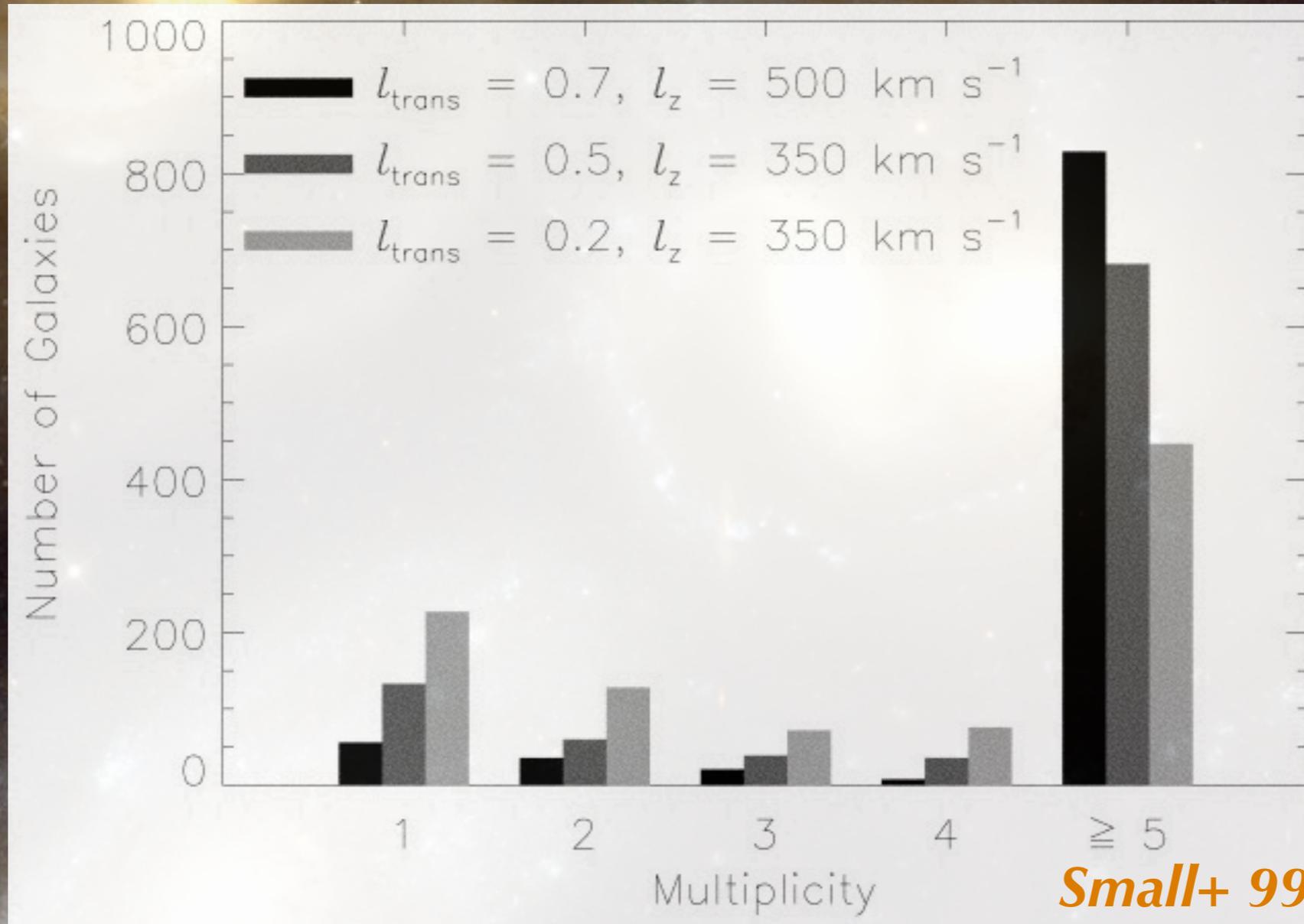
**Iraklis Konstantopoulos**  
*John Stocker Research Fellow, AAO*

Galaxy Zoo, Sydney, 26 September 2013

The image features two large galaxies against a dark, star-filled background. The galaxy on the left is predominantly yellow and orange, with a bright central core and diffuse, irregular edges. The galaxy on the right is predominantly blue and white, also with a bright central core and more defined, swirling structures. The background is filled with numerous stars of varying colors and sizes, some appearing as bright points with diffraction spikes. A semi-transparent black rectangular box is positioned in the lower-middle section of the image, containing white text.

*this presentation has been modified  
for stand-alone pdf viewing—enjoy!*

# why study groups?



*galaxy clusters:*

$$f(M^*) \sim 2\%$$

*e.g., Eke+ 2005*

$$f(M^*) \sim 50\%$$

*groups*

**VS**

*clusters*

$$f(M^*) \sim 2\%$$

# compact galaxy groups

- \* Highest volume densities
- \* Small memberships

- ➔ Most of the processes
- ➔ Few degrees of freedom

- \* 50:50 isolated:embedded

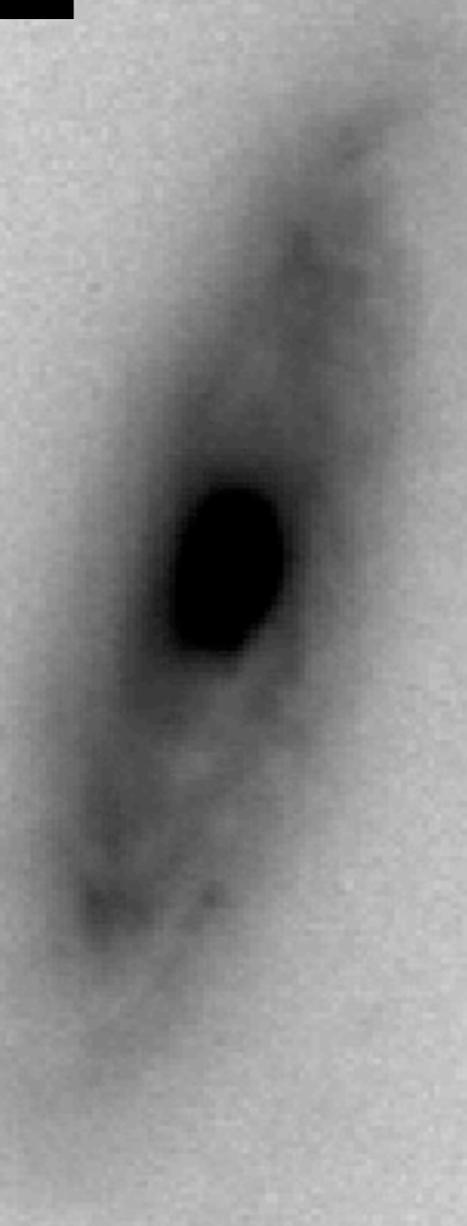
**evolutionary** PATHS

IN GALAXY **morphology**

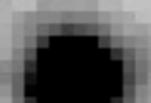
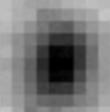
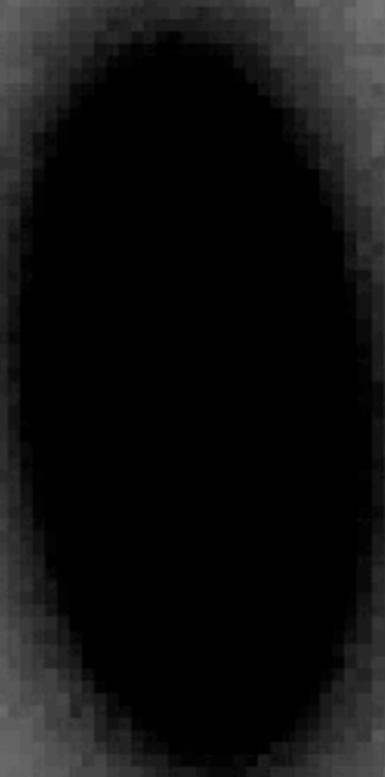
what about their

**morphologies?**

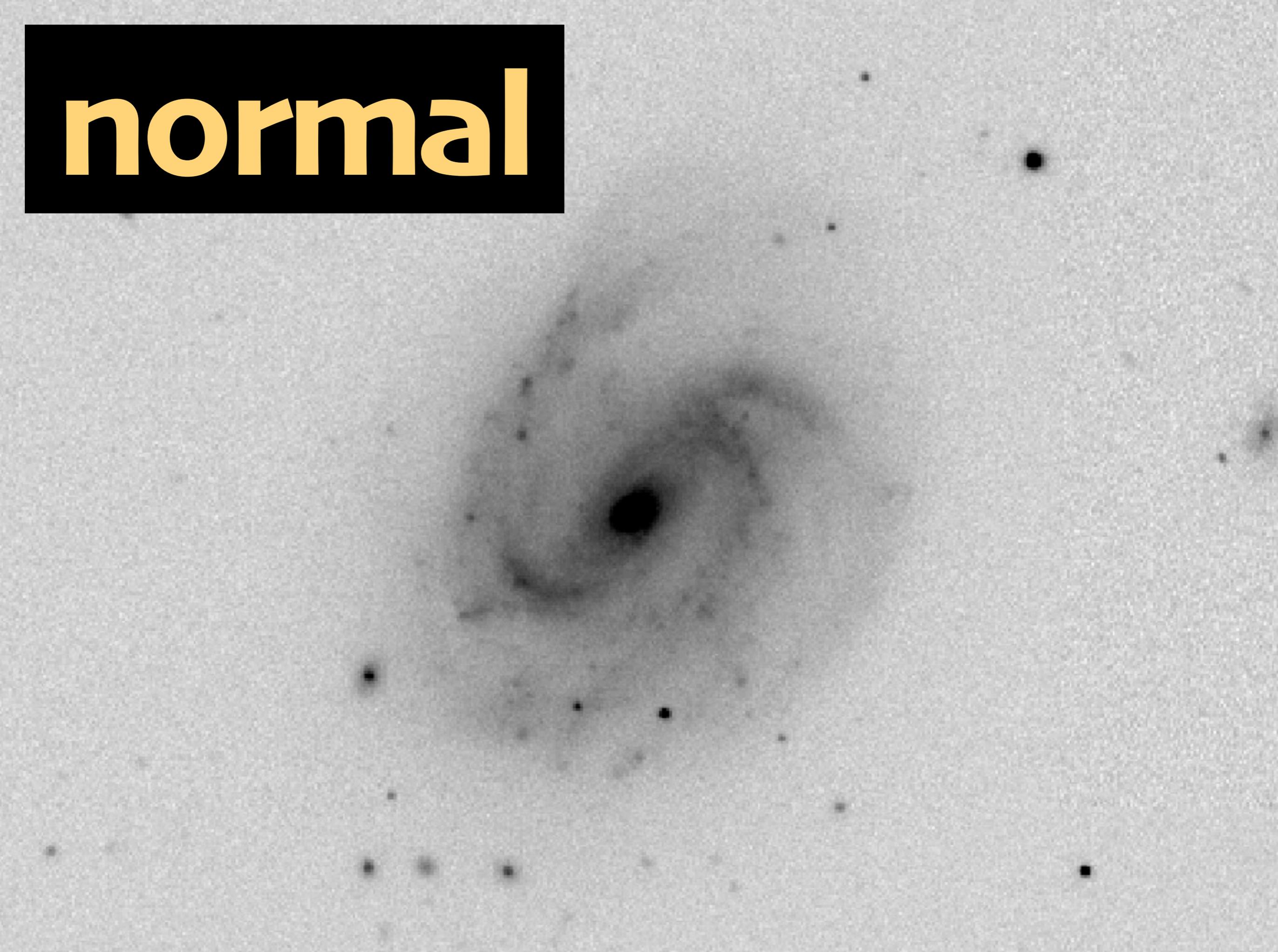
**normal**



**normal**

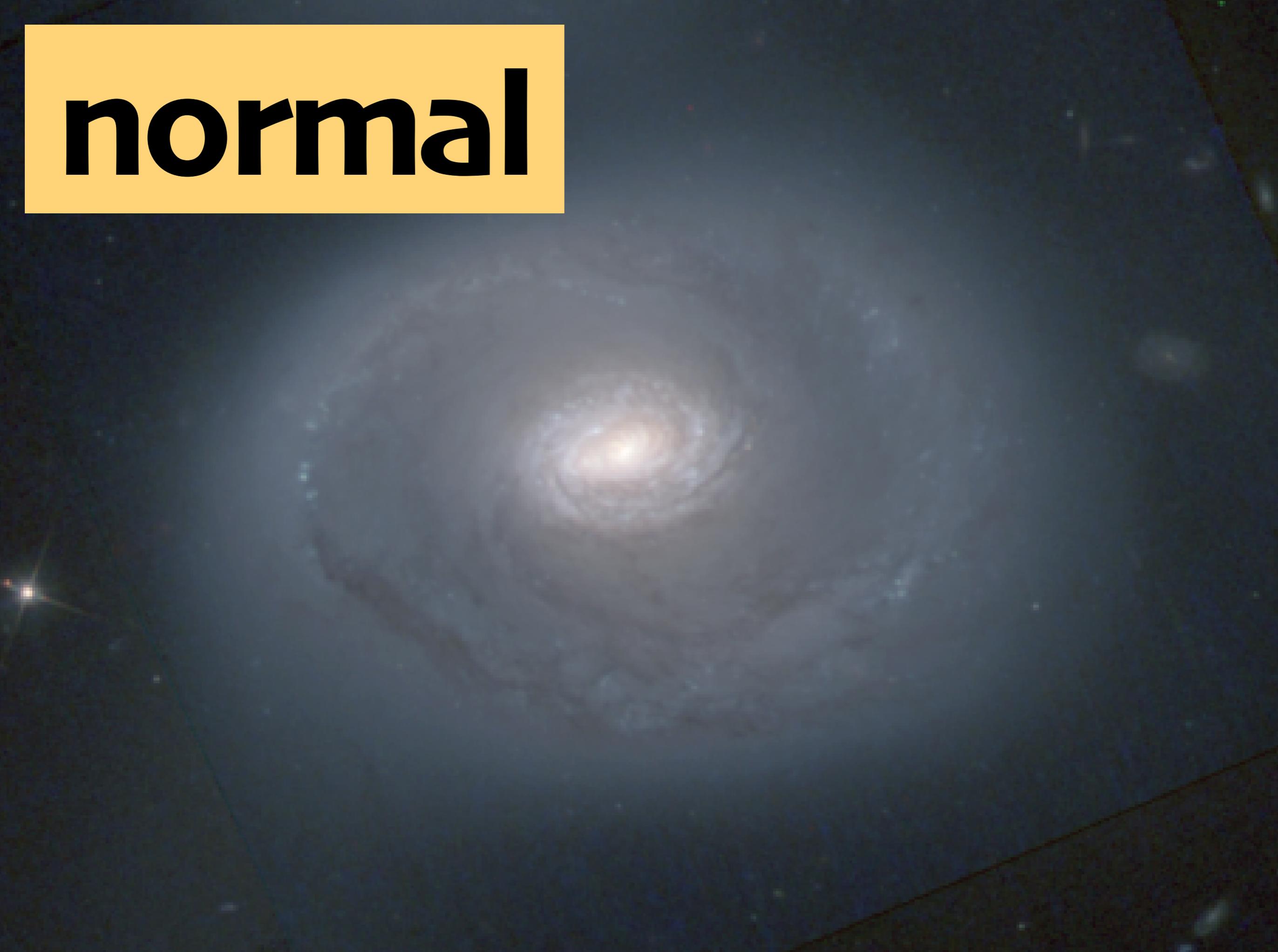


**normal**



**FREAK!**

**normal**



**normal**



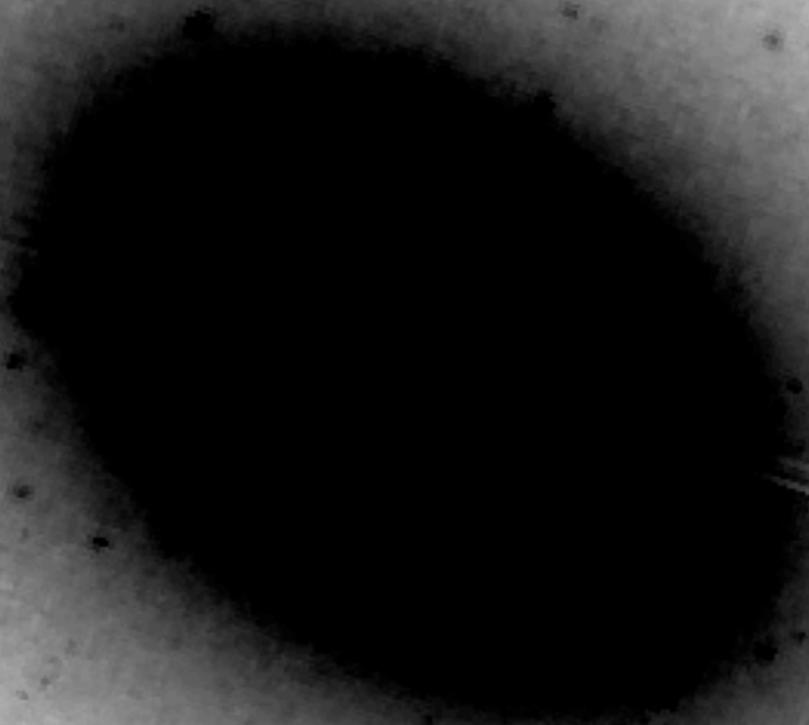
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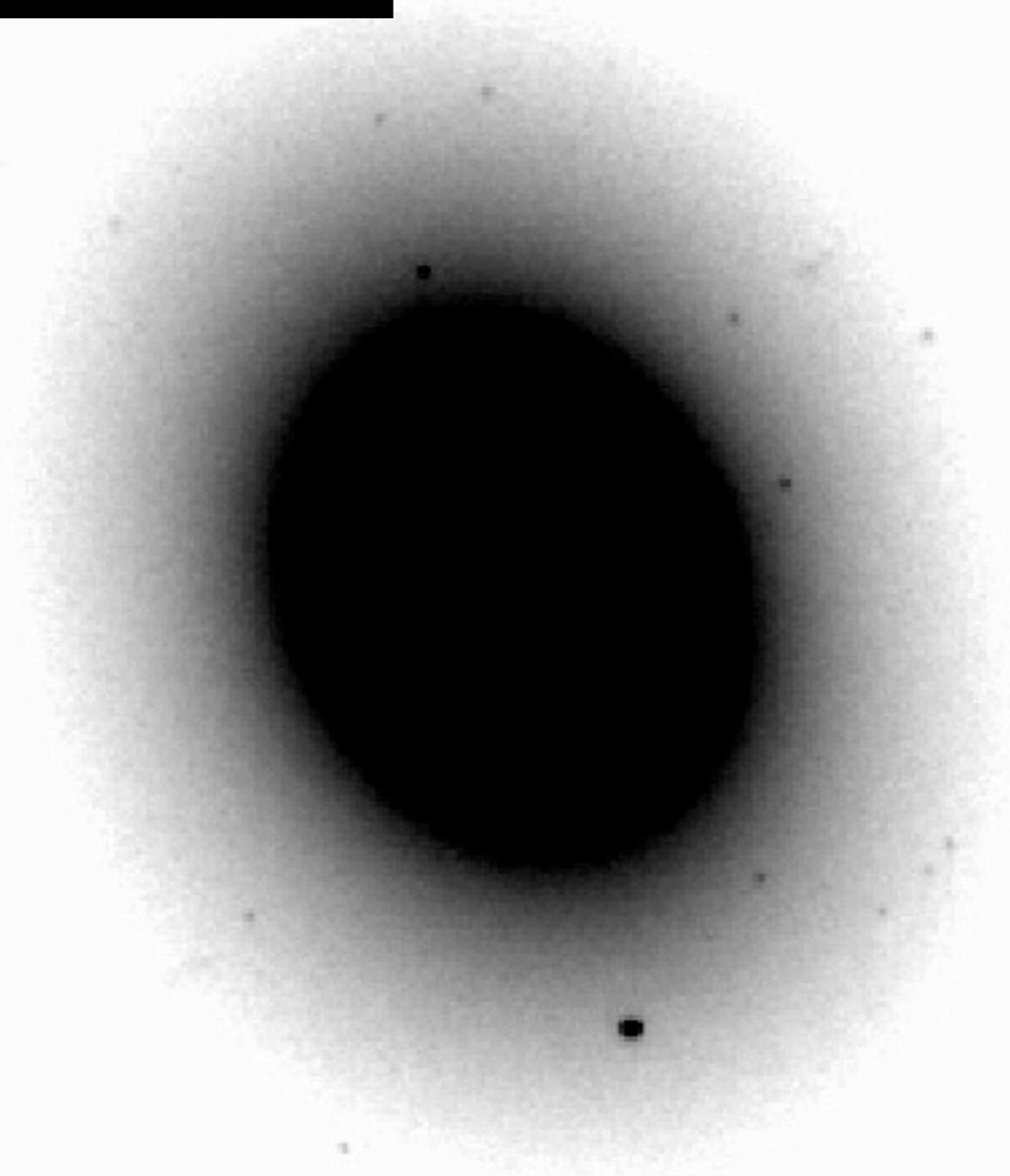
**FREAK!**



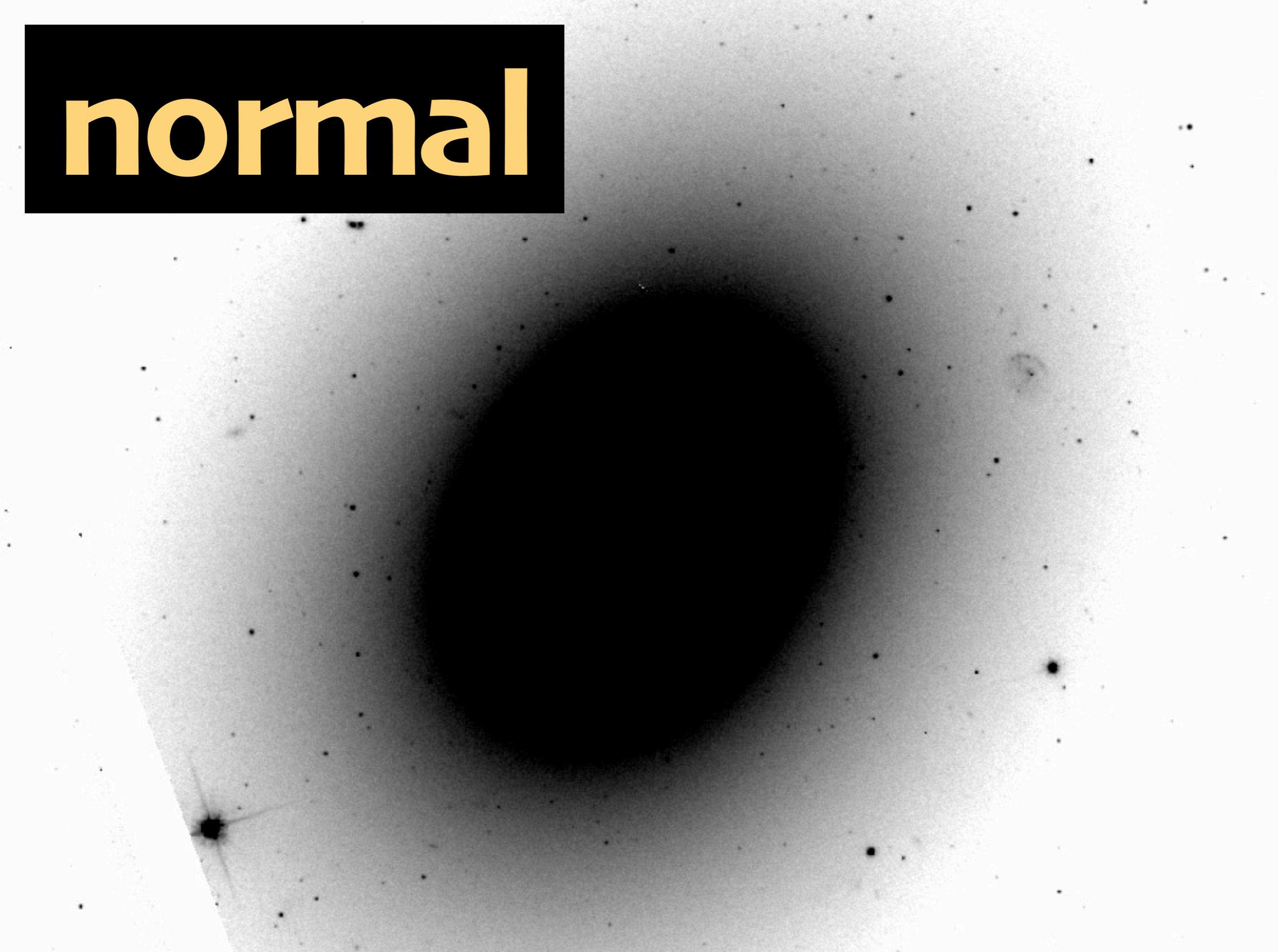
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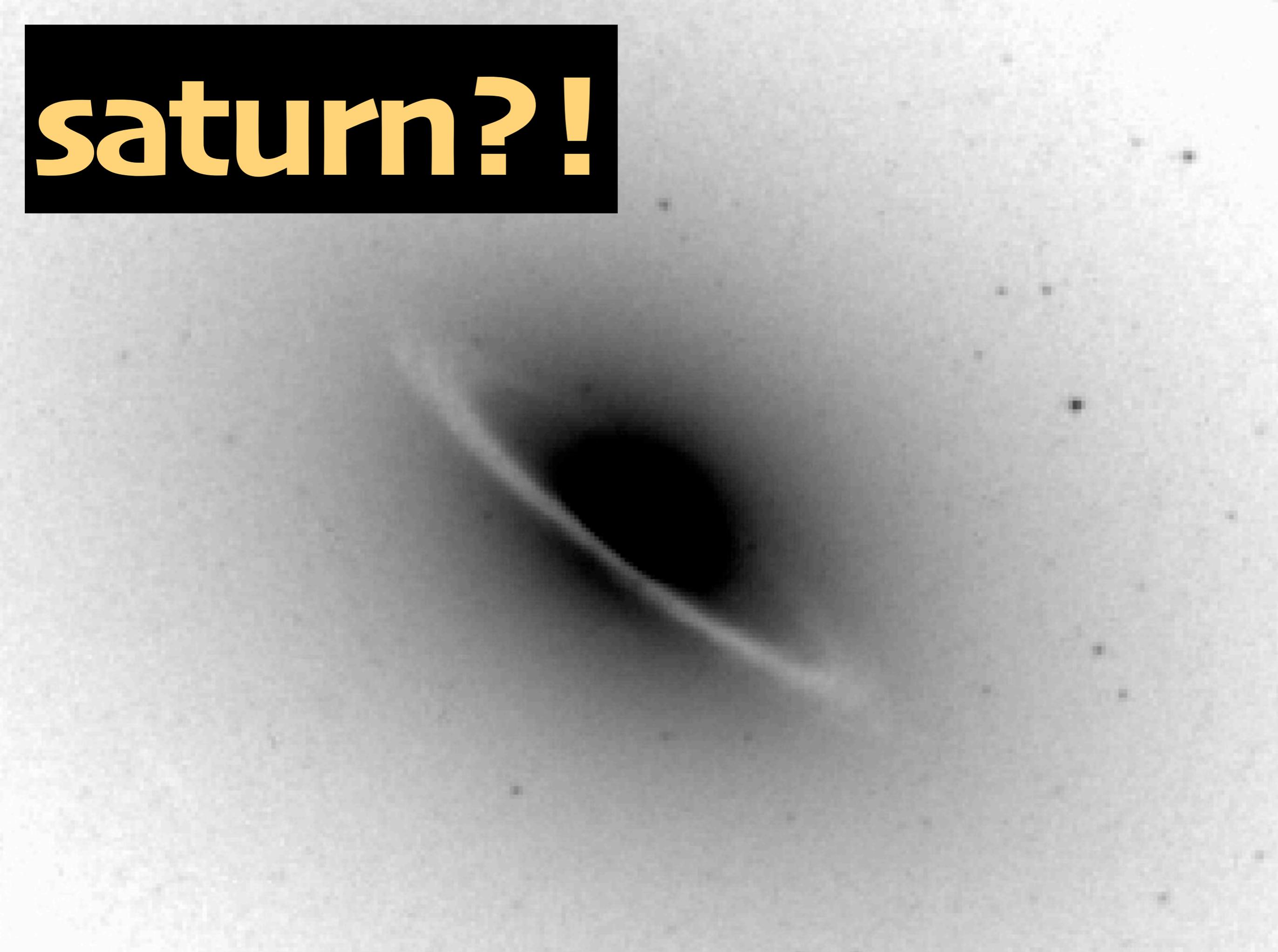
**normal**



**normal**



**saturn?!**



**normal**



**normal**



**normal**



**really?!**



**75%**

**normal**

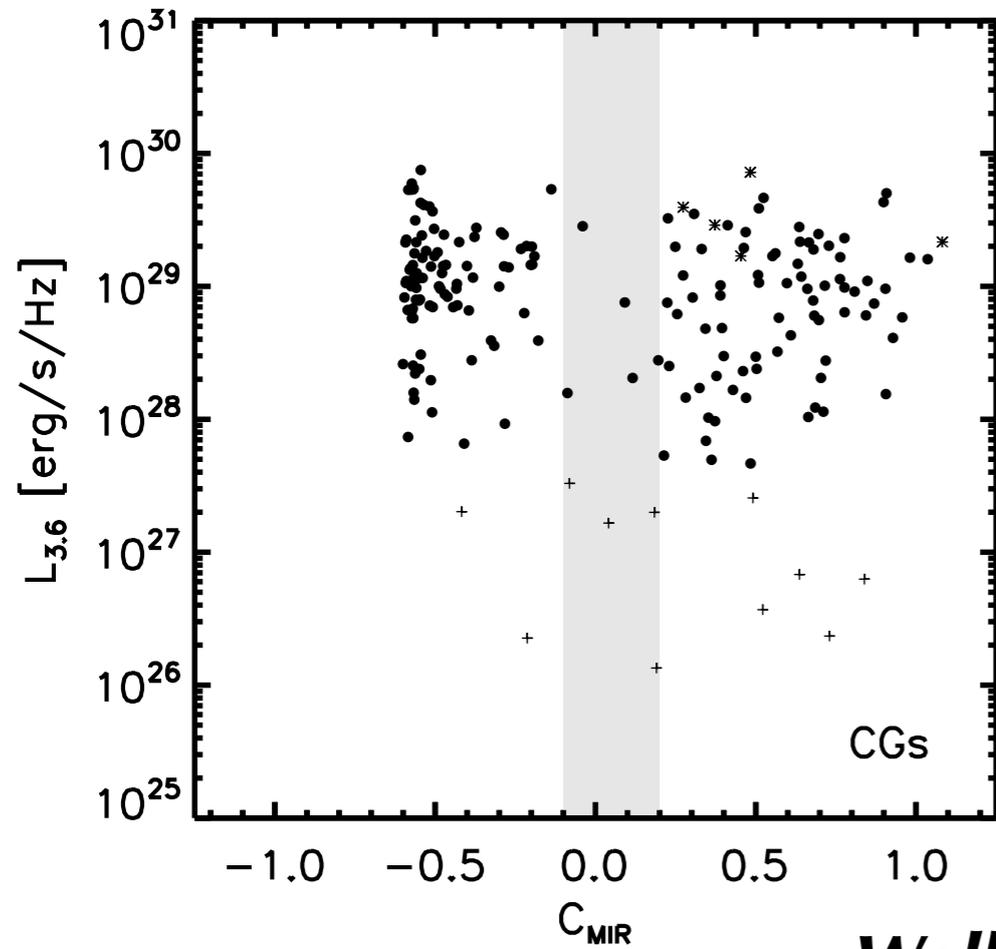
**25%**

**FREAK!**

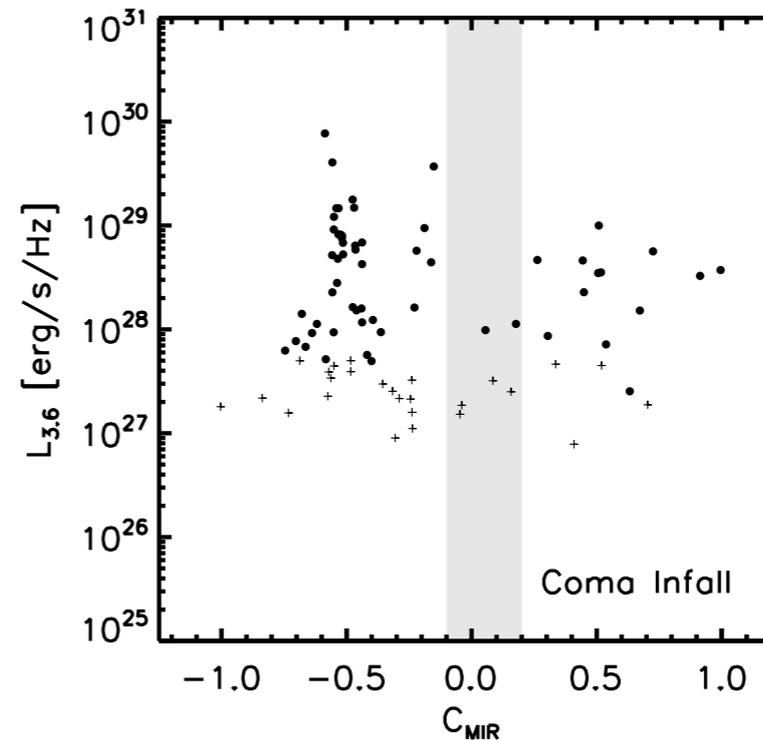
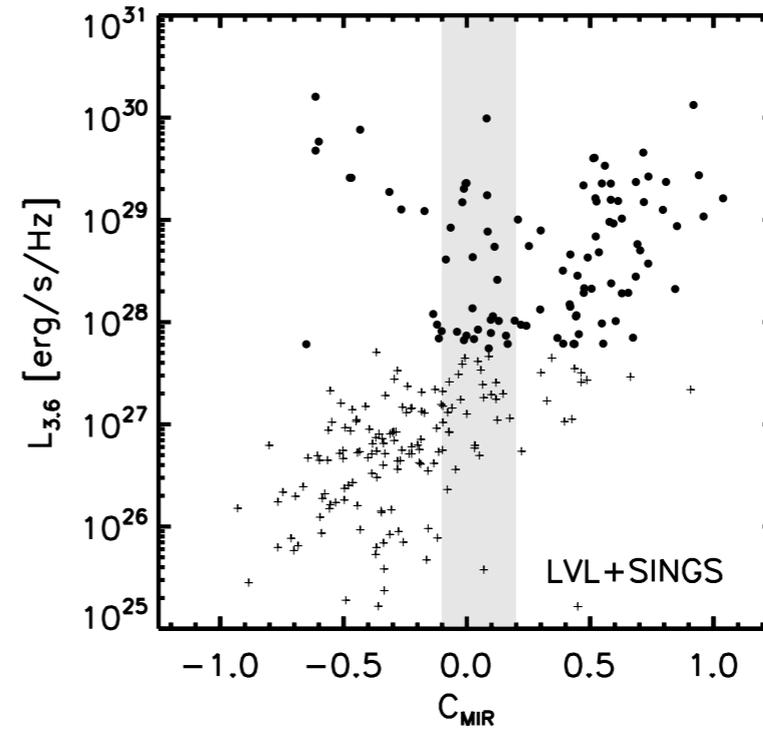
what about their

**evolution?**

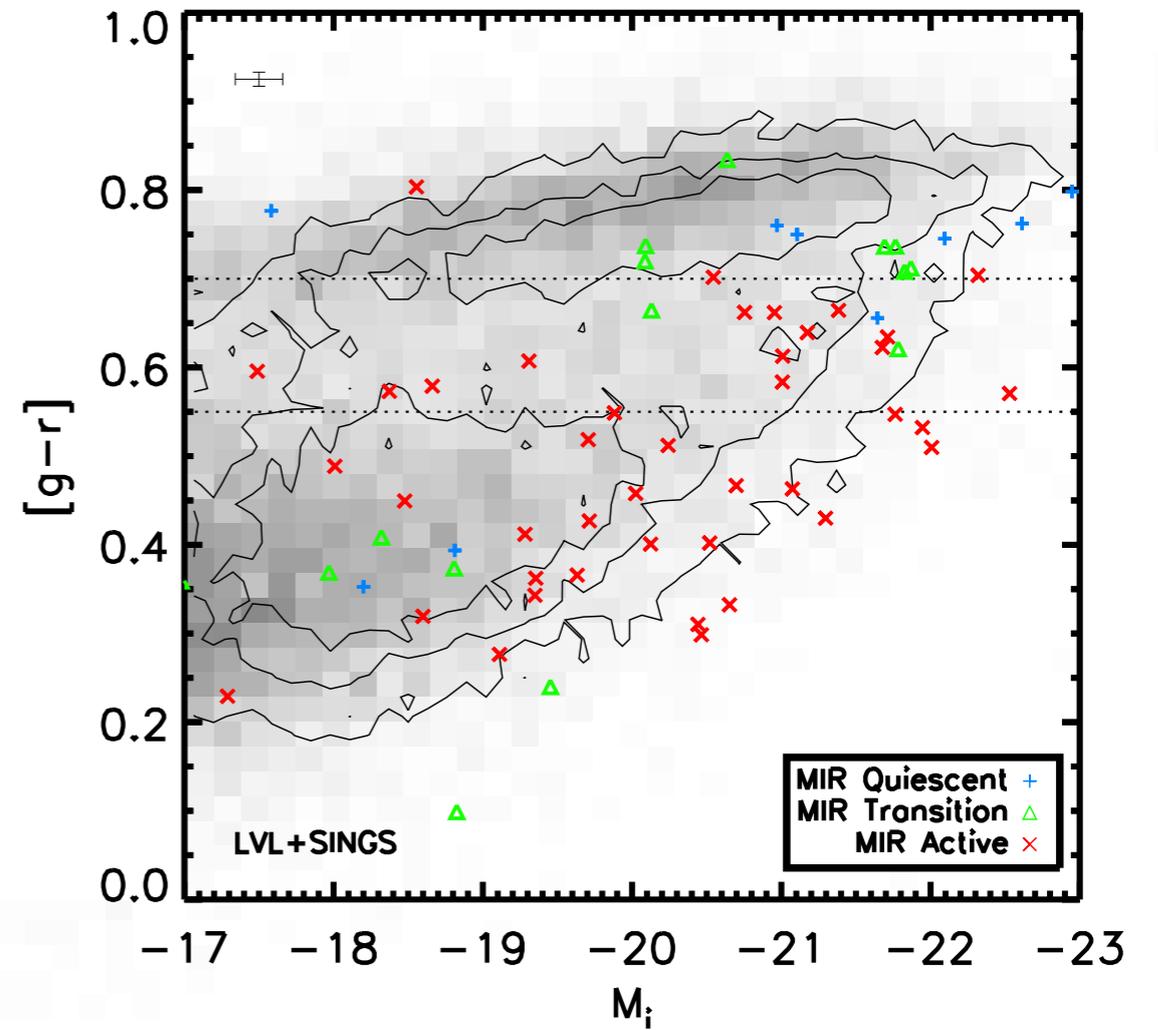
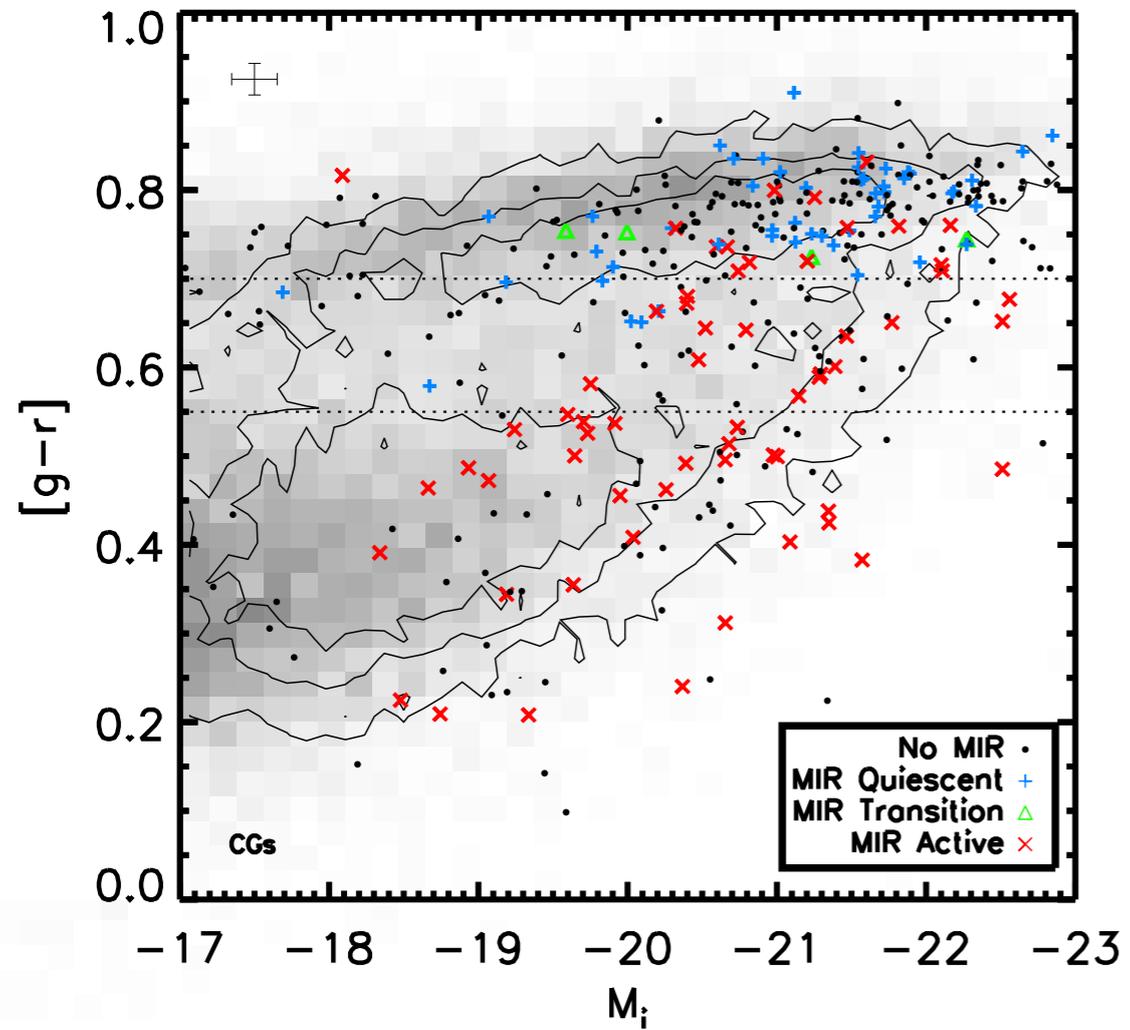
# bimodal mid-IR colour distro



*Walker+ 12*

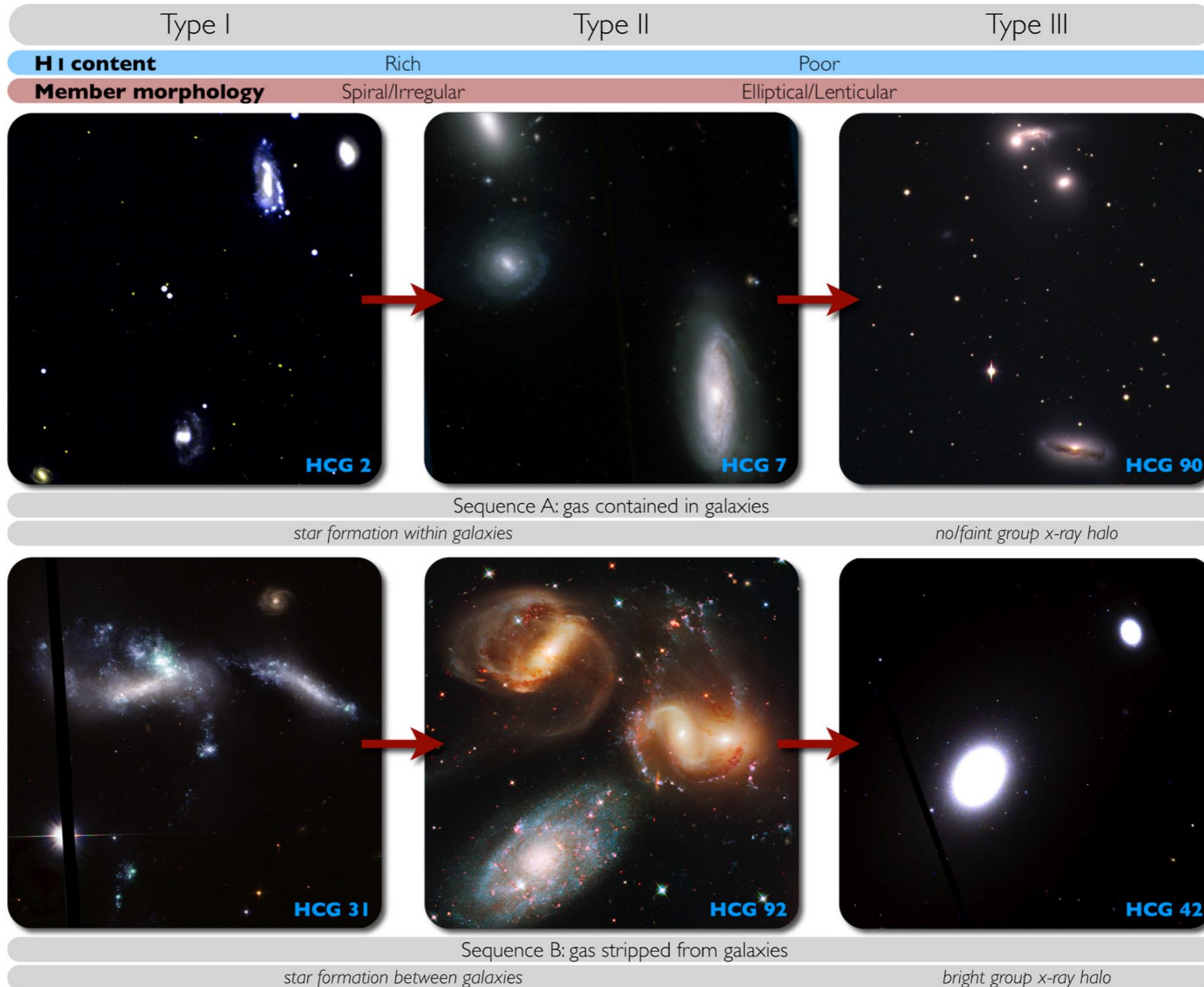


# valley, shmalley



*Walker+ 13*

# proposed evolutionary sequence



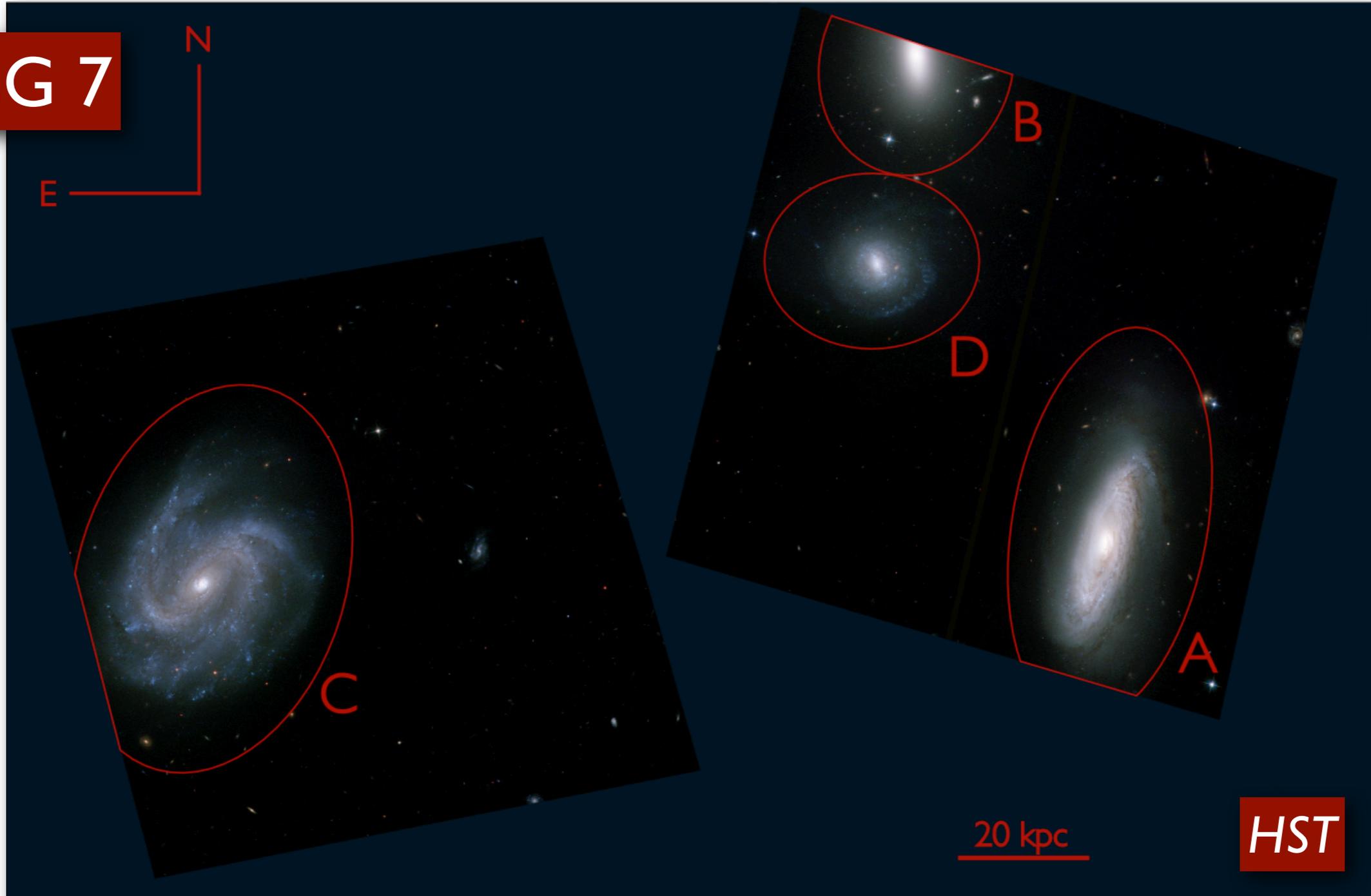
**sequence B**

**SPHEROIDS ON  
STEROIDS**

**sequence A**

# appearances deceive

HCG 7



20 kpc

HST

*Konstantopoulos+ 10*

# compact groups: huh, what are they good for?

- \* Majority of galaxies (/stars) in small groups.
- \* CGs are as dense as clusters, but simpler.
- \* Rapid evolution, elevated SFRs.
- \* S0 production plants.
- \* Delivery mechanism of evolved galaxies.

how do we find them  
**in surveys?**

- \* An imaging survey.
- \* McConnachie+ 09, Mendel+ 11:
  - \* Apply Hickson '82 criteria:
    - \* ~1% of all galaxies in HCG-like groups.
    - \* ~50% of CGs embedded in rich groups.

**GAMA**



- \* A spectroscopic survey,  $\sim 2e5$  galaxies.
- \*  $r \lesssim 20$  mag, covers reasonably low  $M^*$ .
- \* Ancillary info:  $M^*$ , SFR, morphology ++
- \* Free of pesky galaxy clusters!

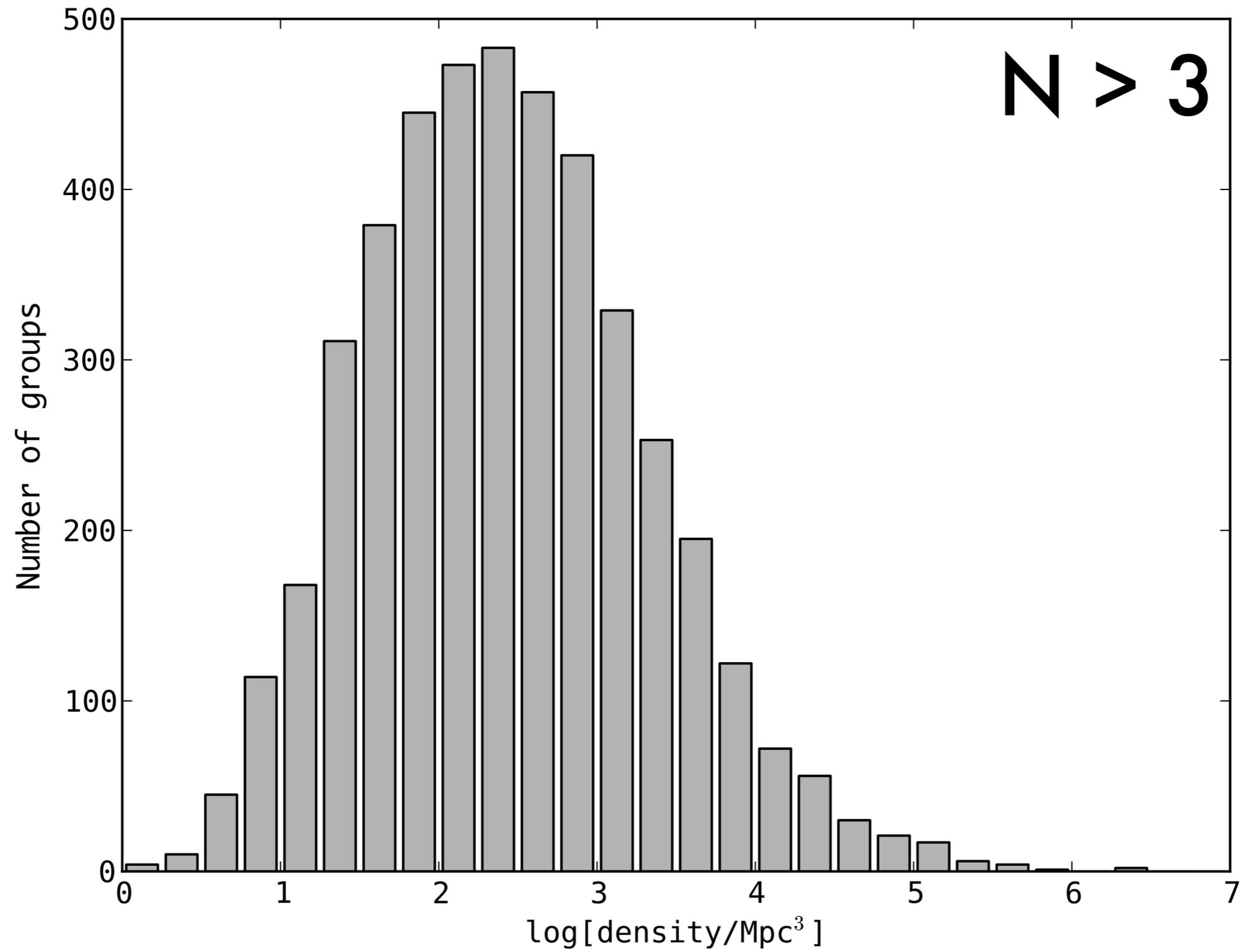


- \* GAMA Galaxy Groups Catalogue: Robotham+ 2011.
- \* 40% of all GAMA galaxies are grouped (including in pairs and triplets).
- \* How many groups are compact?
- \* And do they display HCG-ish behaviour?

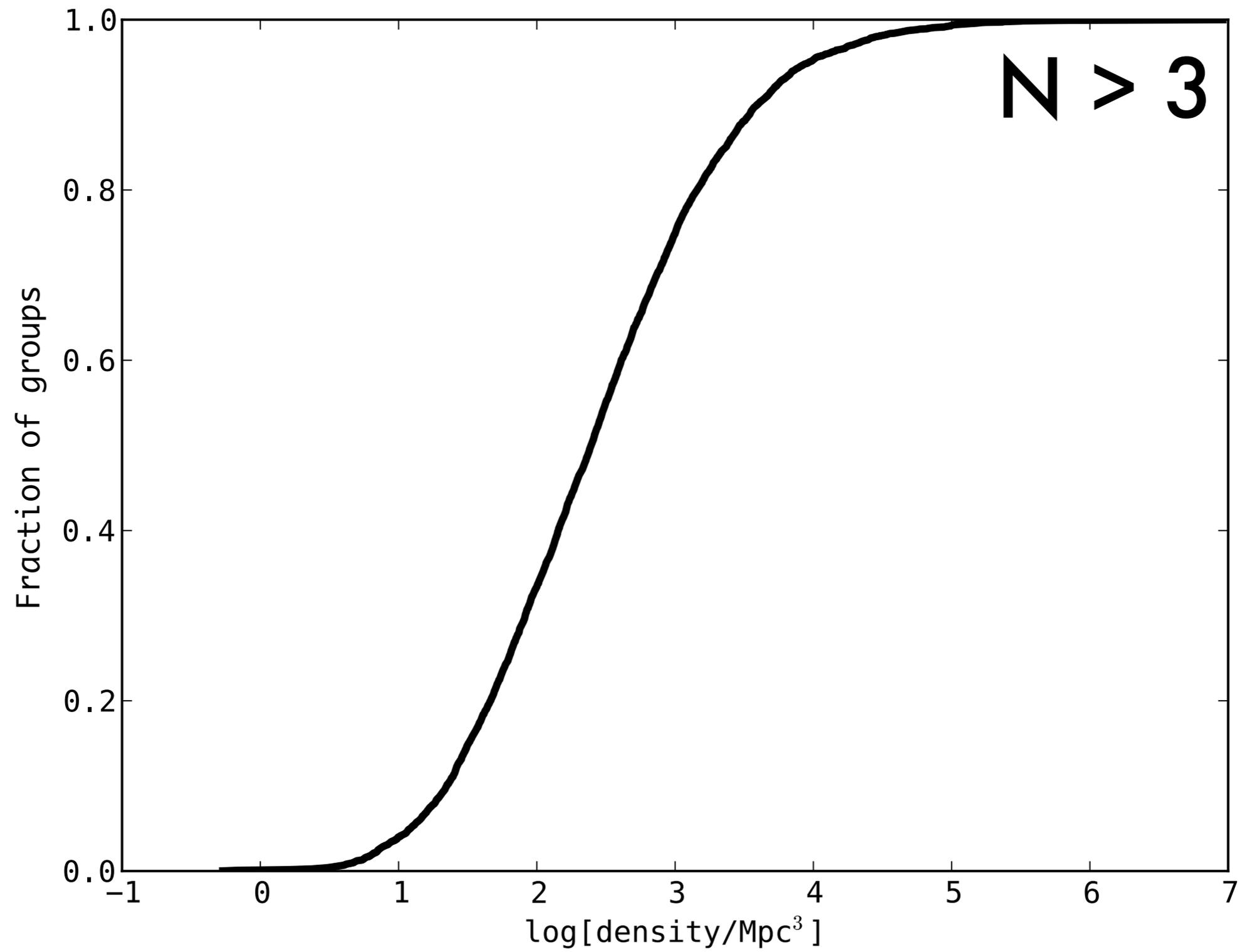
compactness equals

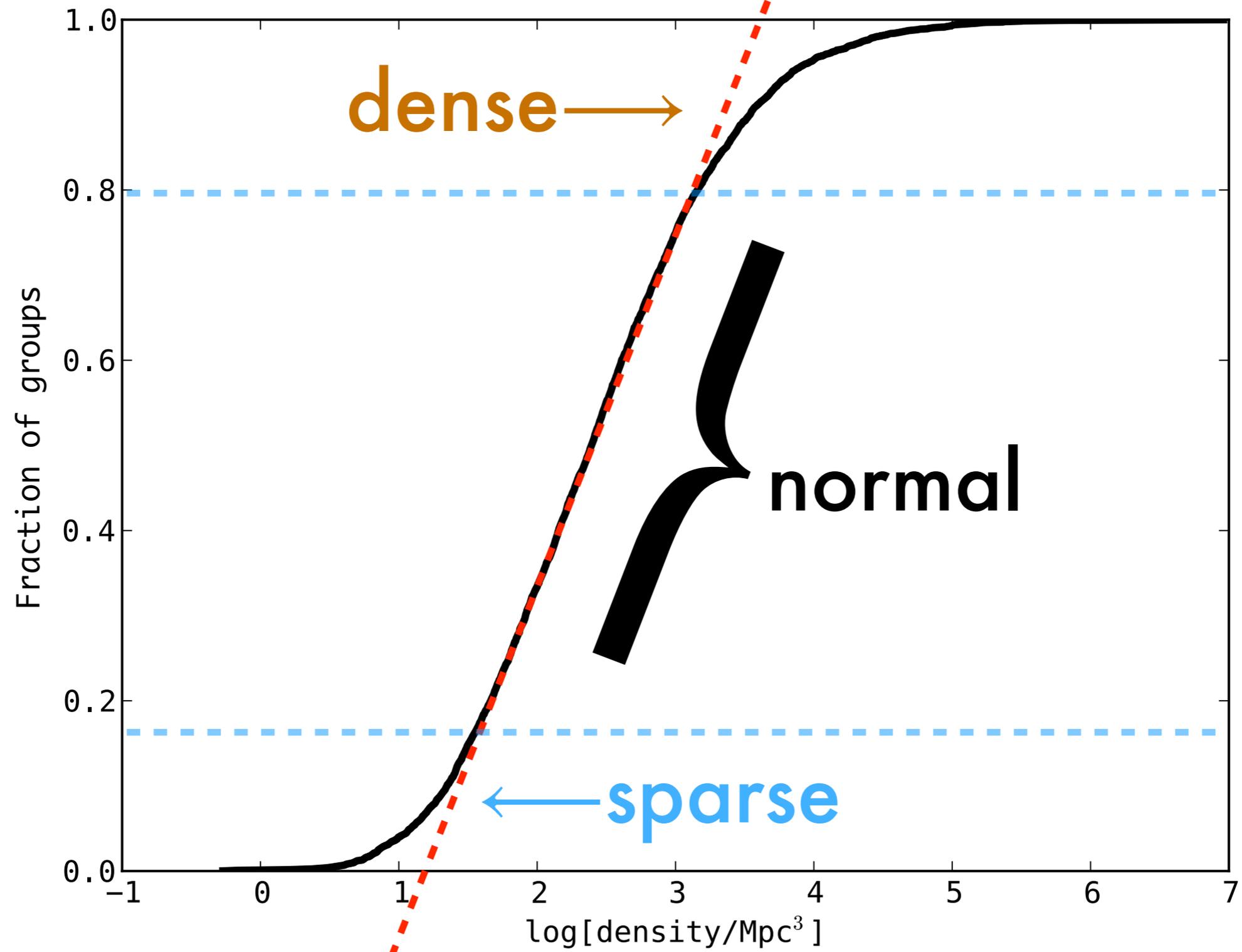
**density**

# group densities



# group densities

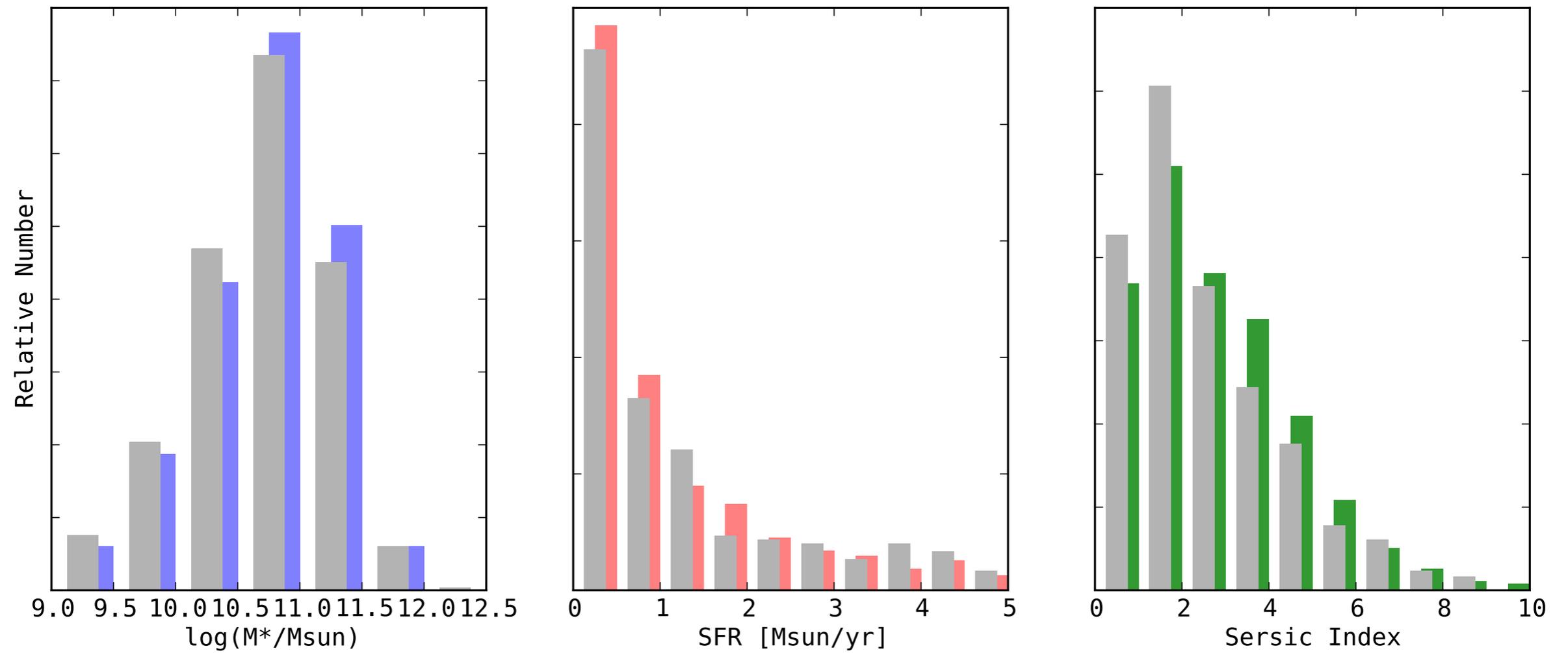




GAMA



- \* How many groups are compact?
- \* About 10%
- \* They contain  $\sim 10\%$  of grouped galaxies.
- \* ...i.e.,  $\sim 4\%$  of all GAMA galaxies!
- \* *And do they display HCG-ish behaviour?*



grey: control

colour: CGs

**GAMA**



- \* Do they display HCG-ish behaviour?
- \* Assembly: greater stellar mass, fixed SFR.
- \* Evolution: higher Sersic indices.
- \* ...so, maybe.

# compact groups & galaxy evolution

- \* 50% of  $M^*$  in groups.

- \* Clusters are, like, so 2001.

- \* Rapid evolution.

- \* S0/slow rotator production.

- \* G3C analysis promising.

- \* First dynamical definition.

