

Scaling relations

Tully-Fisher

Faber-Jackson

size-mass

Luminosity/Mass Fcns

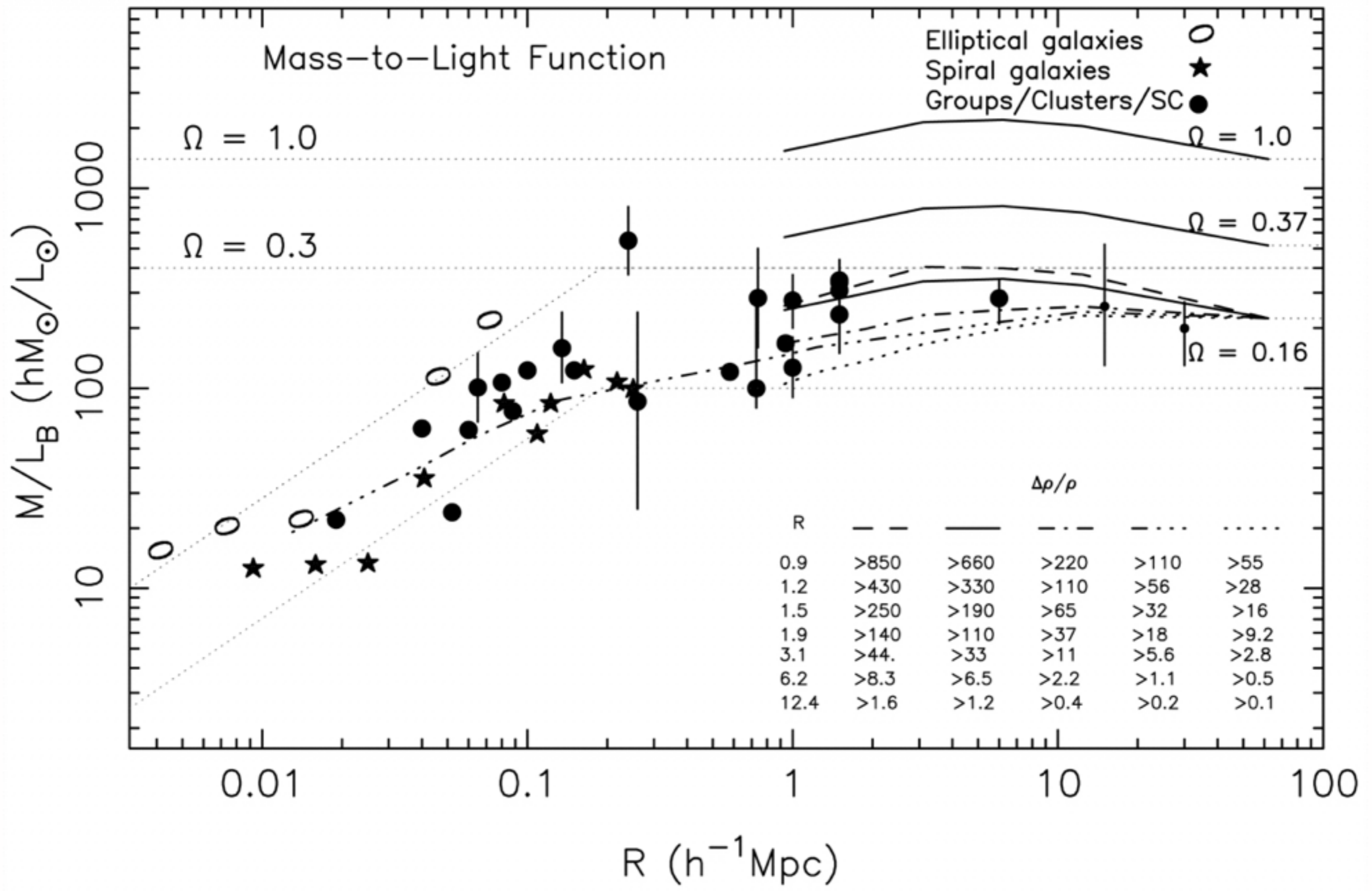
baryon fractions

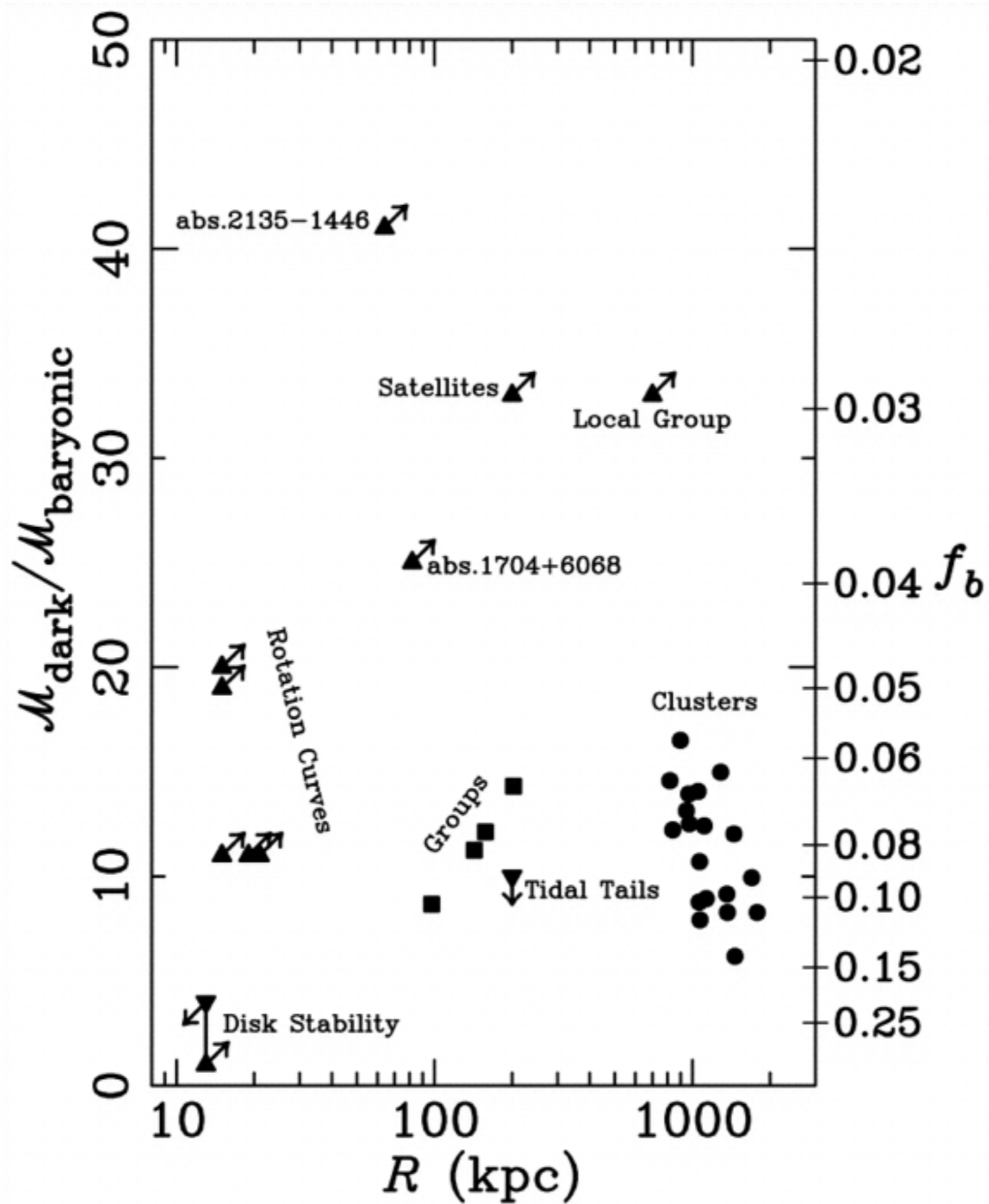
M/L vs scale

logistics

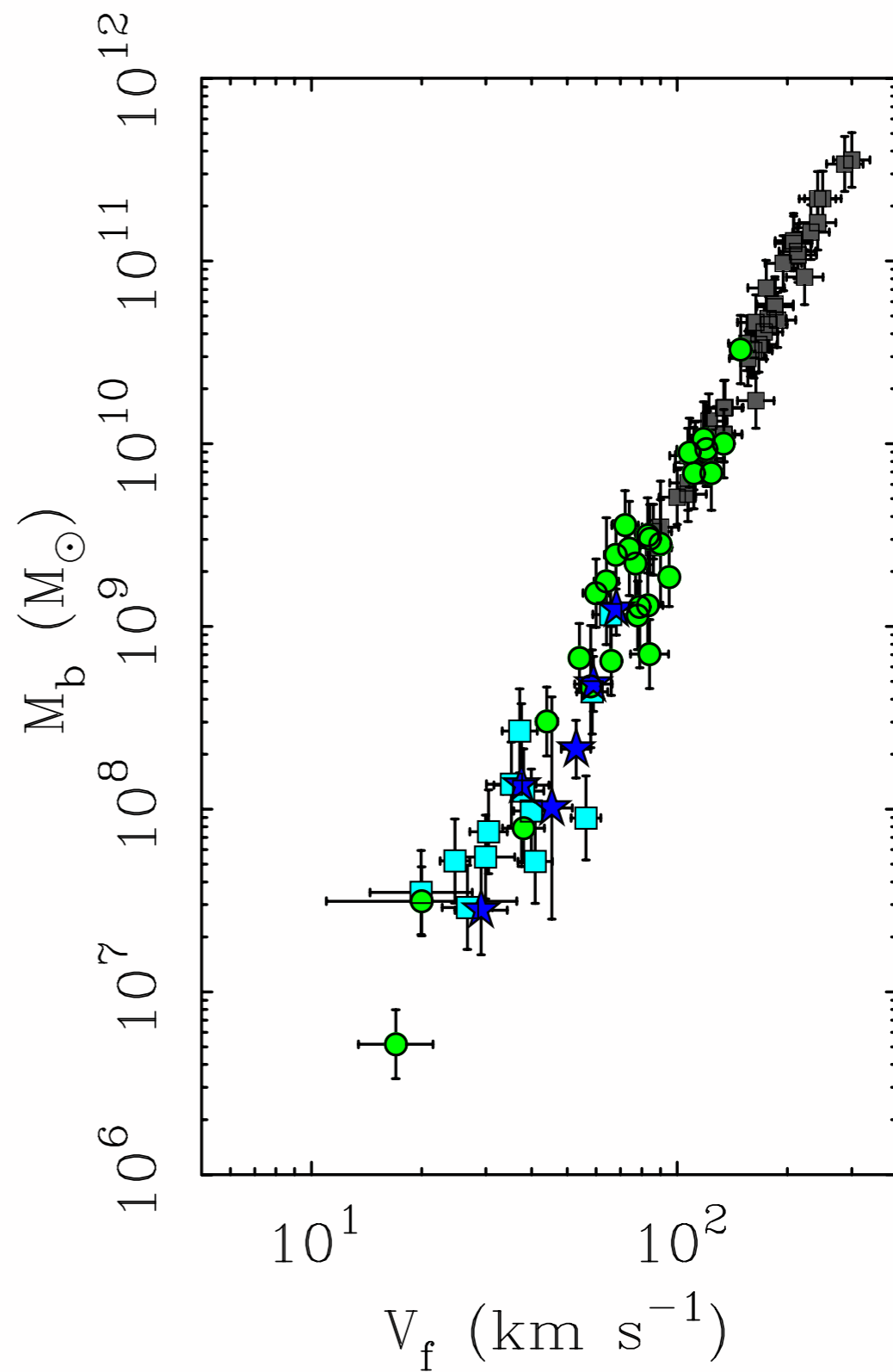
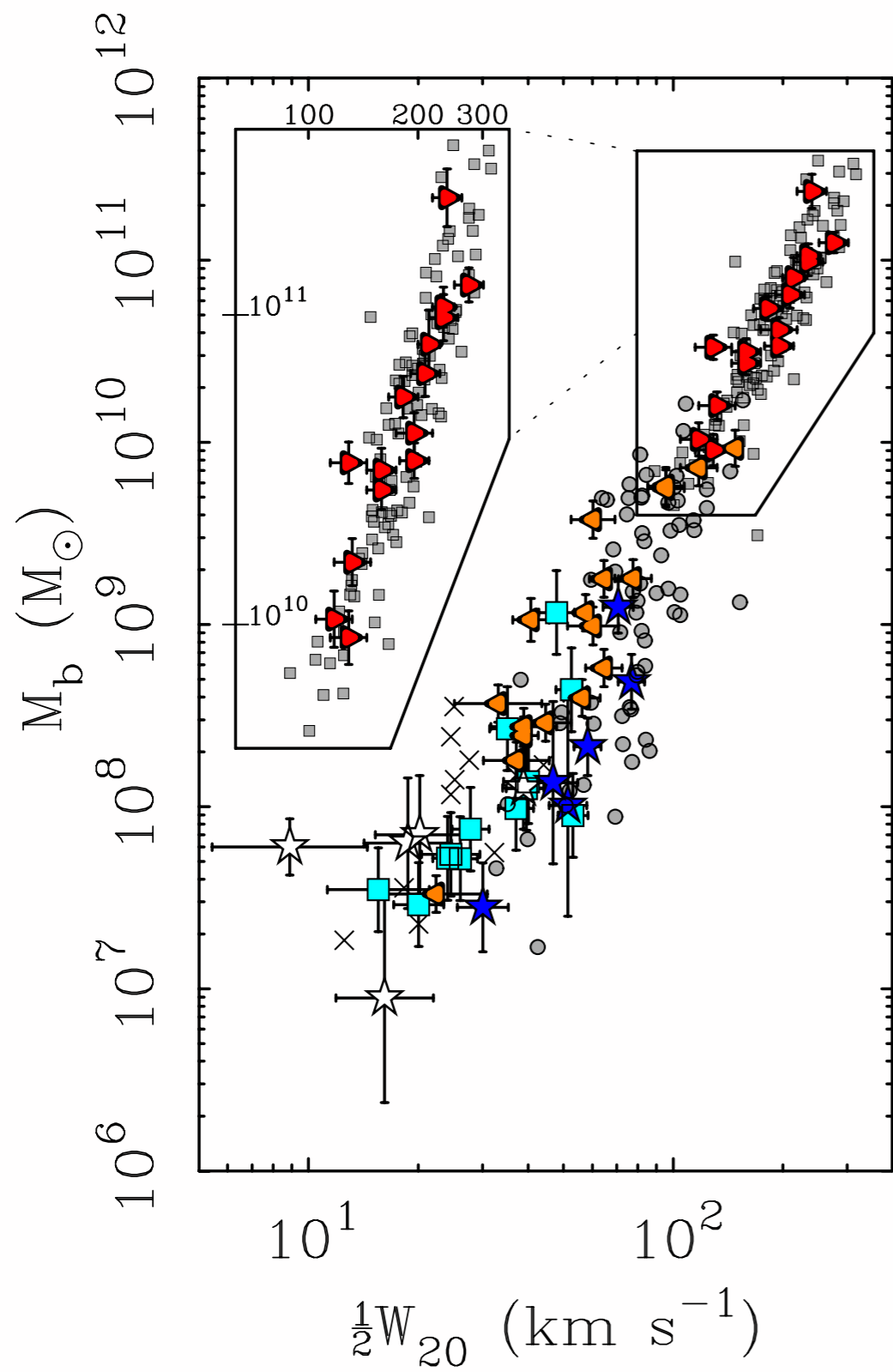
- Next homework due March 24

Neta Bahcall

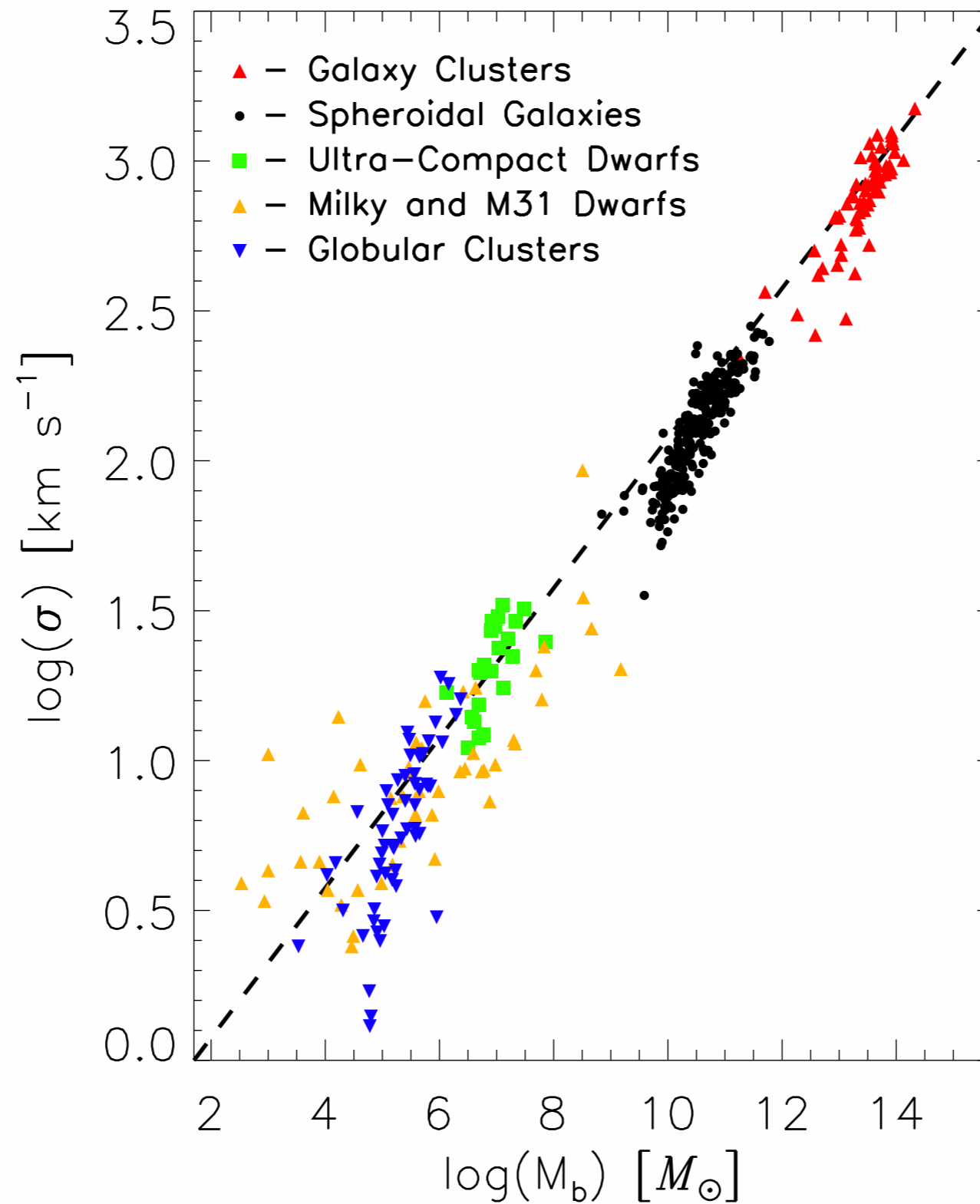




Tully-Fisher (rotationally supported)



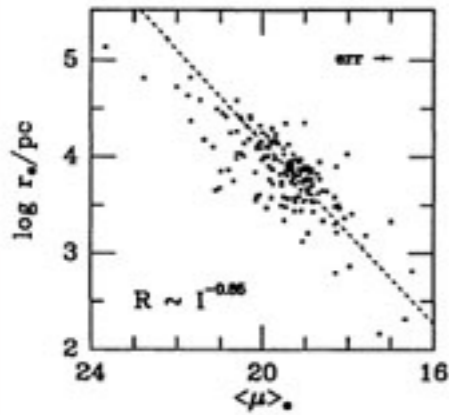
Faber-Jackson (pressure supported)



Fundamental Plane (pressure supported)

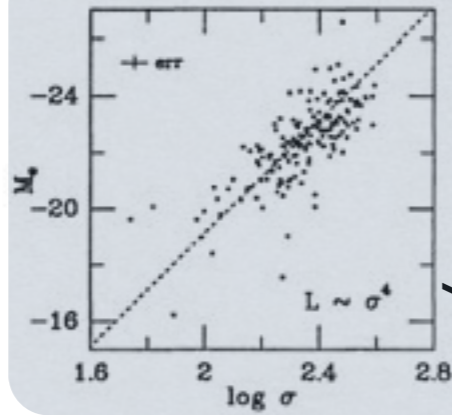
surface
brightness

size



velocity
dispersion

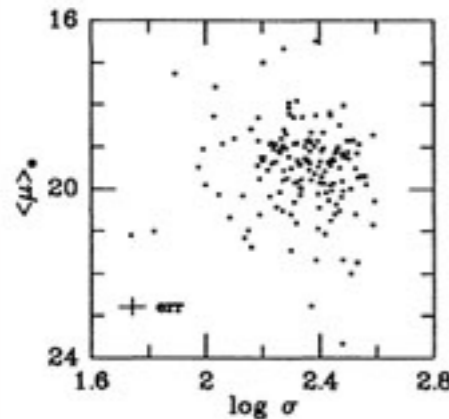
Faber-Jackson



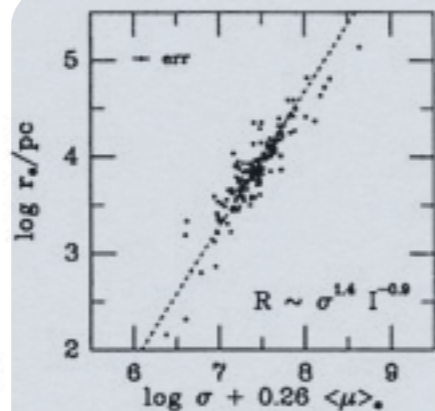
Luminosity

surface
brightness

$\langle \mu \rangle_*$



velocity
dispersion



size

v-disp &
surf bright.

Fundamental Plane

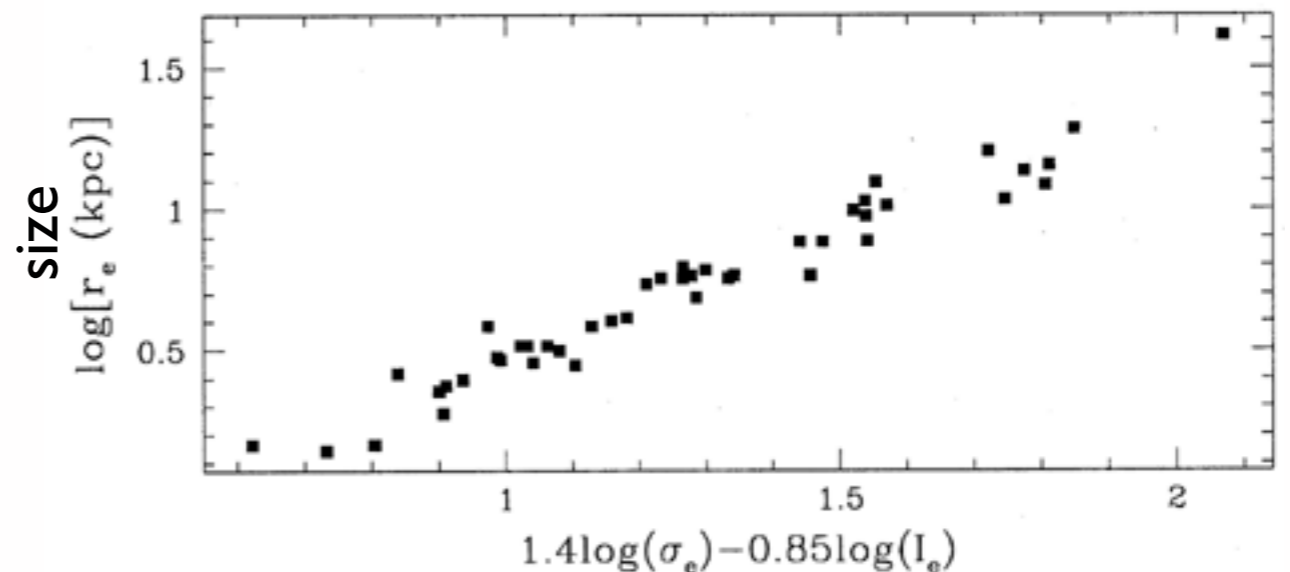
“Viral” fundamental plane

$$R_e \propto \sigma^2 I_e^{-1}$$

observed fundamental plane
“tilted” wrt virial expectation:

$$R_e \propto \sigma^{1.4} I_e^{-0.85}$$

velocity dispersion & surface brightness



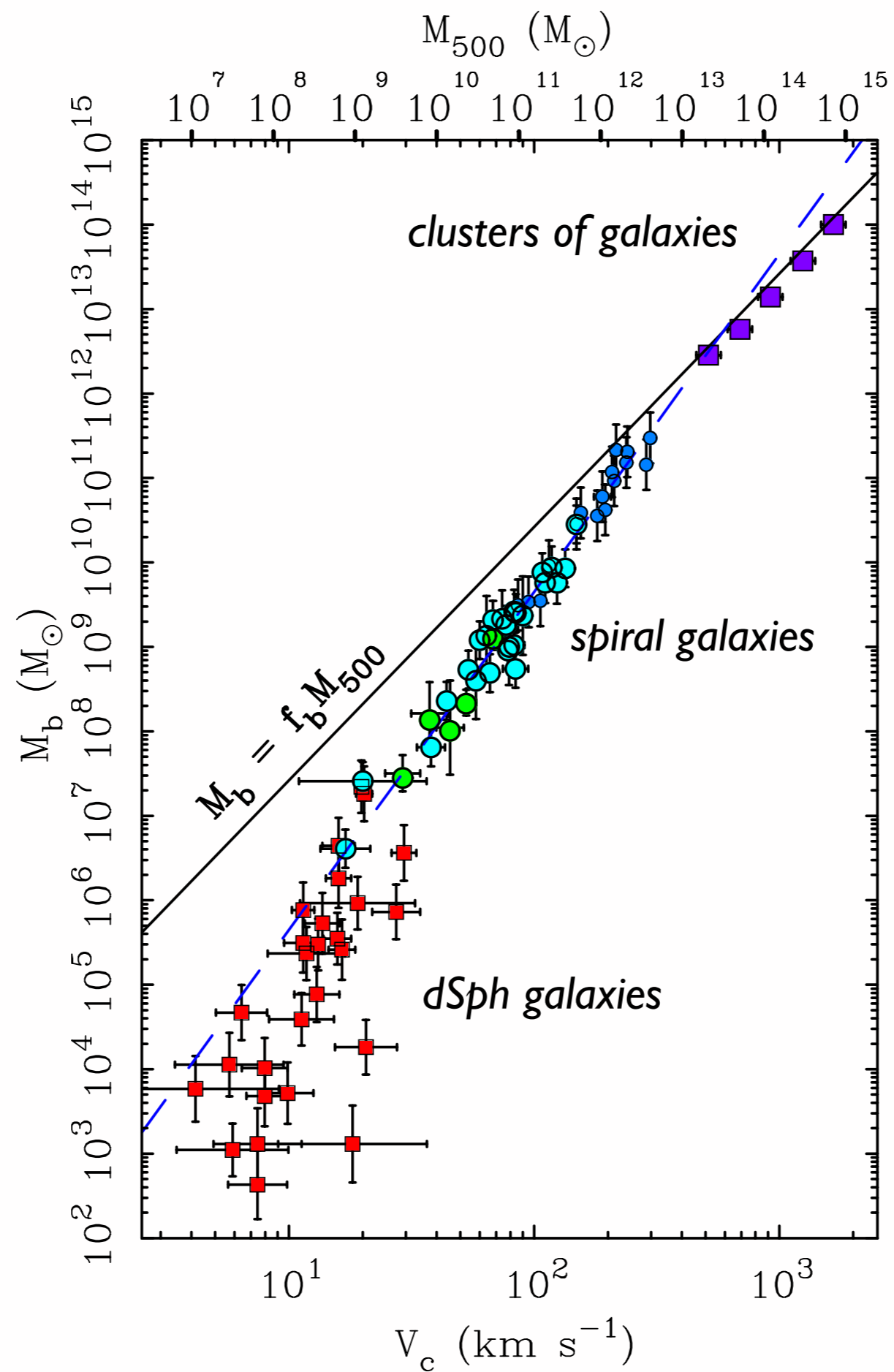
$$M \propto \sigma^2 R_e$$

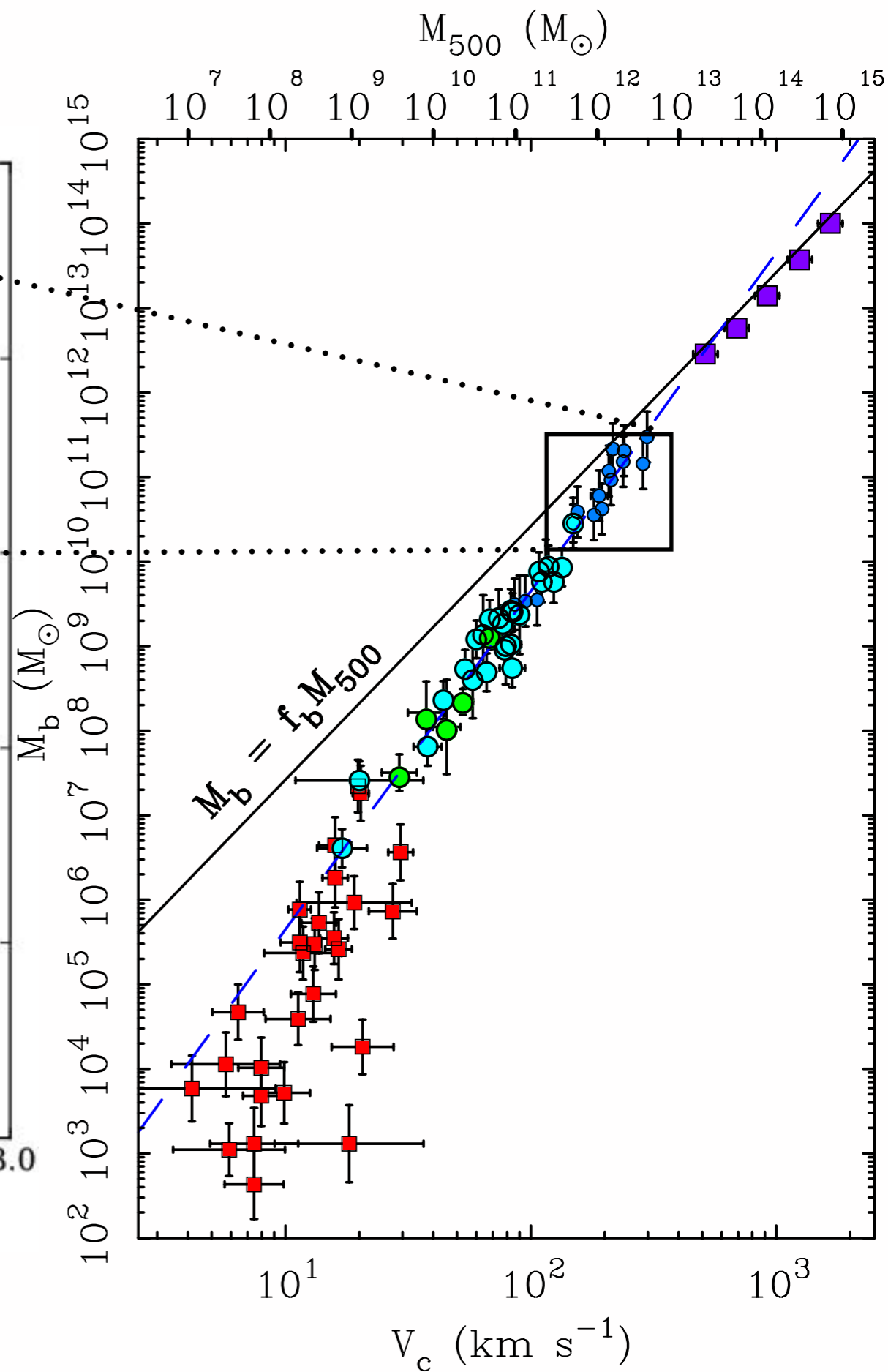
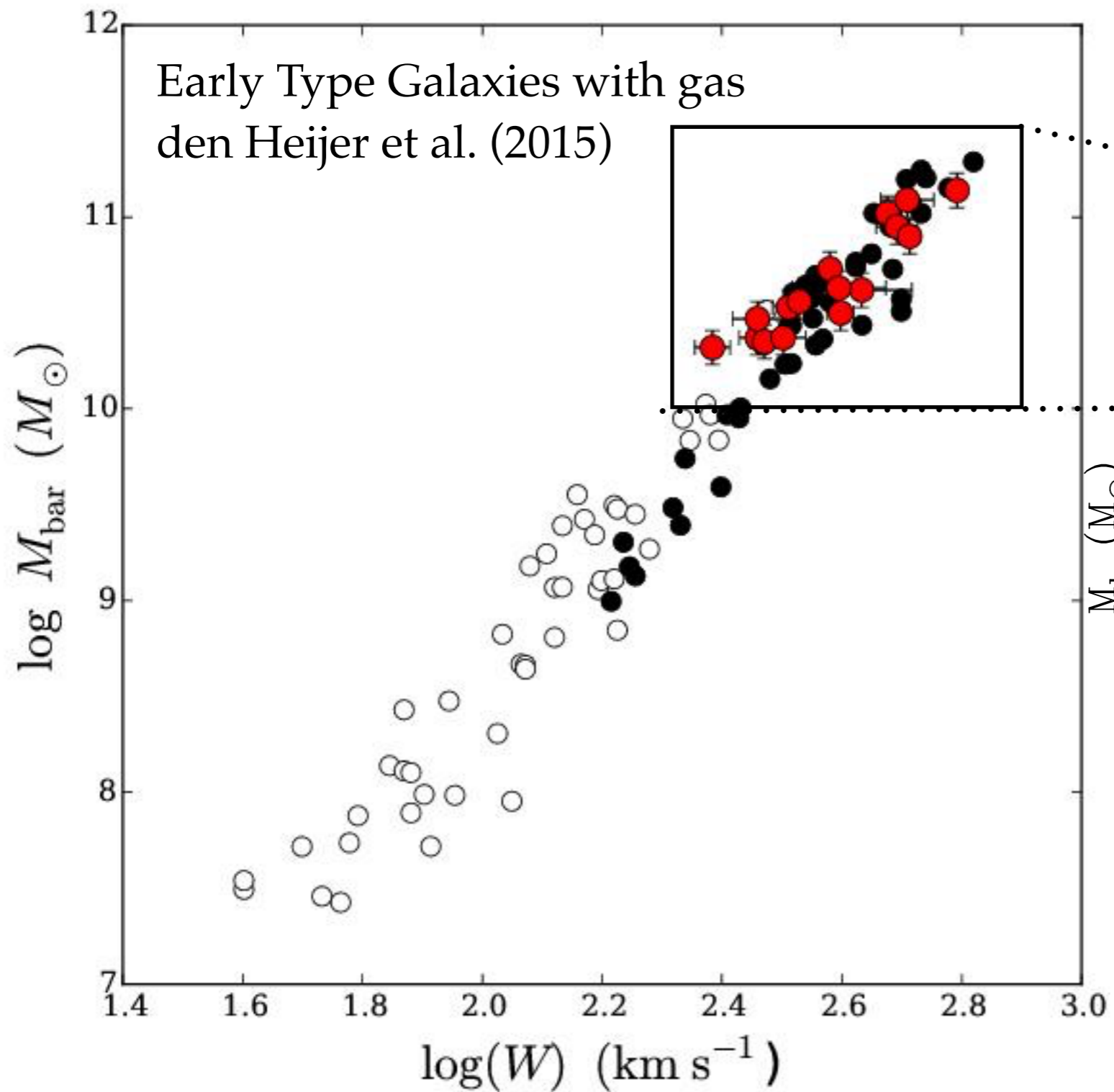
virial theorem

$$L \propto I_e R_e^2$$

luminosity,
surface brightness
size

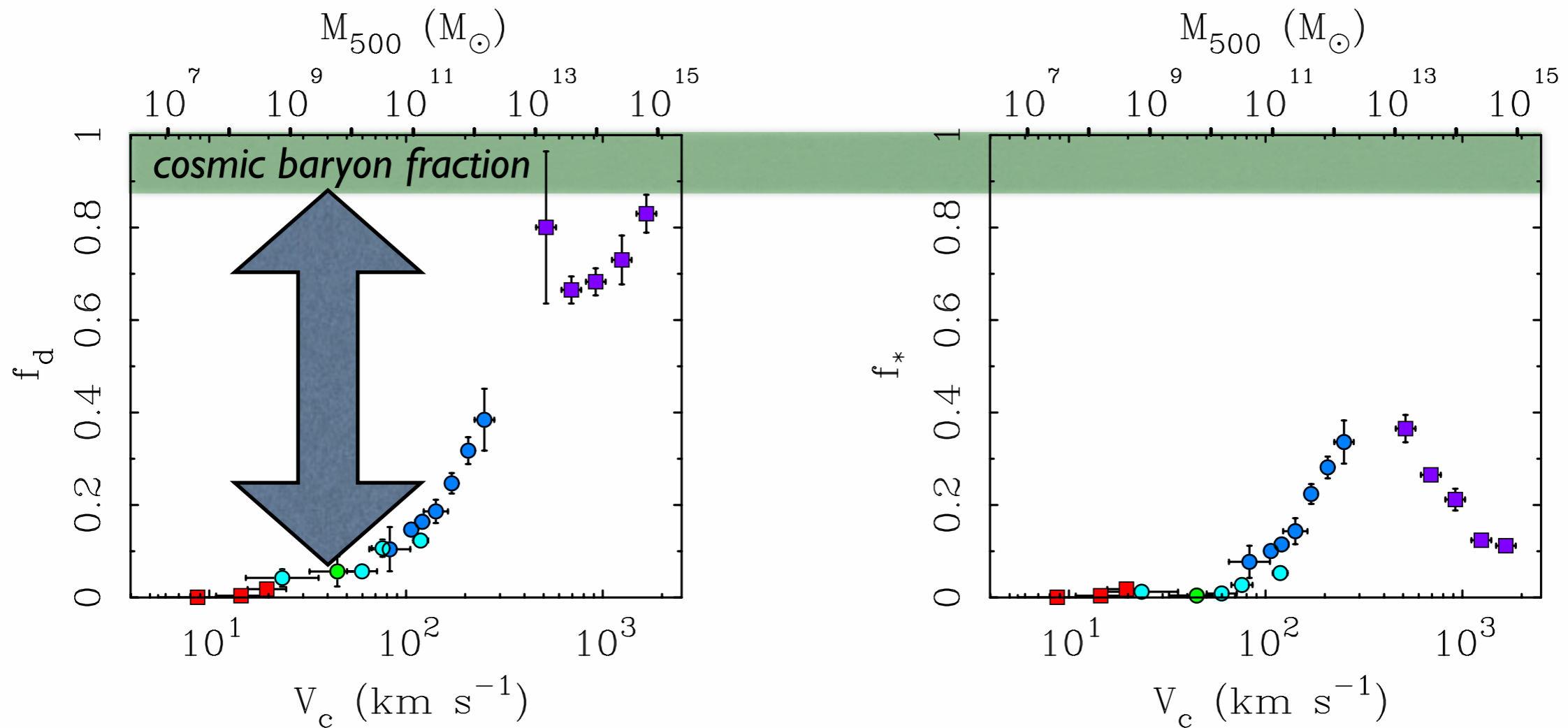
Extended TF





$$f_d = \frac{M_b}{f_b M_{500}}$$

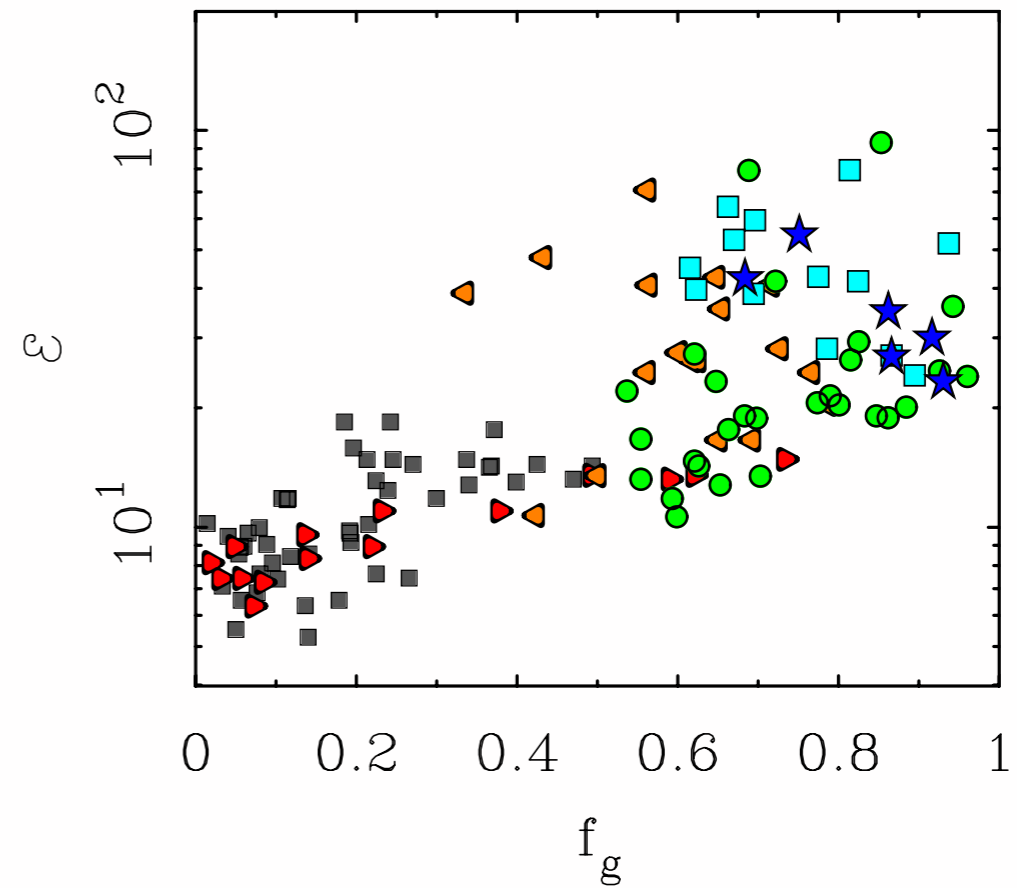
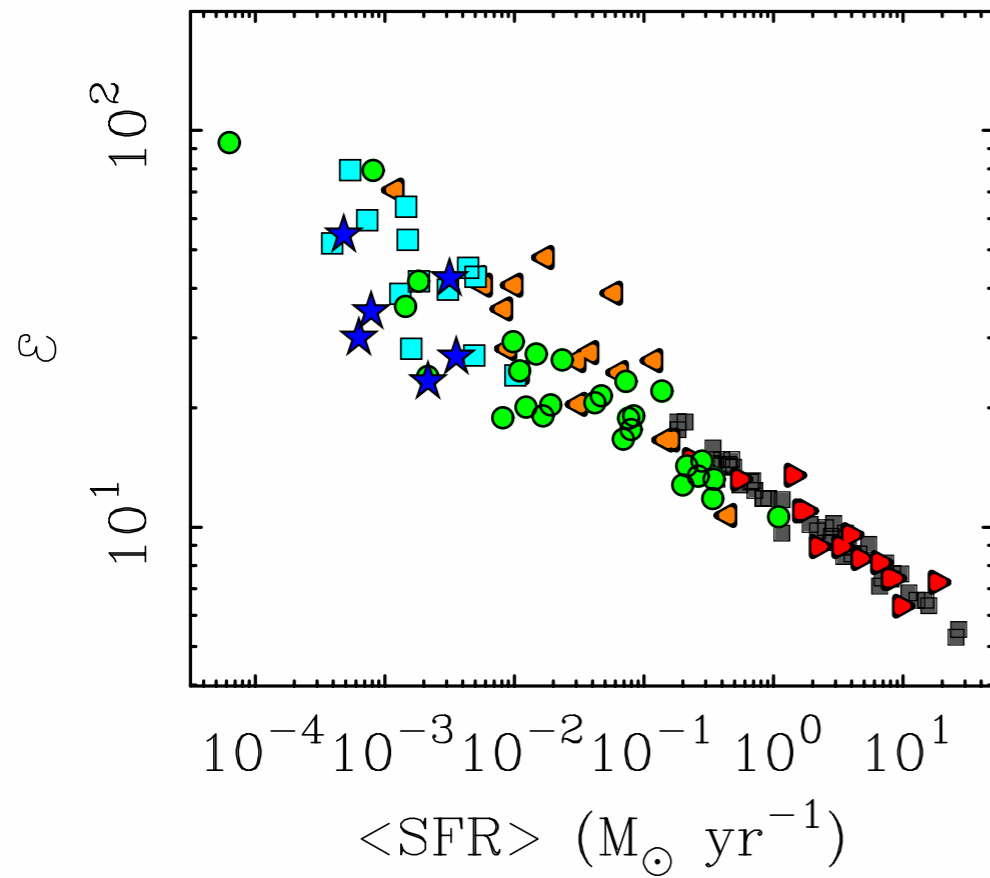
$$f_* = \frac{M_*}{f_b M_{500}}$$



Halo by halo missing baryon problem

2 missing mass problems: baryonic AND non-baryonic DM

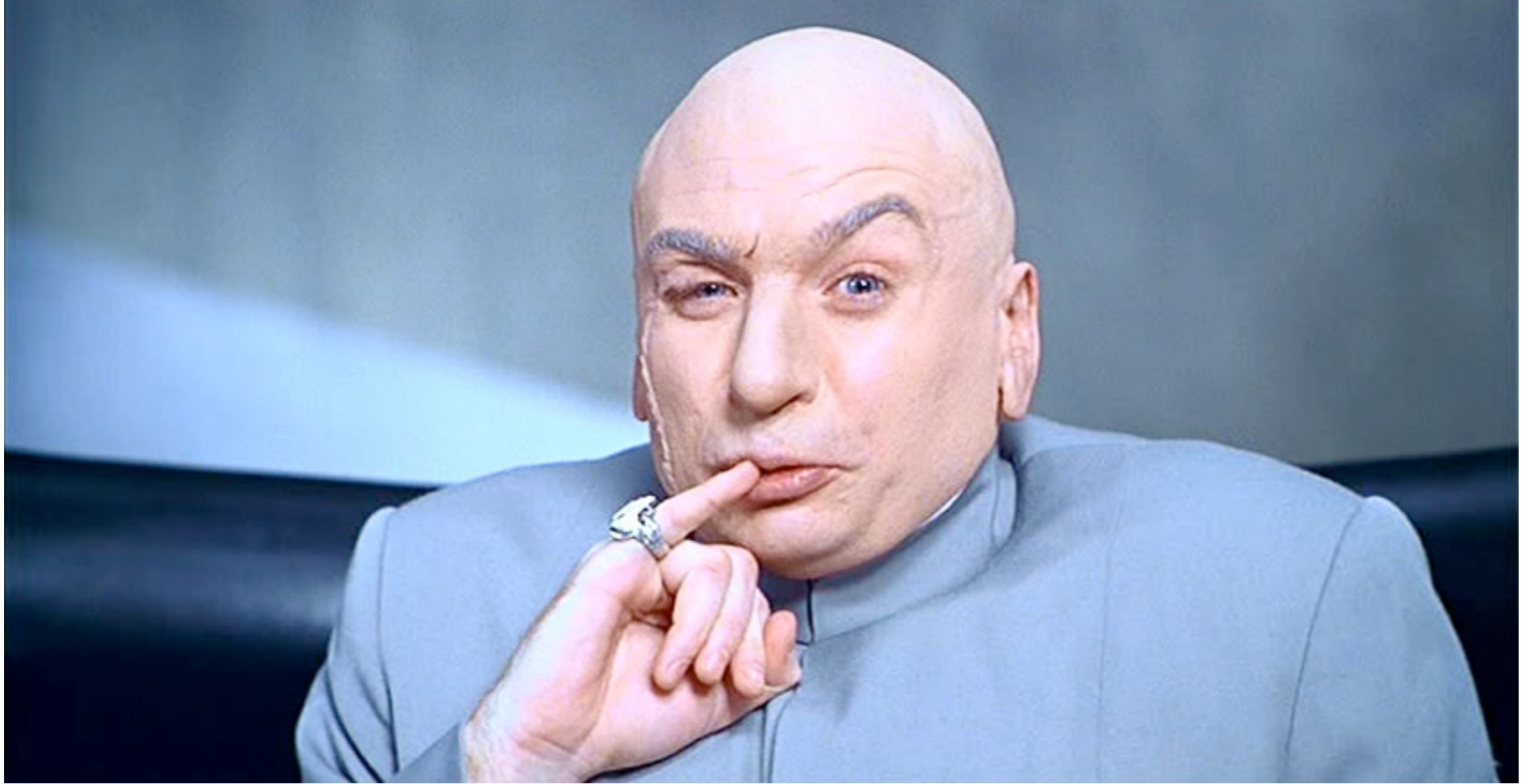
Feedback



$$\log \mathcal{E} \equiv 3 \log f_V - \log f_d.$$

Efficacy of feedback.

Basically the ratio of baryons lost to those retained.

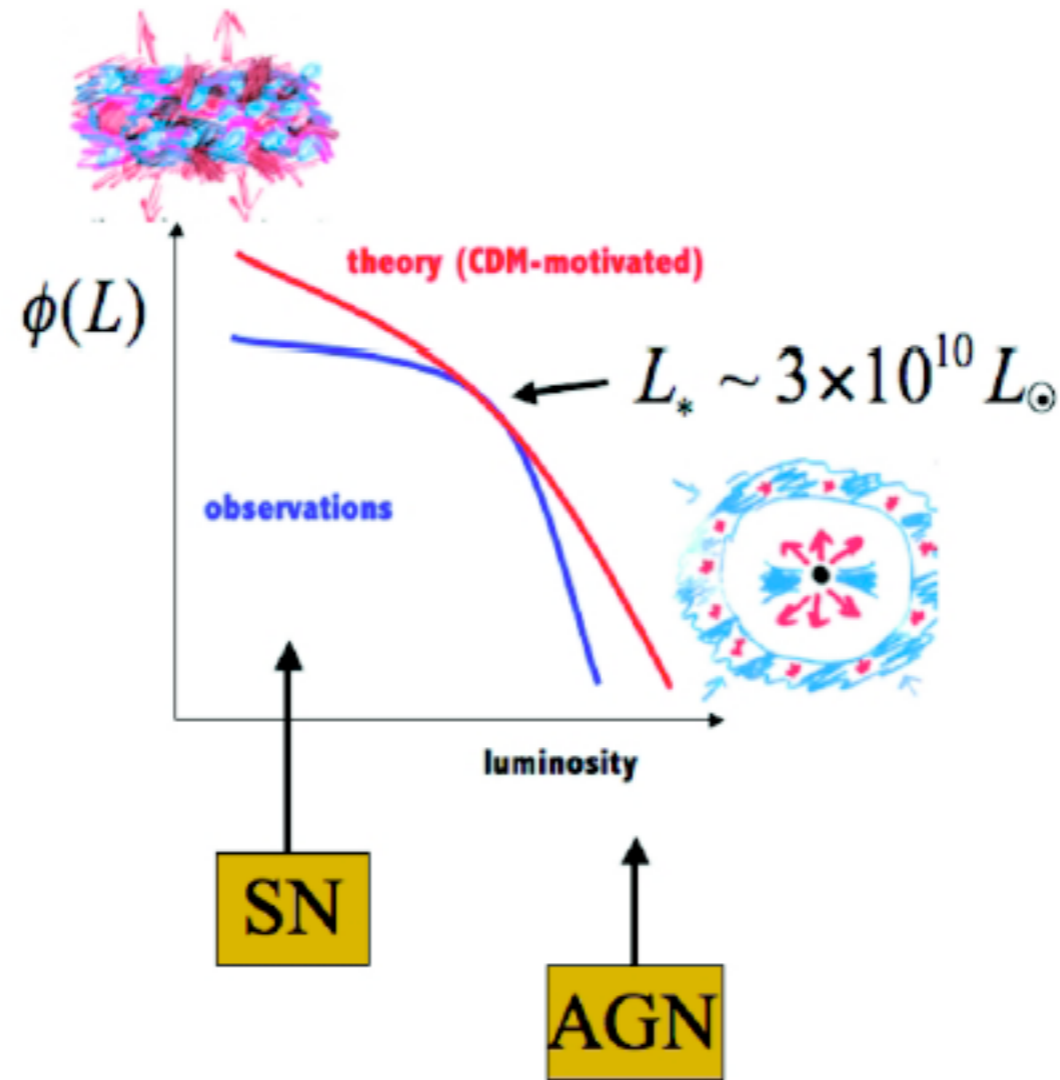


Theorist: I have an even better idea. I'm going to place model galaxies in easily escapable dark matter halos by invoking overly elaborate and exotic feedback schemes.

Observer: Wait, aren't you even going to test that? It might not work!

Theorist: No no no, I'm going to leave it alone and not actually witness it happening; I'm just gonna assume it all went to plan. What?

Feedback



Basic idea: SN affect low mass halos
AGN affects high mass halos