

DARK MATTER

ASTR 333/433

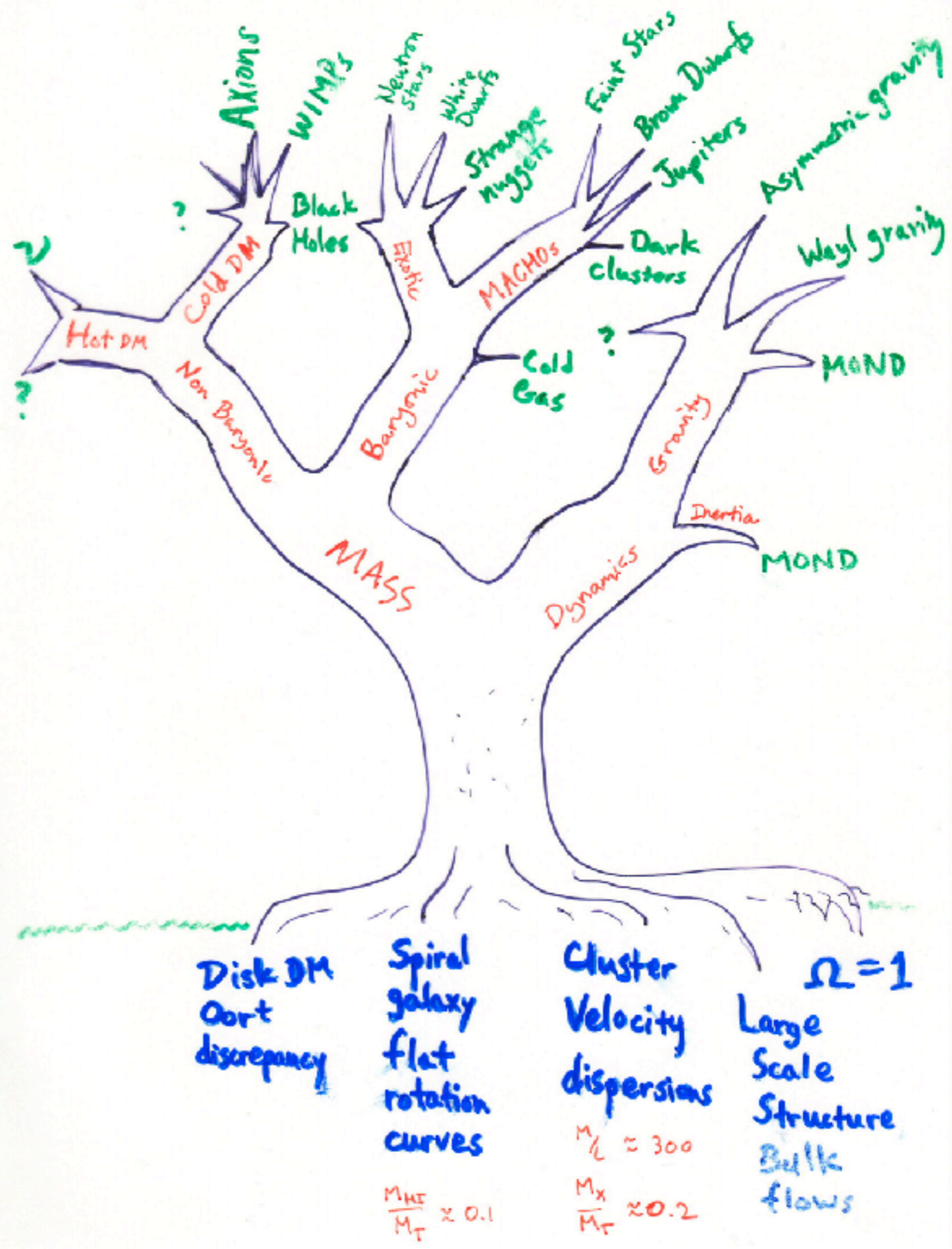
TODAY

FEEDBACK

MISSING SATELLITES

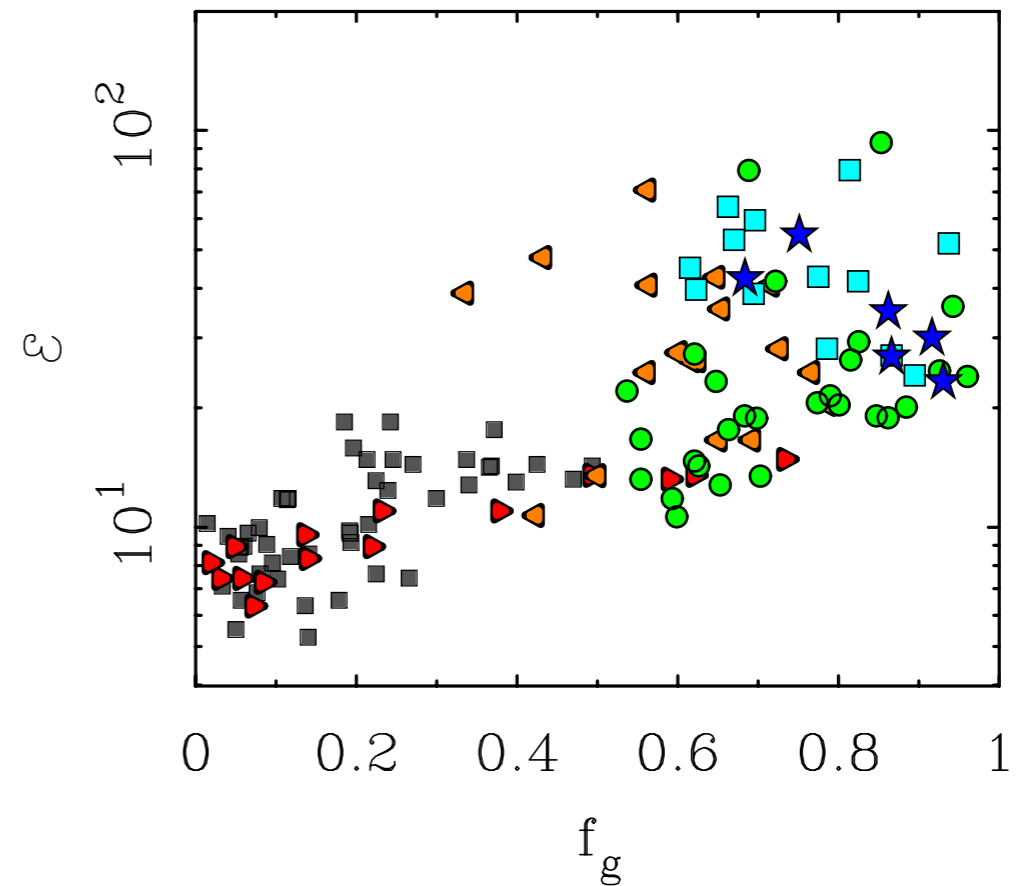
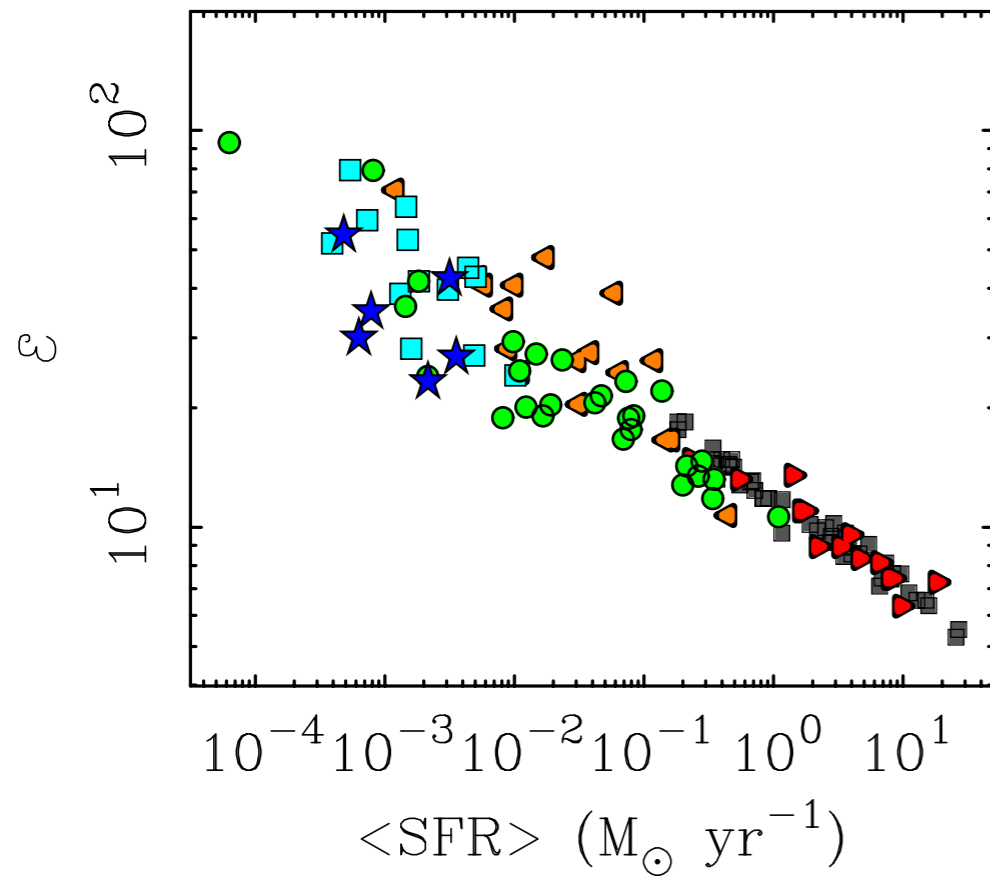
LUMINOSITY FCN

Homework 3 due April 5



Feedback

invoked to explain cusp-core problem and missing baryon/missing satellite problem



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

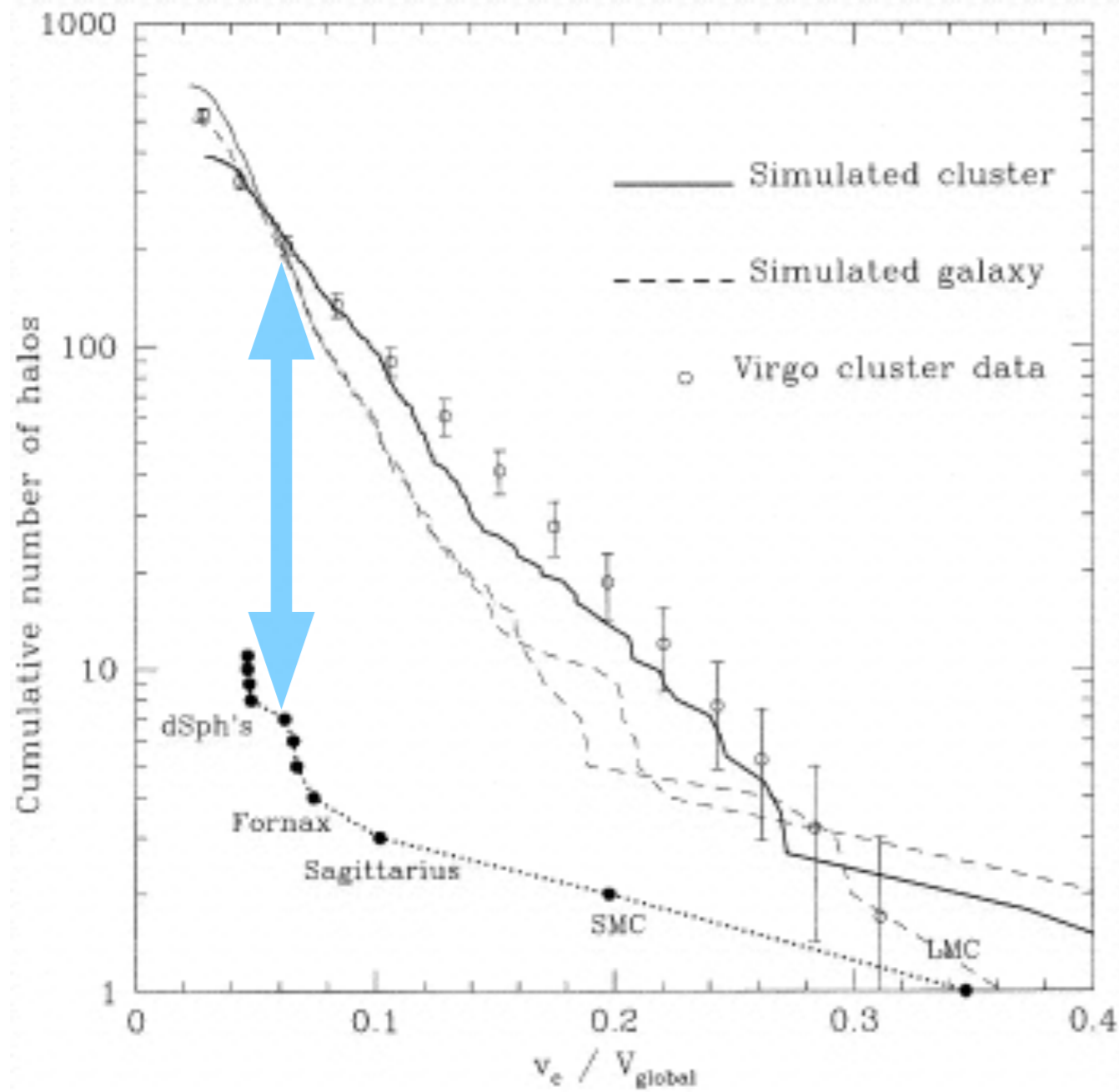
Efficacy of feedback.

Basically the ratio of baryons lost to those retained.

Most baryons are missing, especially from low mass halos.

Missing Satellites

e.g., Moore et al. (1999); Klypin et al. (1999)



V_c / V_{parent}

CDM is scale free

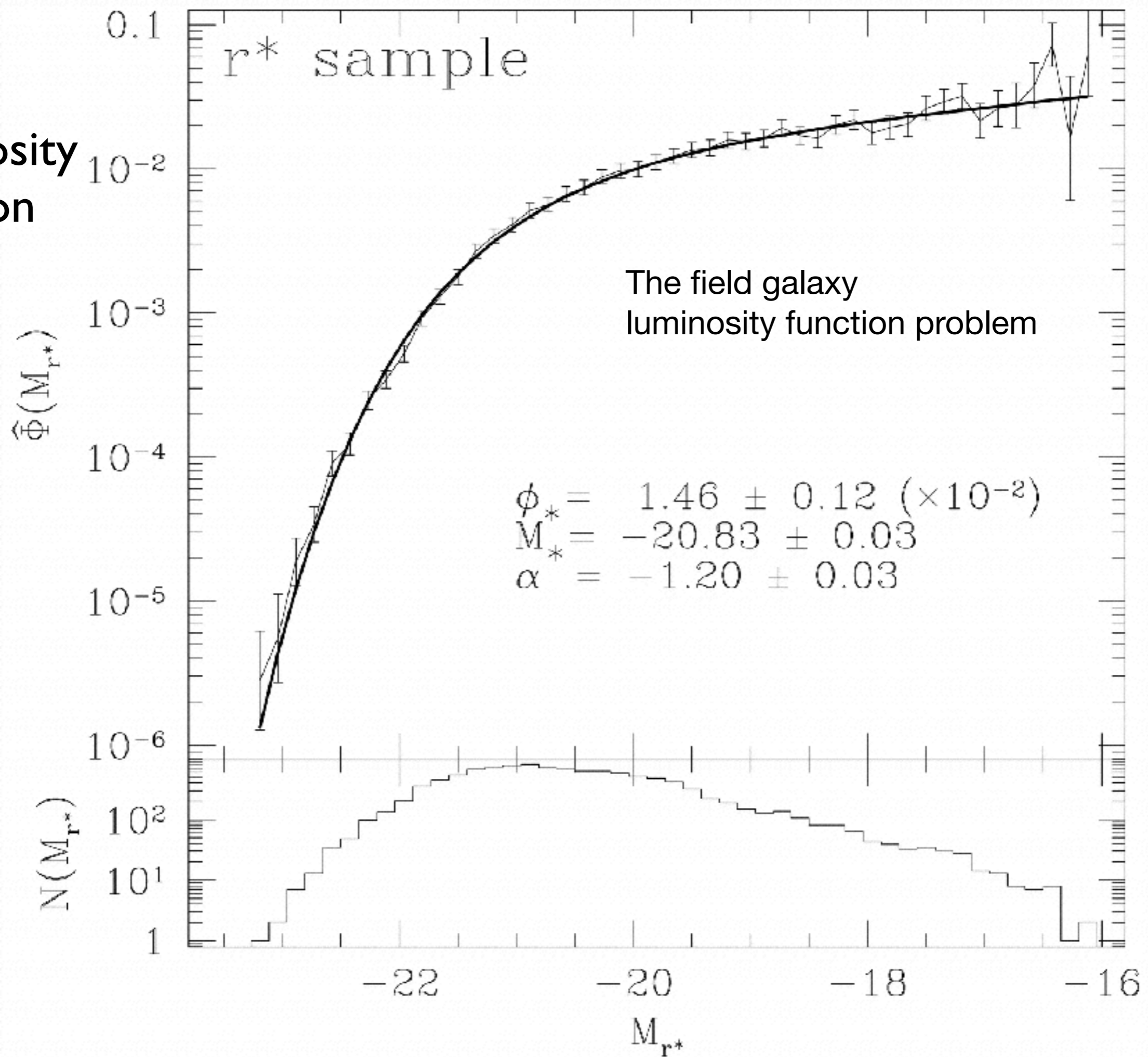
Cluster mass halo $5 \times 10^{14} M_{\odot}$
Galaxy mass halo $2 \times 10^{12} M_{\odot}$



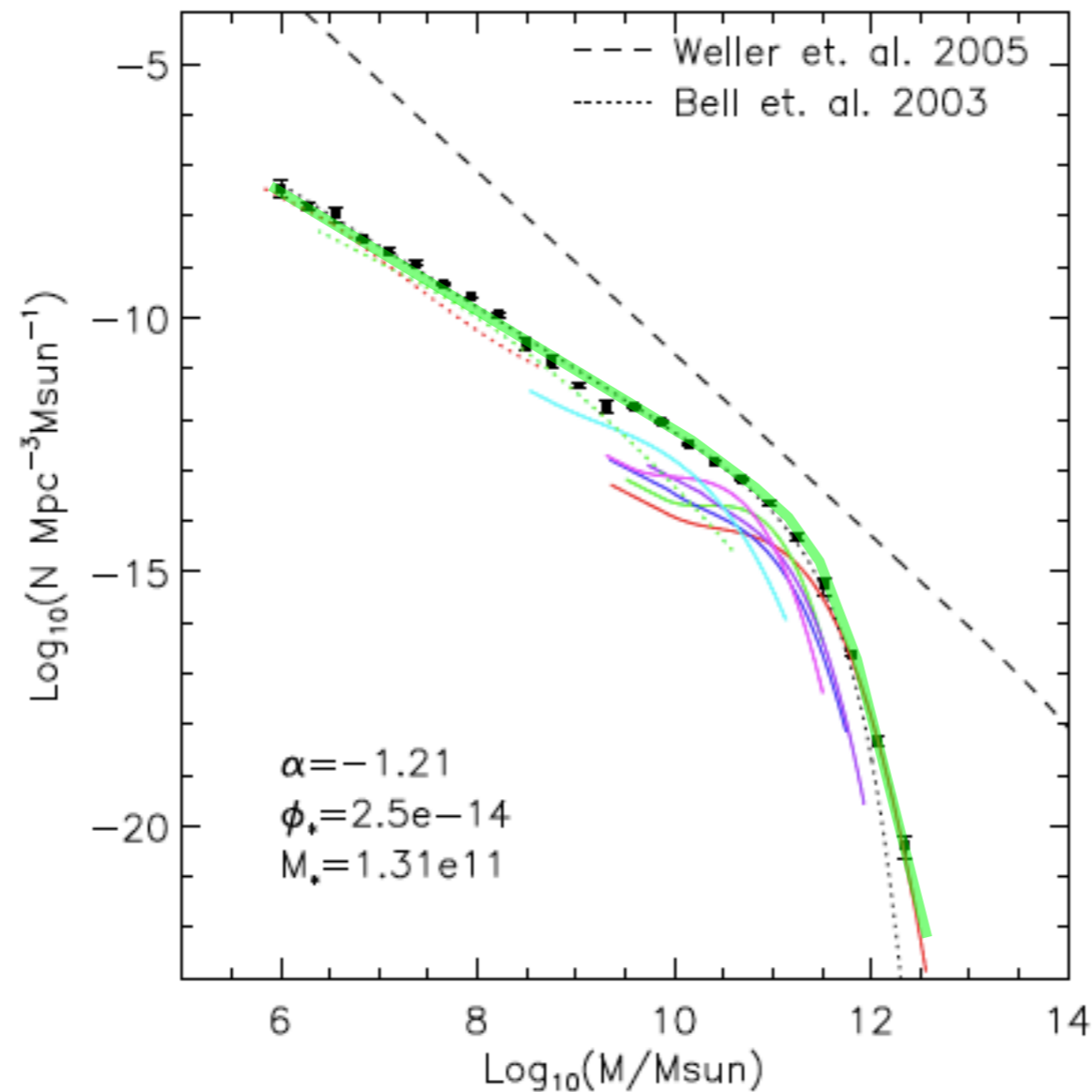
The Local Group
does not look like a simulated dark matter halo



SDSS
r-band
luminosity
function



Baryonic Mass Function (Read & Trentham 2005)

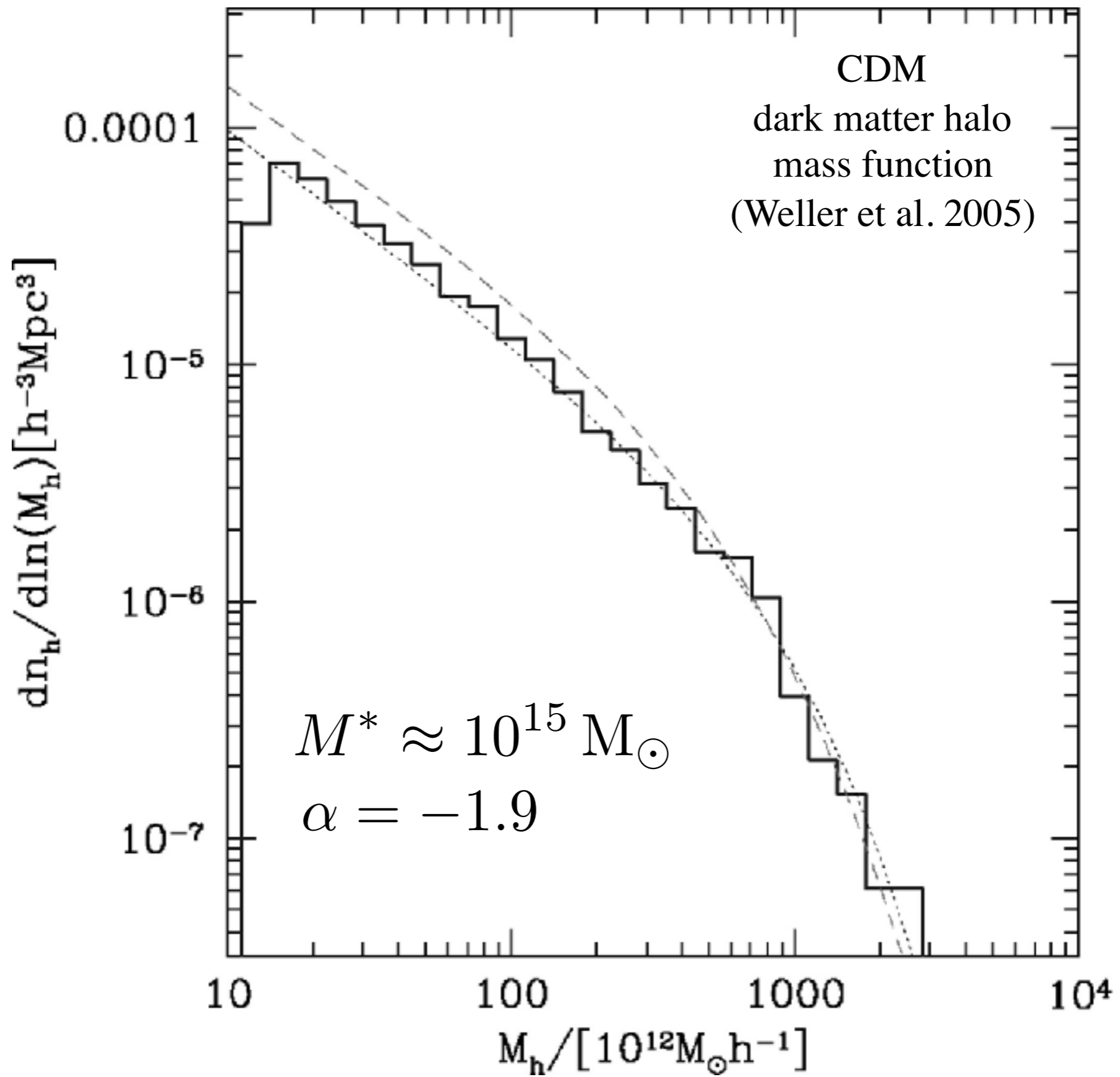


The missing satellite problem
is a local version of
the field galaxy
luminosity function problem

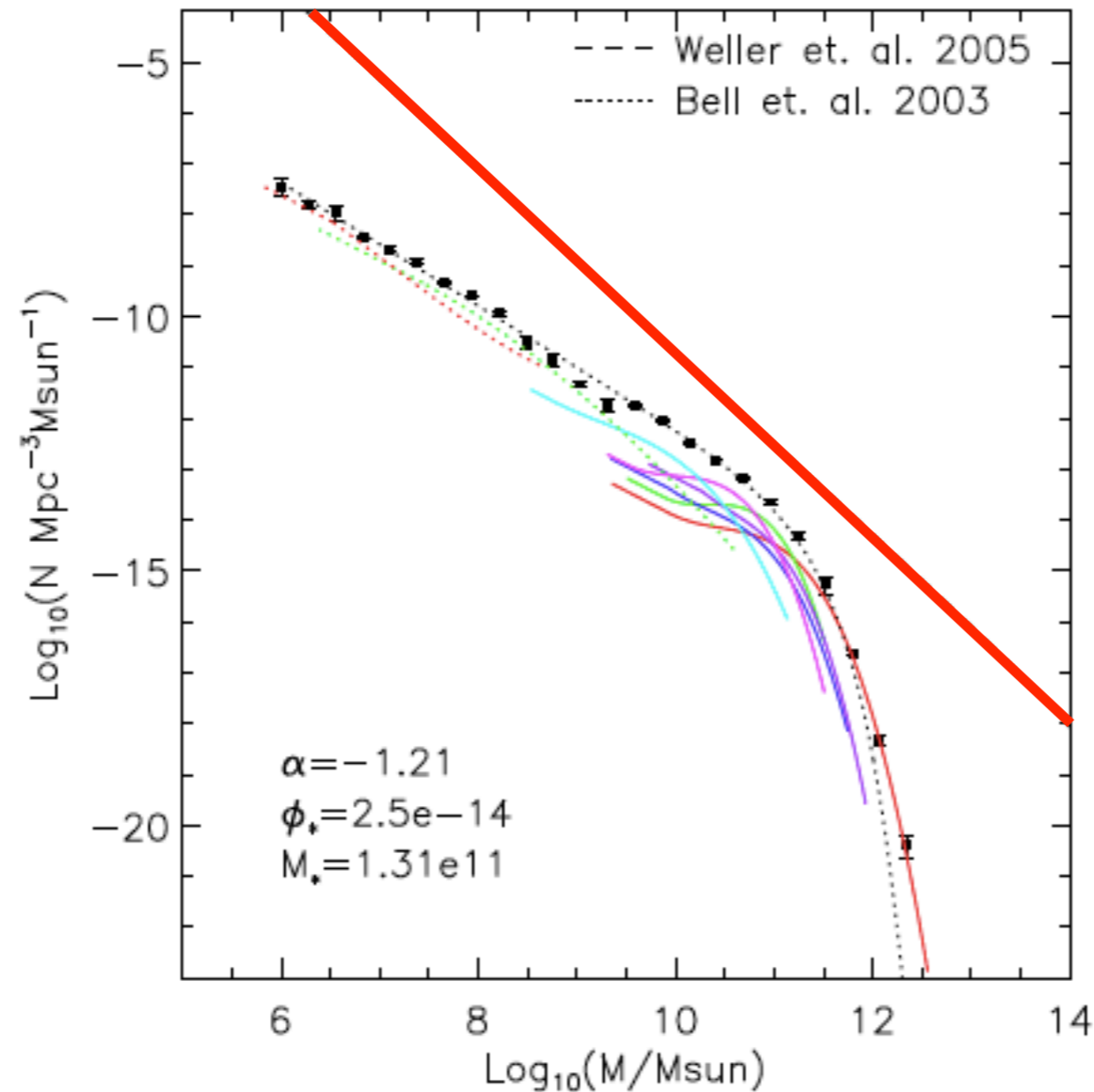
observed galaxies

Figure 4. The field galaxy baryonic mass function. The data points are for all galaxies, while the lines show spine fits by Hubble Type. The lines are as in Figure 2. The CDM mass spectrum from the numerical simulations of Weller et al. (2004) is also shown. Overlaid are parameters for a Schechter fit to the total mass function.





Baryonic Mass Function (Read & Trentham 2005)

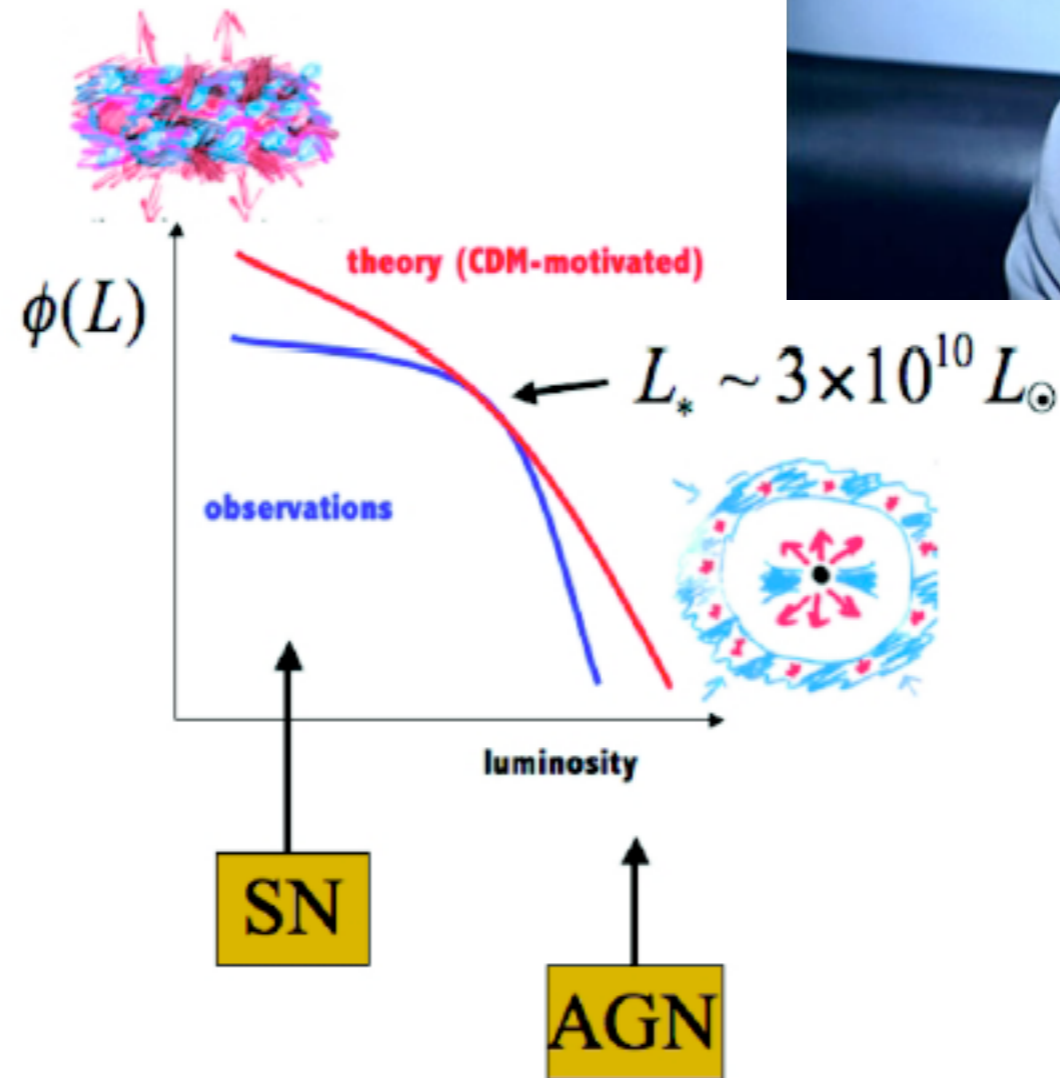


CDM halo
mass function

$$\alpha = -1.9$$

Figure 4. The field galaxy baryonic mass function. The data points are for all galaxies, while the lines show spine fits by Hubble Type. The lines are as in Figure 2. The CDM mass spectrum from the numerical simulations of Weller et al. (2004) is also shown. Overlaid are parameters for a Schechter fit to the total mass function.

Feedback



Need non-linear mapping between properties of dark matter halos and observed, luminous galaxies

It does not work to make the obvious assumption

$$M_{tot} \propto L$$

One infers the presence of numerous dark sub-halos

“Moster relation”

From
“abundance matching”

Match the number density
of simulated dark matter
halos to that of galaxies

