The final talk (of the meeting)

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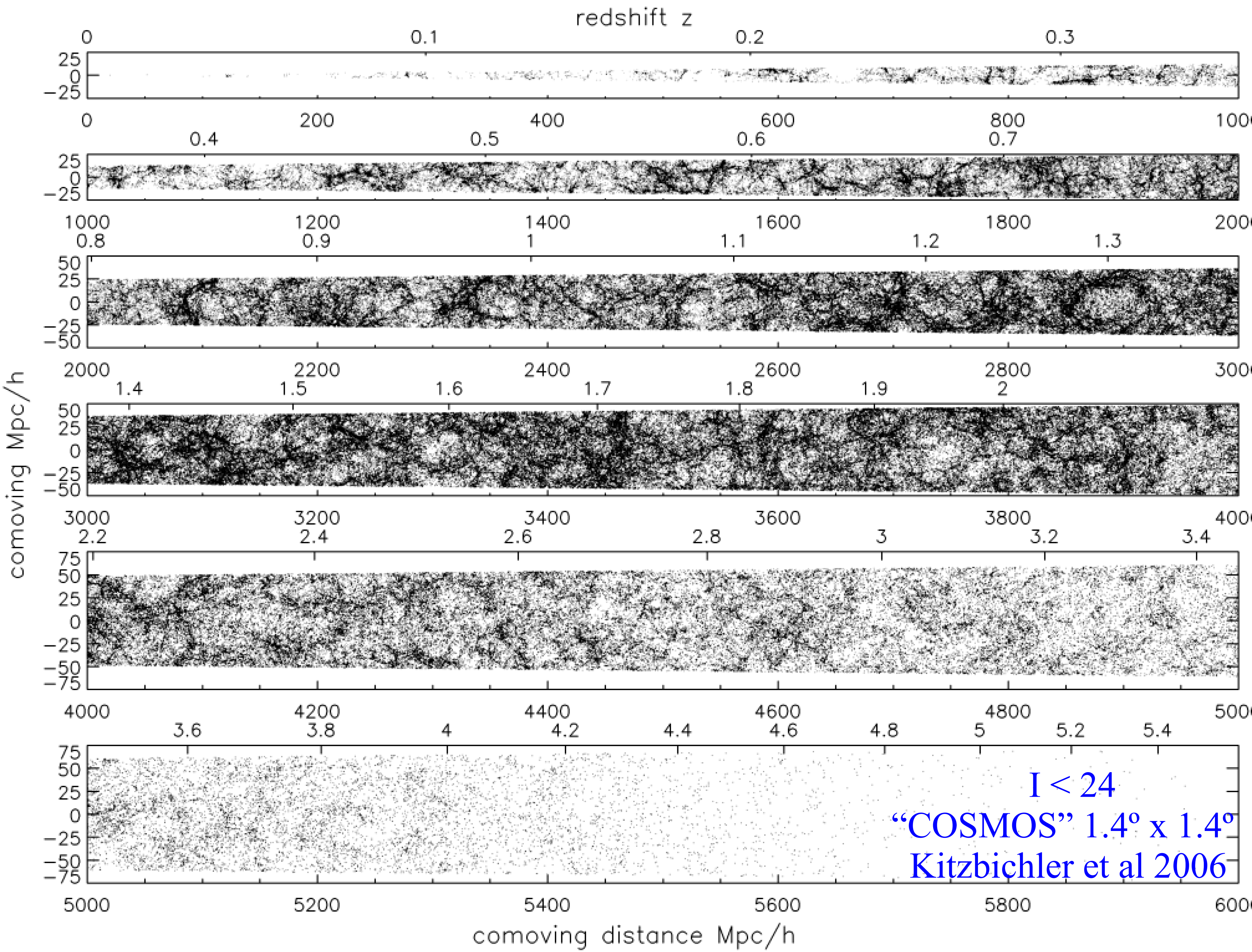
- Physically based galaxy formation models within the ΛCDM cosmology can fit many of the details of measured high redshift populations

- Demanding a good fit provides measurements of physical quantities of interest – merger rates, star-formation/feedback efficiencies, dust content and geometry...

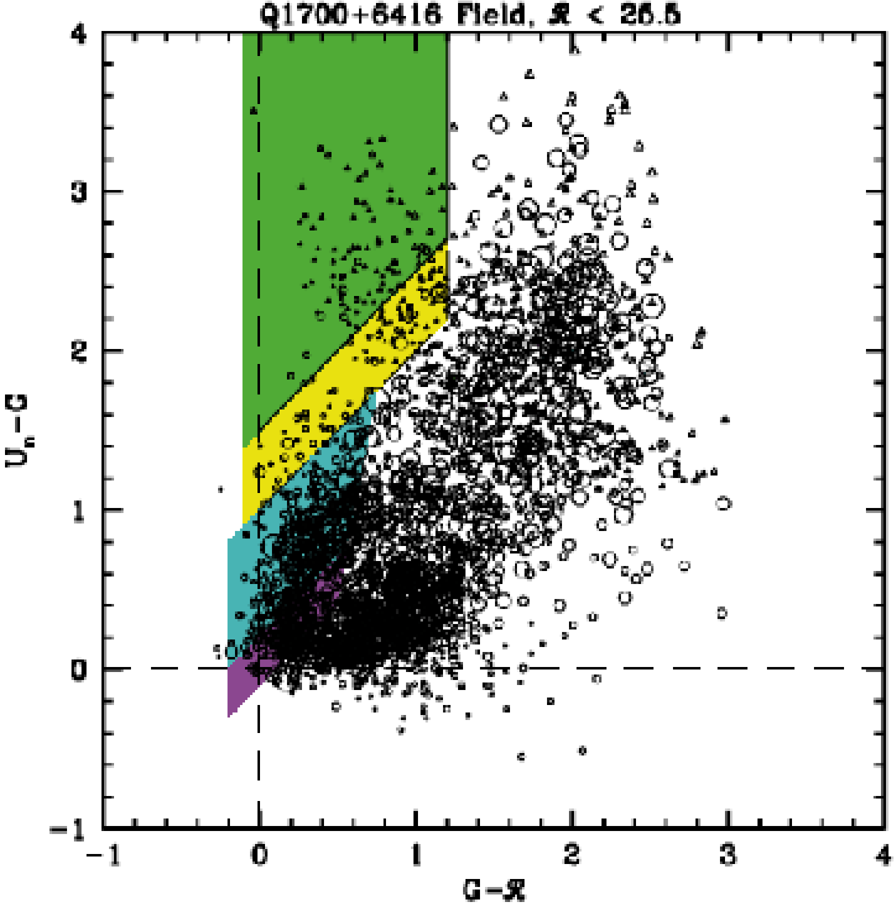
- Detailed models are *required* to interpret the relations between different types of objects (LAE's, LBG's, SMG's, QSO's) and between the objects present at different redshifts.

This requires observers and theorists to cooperate!



redshift z
comoving Mpc/h
comoving distance Mpc/h
I < 24
"COSMOS" 1.4º x 1.4º
Kitzbichler et al 2006

Steidel et al 2004



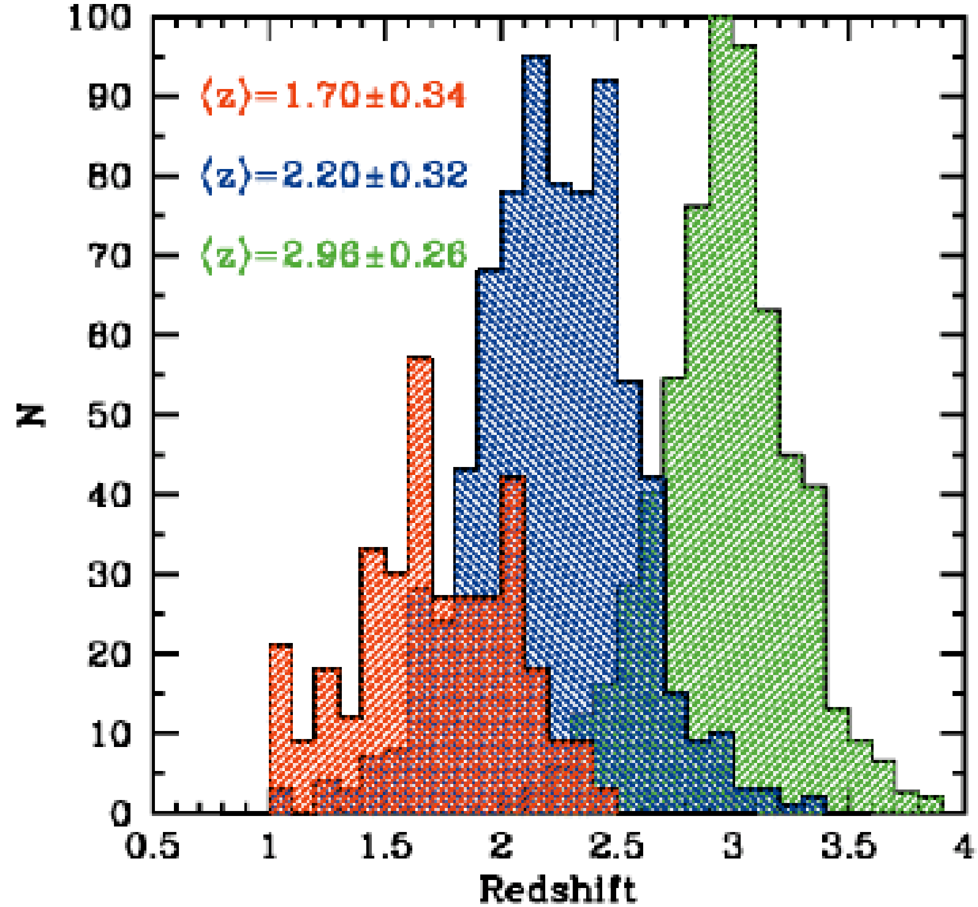
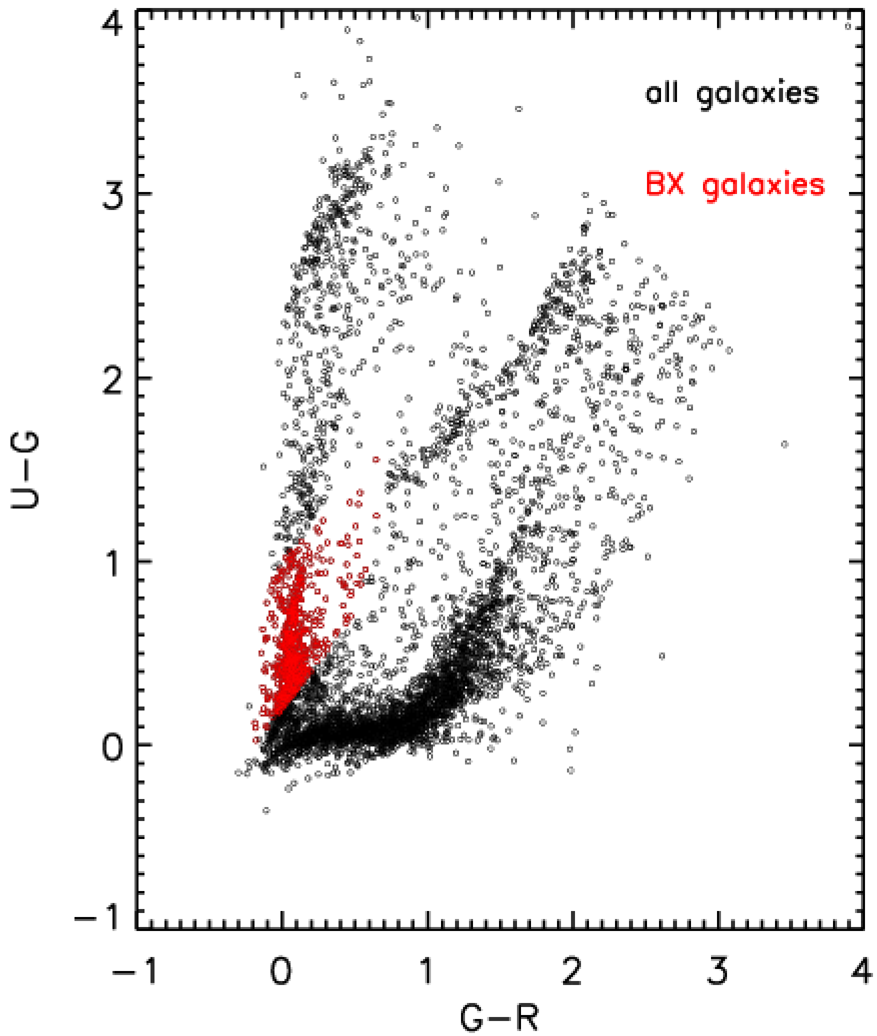
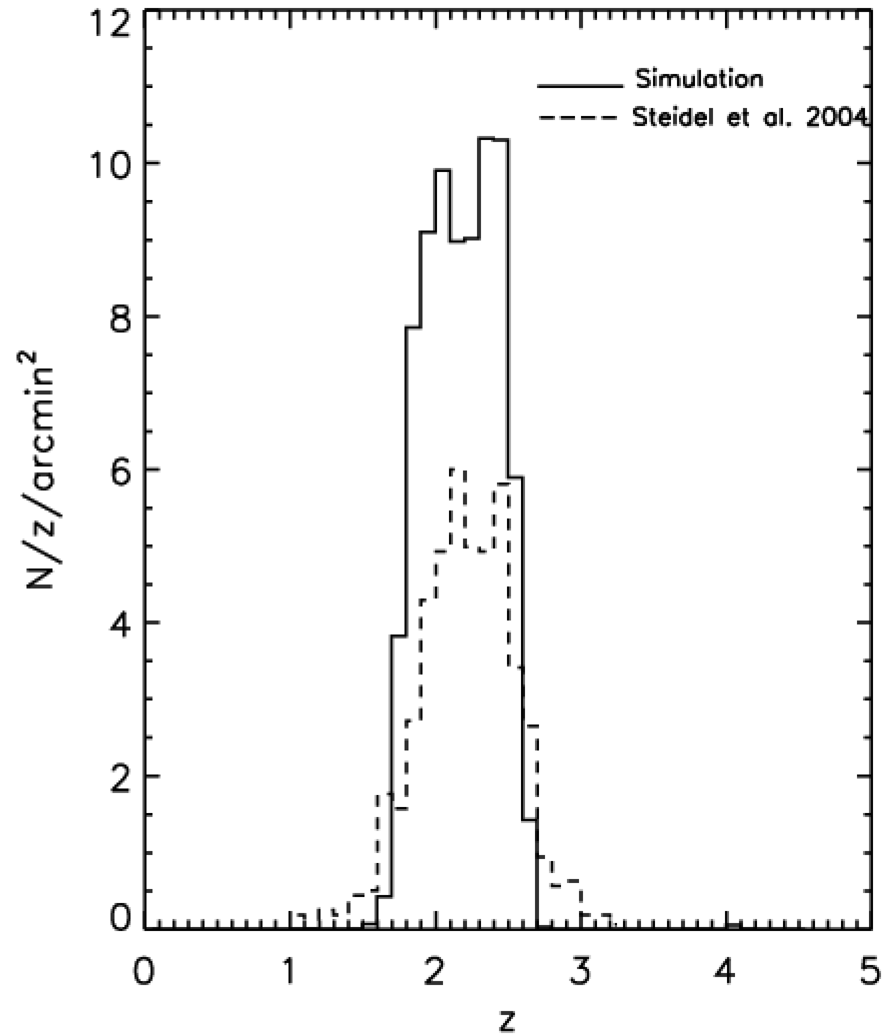


Fig. 1.—Two-color diagram from one of the survey fields, to illustrate the new selection criteria discussed in this paper (see also Adelberger et al. 2004). The size of the symbols scales with object brightness, and triangles are objects for which only limits were obtained on the $U_n - G$ color. The cyan and magenta-shaded regions are the BX and BM selection windows, designed to select galaxies at $z \simeq 2-2.5$ and $z \simeq 1.5-2.0$, respectively. The green and yellow shaded regions are the $z \sim 3$ LBG color section windows used in the survey by Steidel et al. (2003). In this field there are 1831 BX and 1085 BM candidates; together they account for ~25% of the 11547 objects brighter than $\mathcal{R} = 25.5$. For clarity only one in five objects is shown in the plot.

Fig. 2.—Redshift distributions of spectroscopically confirmed galaxies from various color-selected samples. The green histogram is for $z \sim 3$ LBGs from Steidel et al. (2003) (scaled by 0.7); the blue histogram shows the redshifts of our current BX sample (749 galaxies), while the red histogram is the smaller BM sample of 114 galaxies (scaled up by a factor of 3 for clarity). The total number of new spectroscopic redshifts in the range $1.4 \le z \le 2.5$, including both BX and BM samples, is 694, with 244 of those in the range $1.4 \le z \le 2.0$.

Qi Guo & SW 2008





$$\text{Dust/Gas} \quad \propto (1 + z)^{-1}$$

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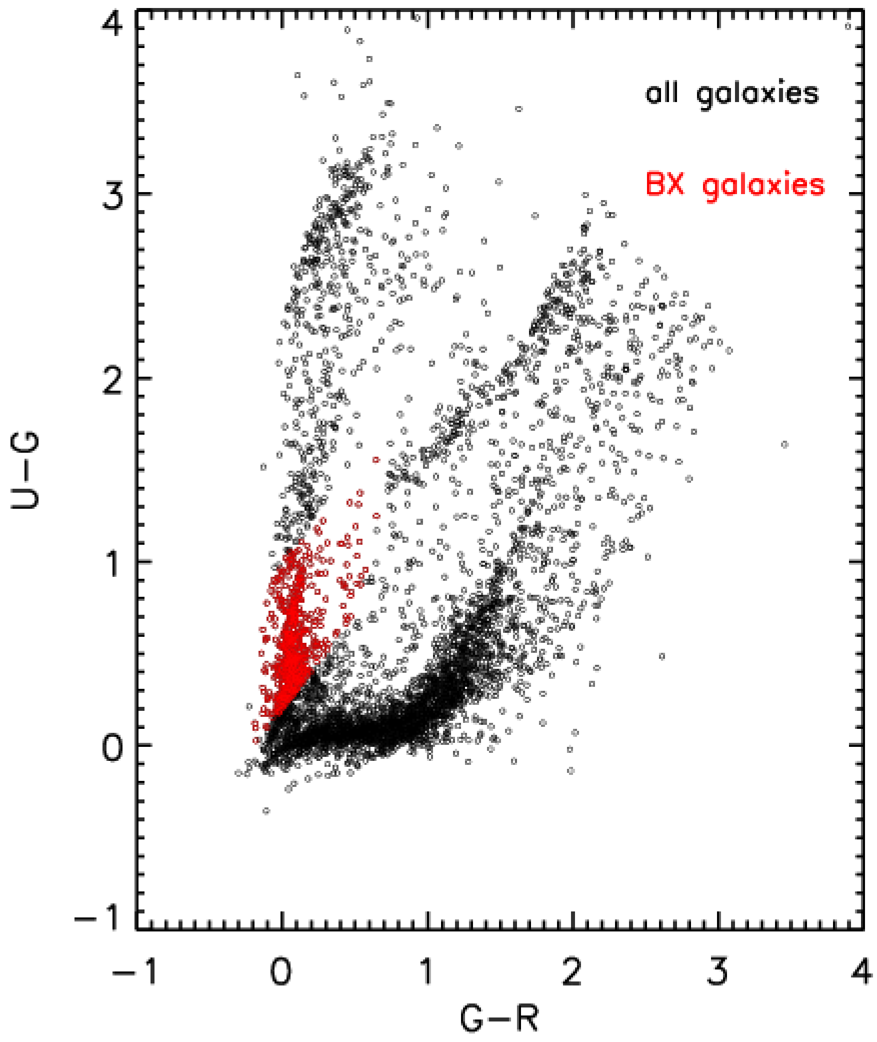
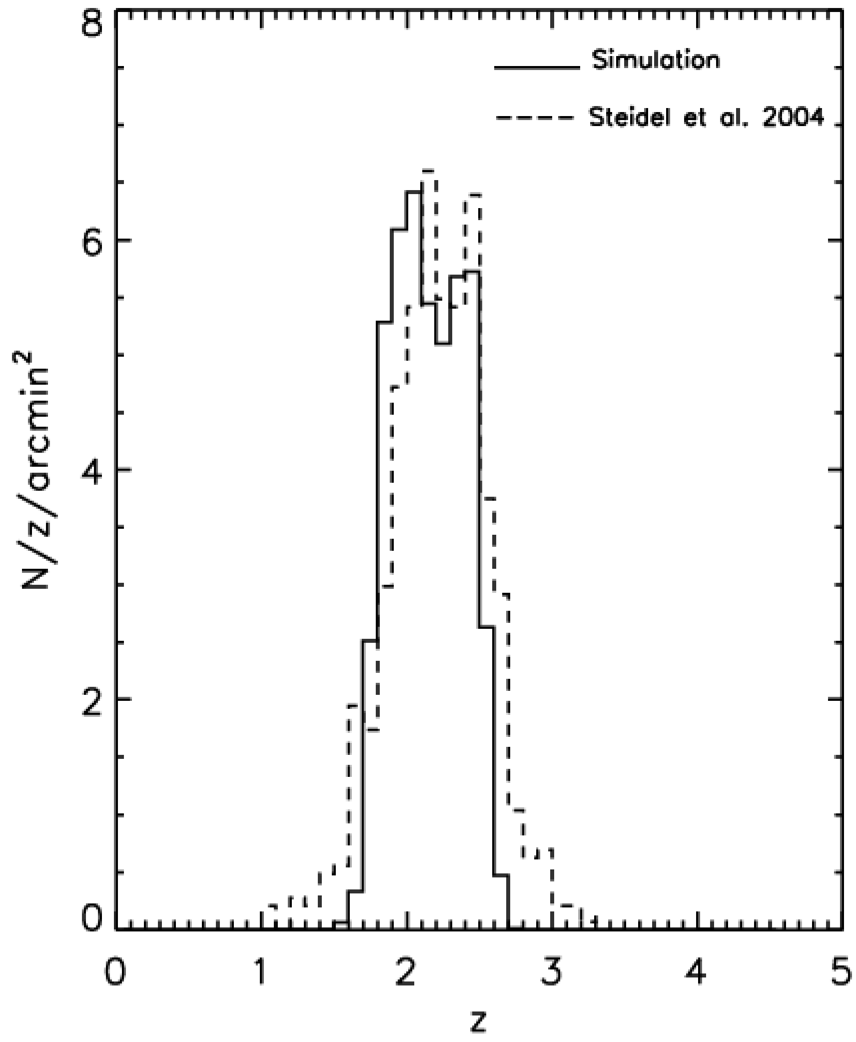
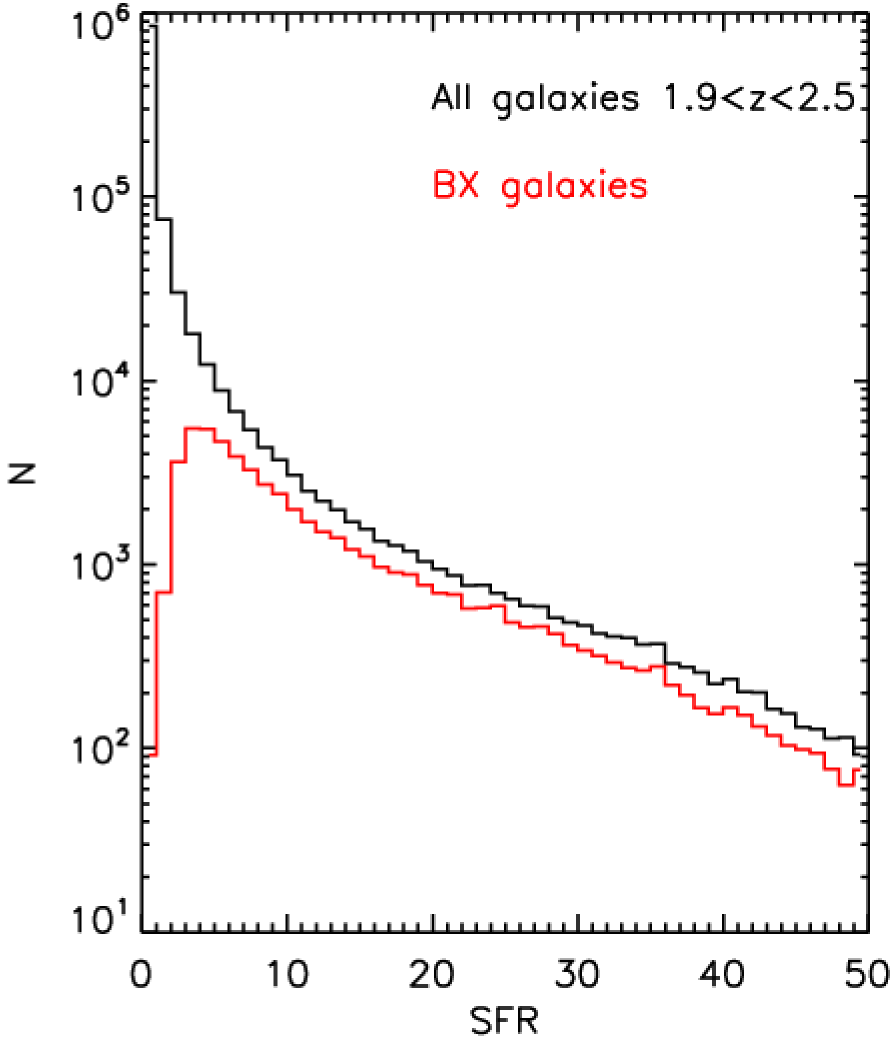




$$\text{Dust/Gas} \propto (1 + z)^{-0.5}$$

Qi Guo & SW 2008



BX selection picks up ~ 70%
of all galaxies with SFR > 5 $M_\odot$/yr
independent of the SFR

The missed objects are the dustiest
at each SFR and they fall below the
R-band limit

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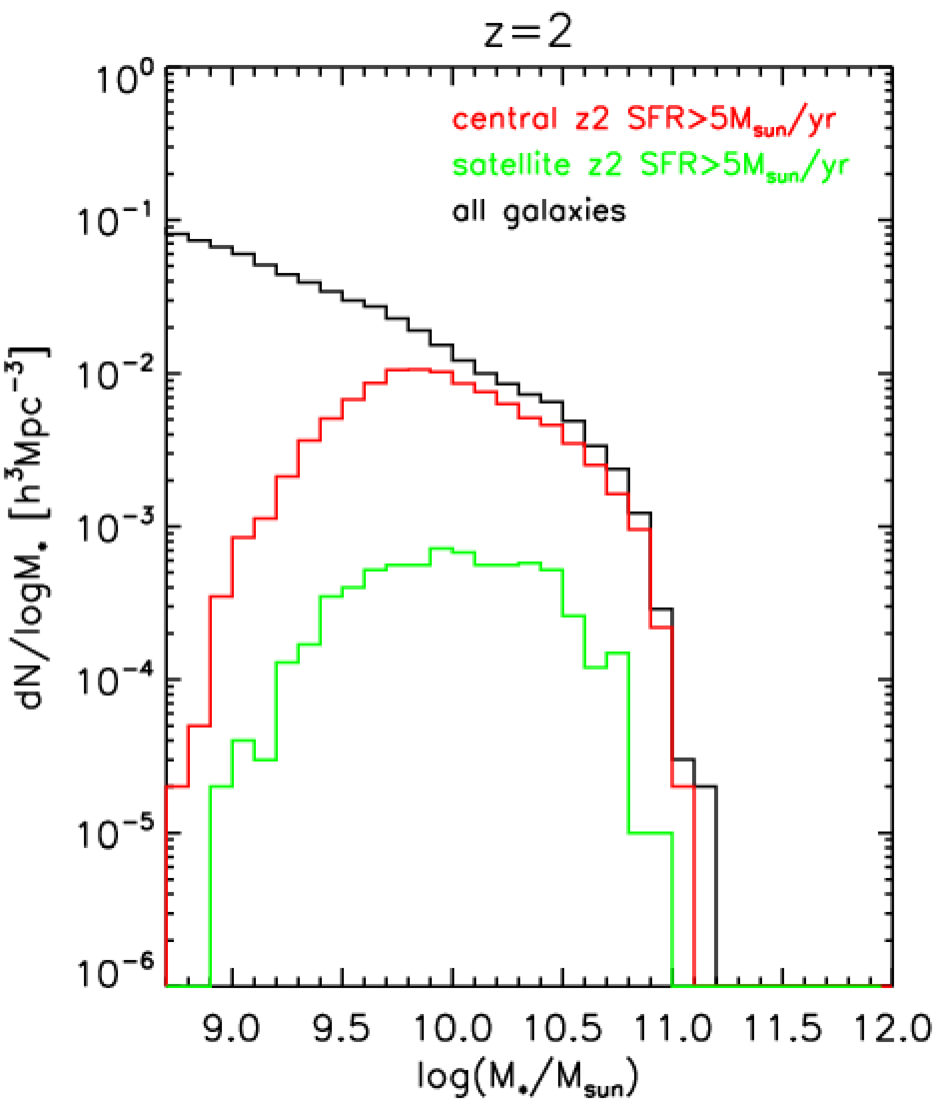

Most SF galaxies are central galaxies

They are most of the galaxies with $M_* > 10^{10.2} M_\odot$

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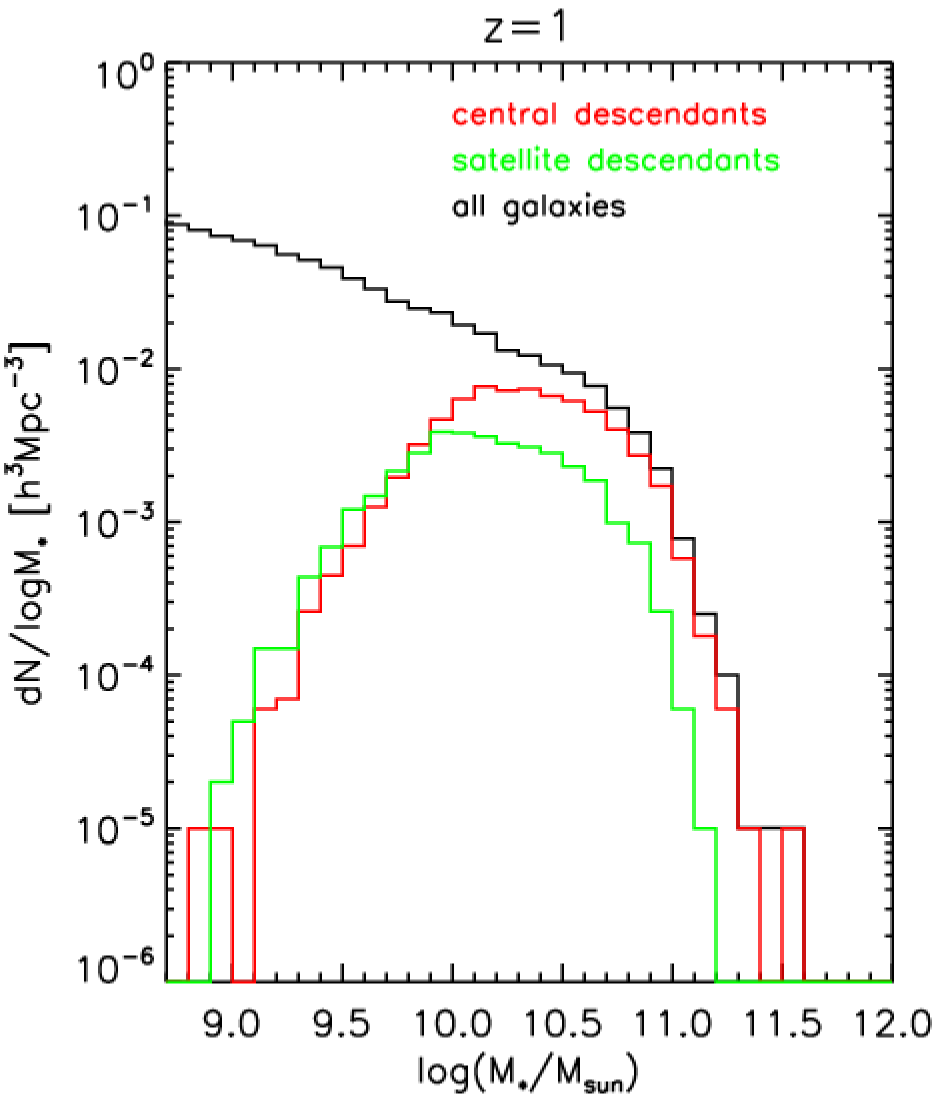

Many SFG descendants are satellite galaxies

They are most of the galaxies with $M_* > 10^{10.4} M_\odot$ at z=1

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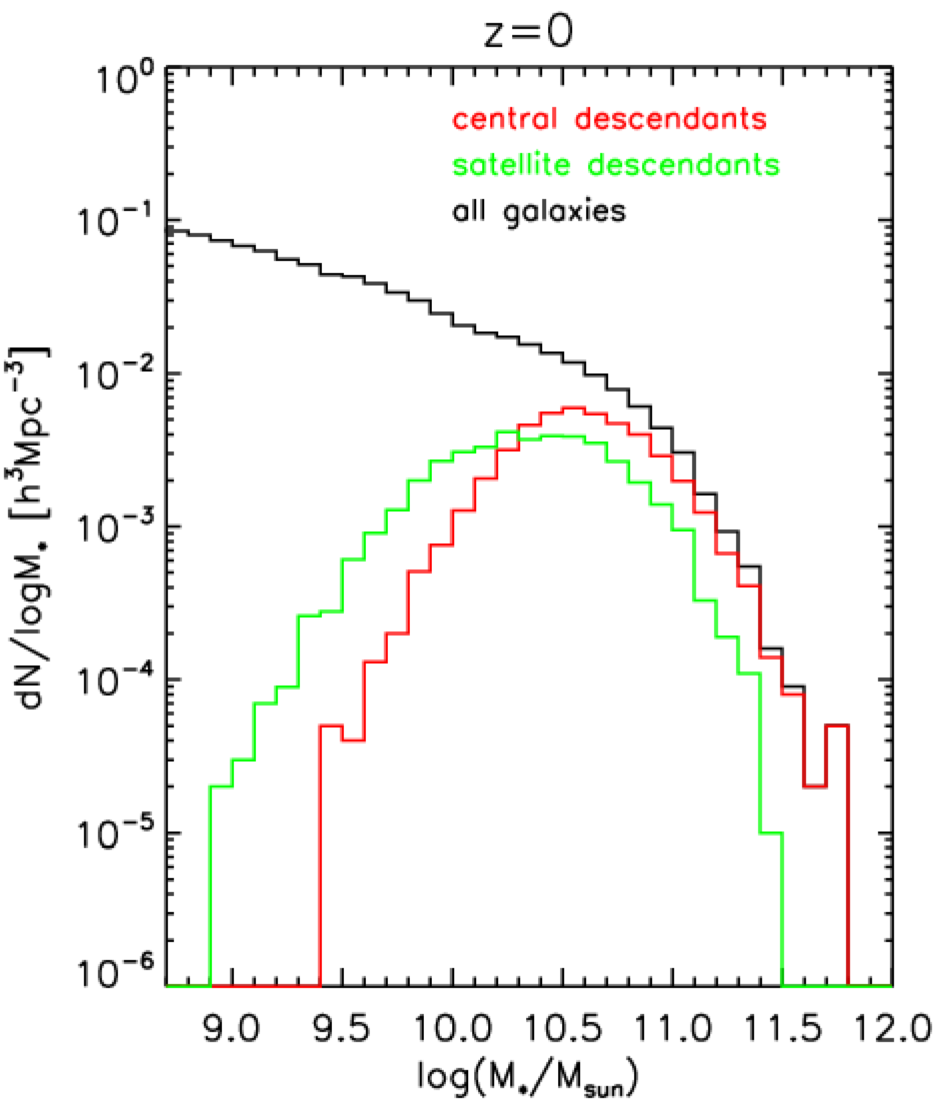

Many SFG descendants are satellite galaxies

They are most of the galaxies with $M_* > 10^{10.6} M_\odot$ at z=0

The number of descendants is about half the number of BX objects → many mergers

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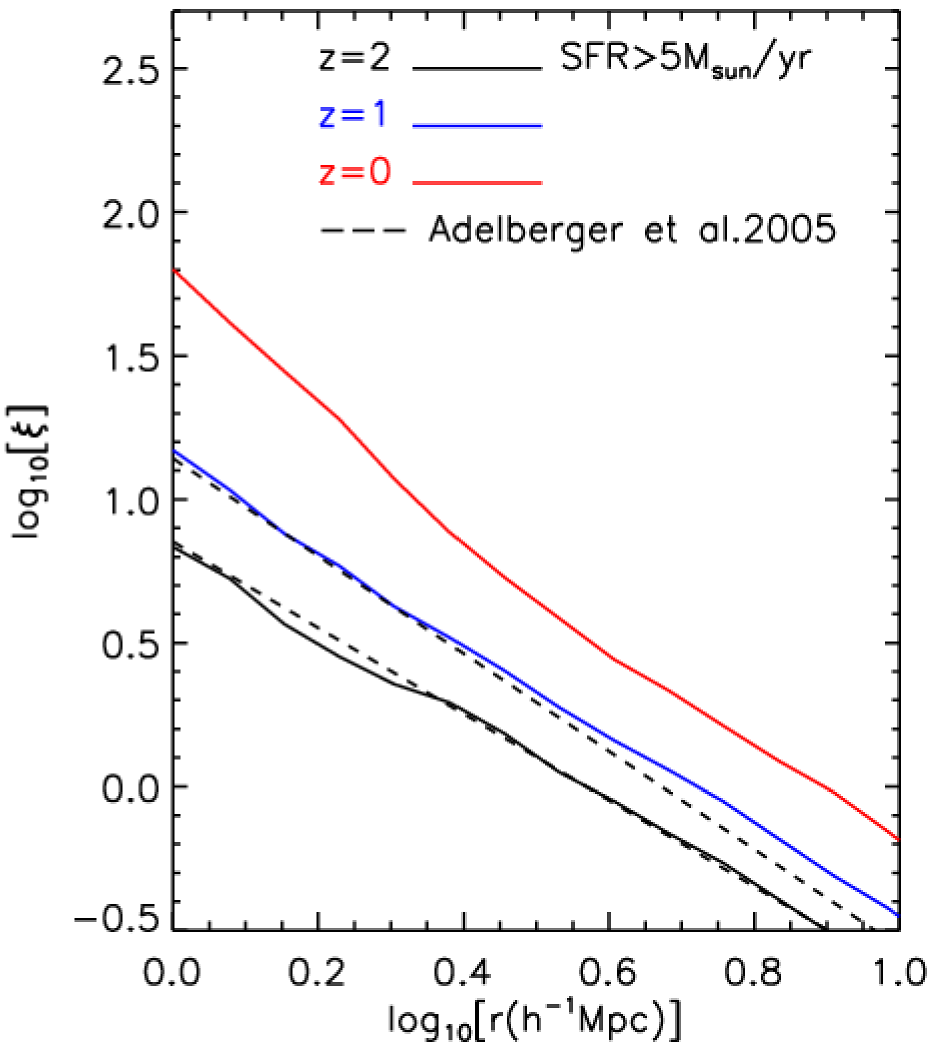

SFG descendants are more clustered than the original objects, but by a smaller factor than would be inferred from galaxy conservation

They are more clustered than present-day L_* galaxies

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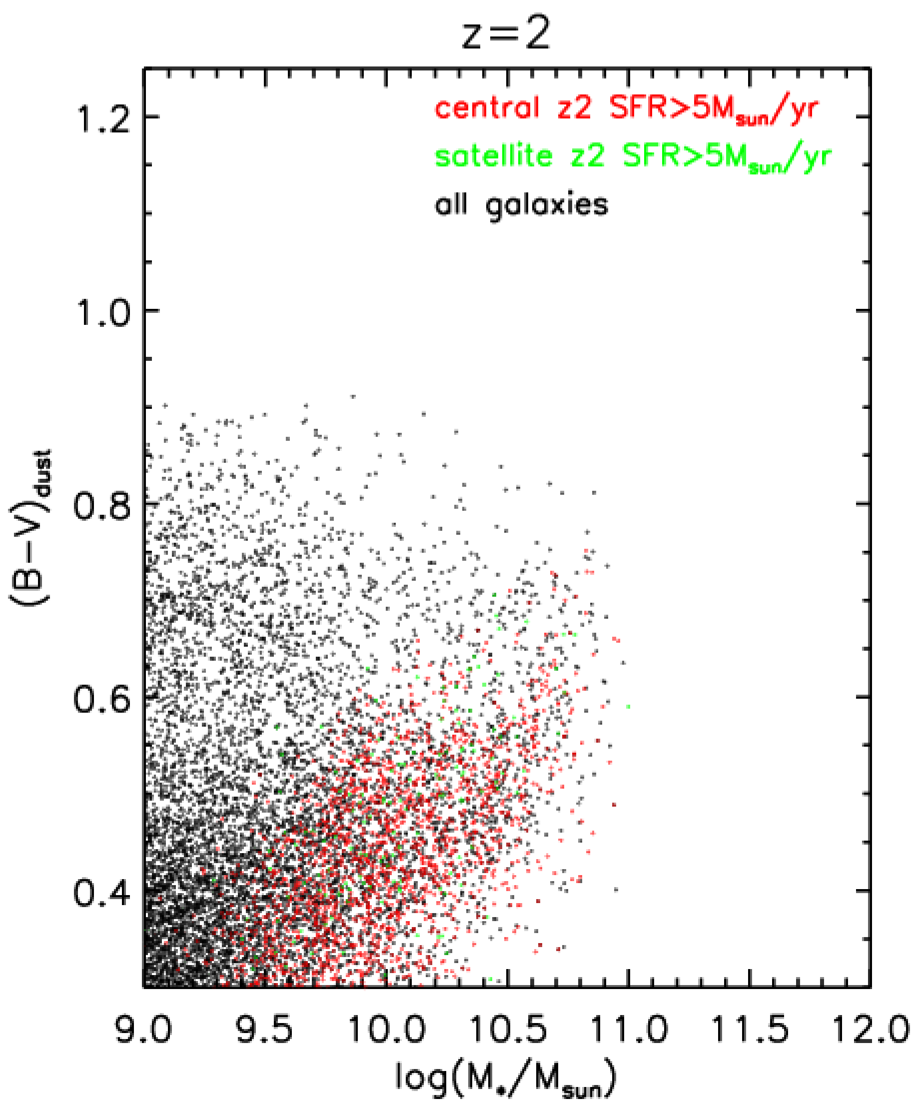

SF galaxies are on the blue and massive edge of the "blue cloud"

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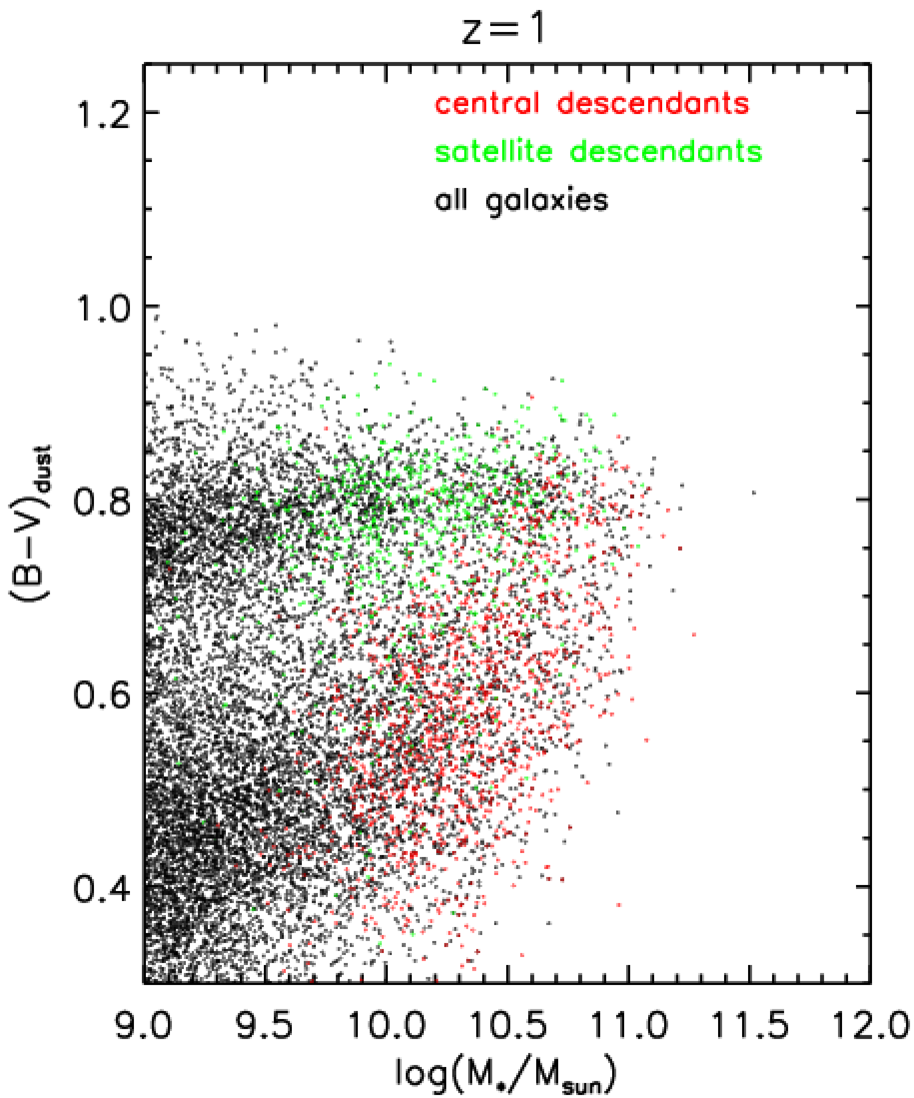

SFG descendants at z=1 are both on the red sequence and in the blue cloud

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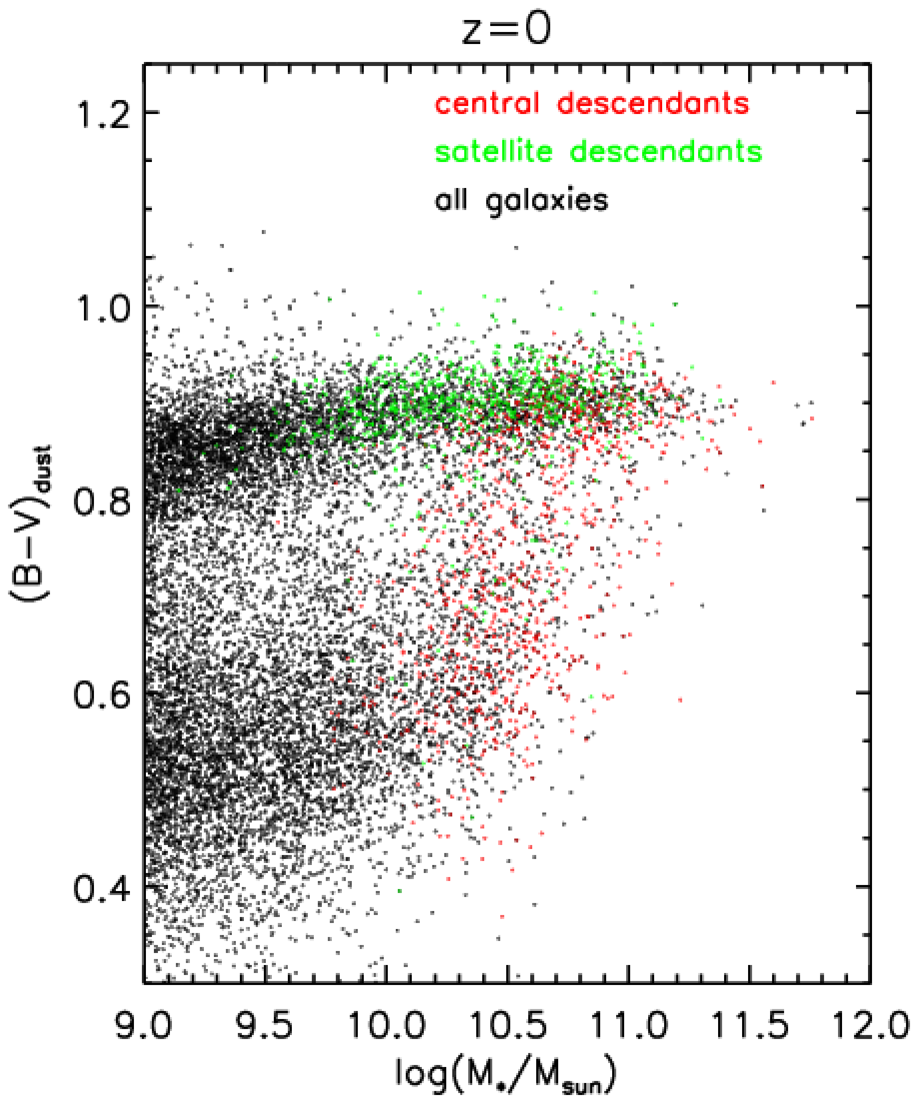


SFG descendants at z=0 are both on the red sequence and in the blue cloud

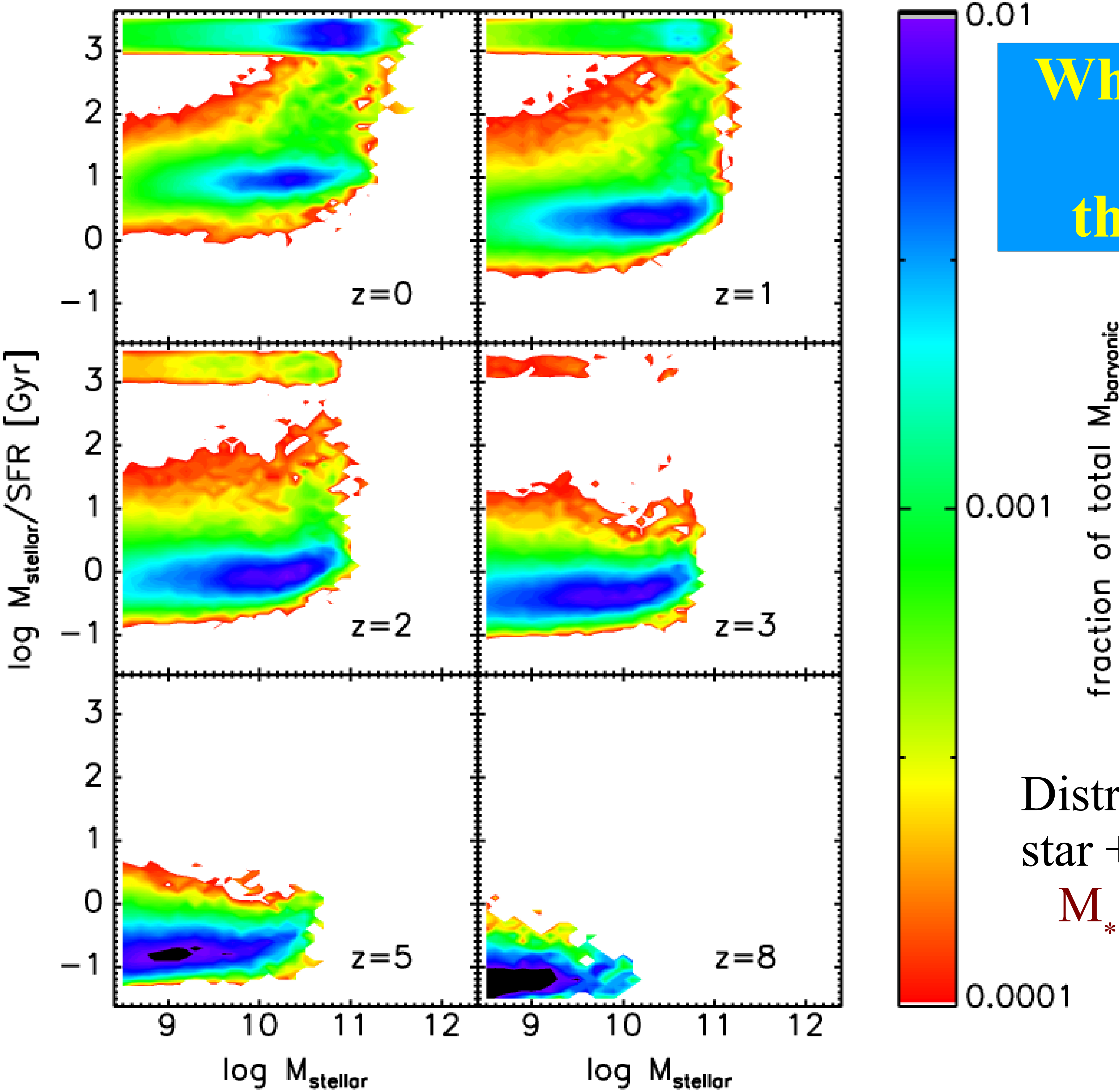
The satellite descendants are mainly on the red sequence

- Present studies of high redshift galaxies suffer strongly from the lamp-post syndrome

- They probably miss the main component of the observed galaxies

- They may miss the dominant galaxy populations.

Which galaxies host the baryons?

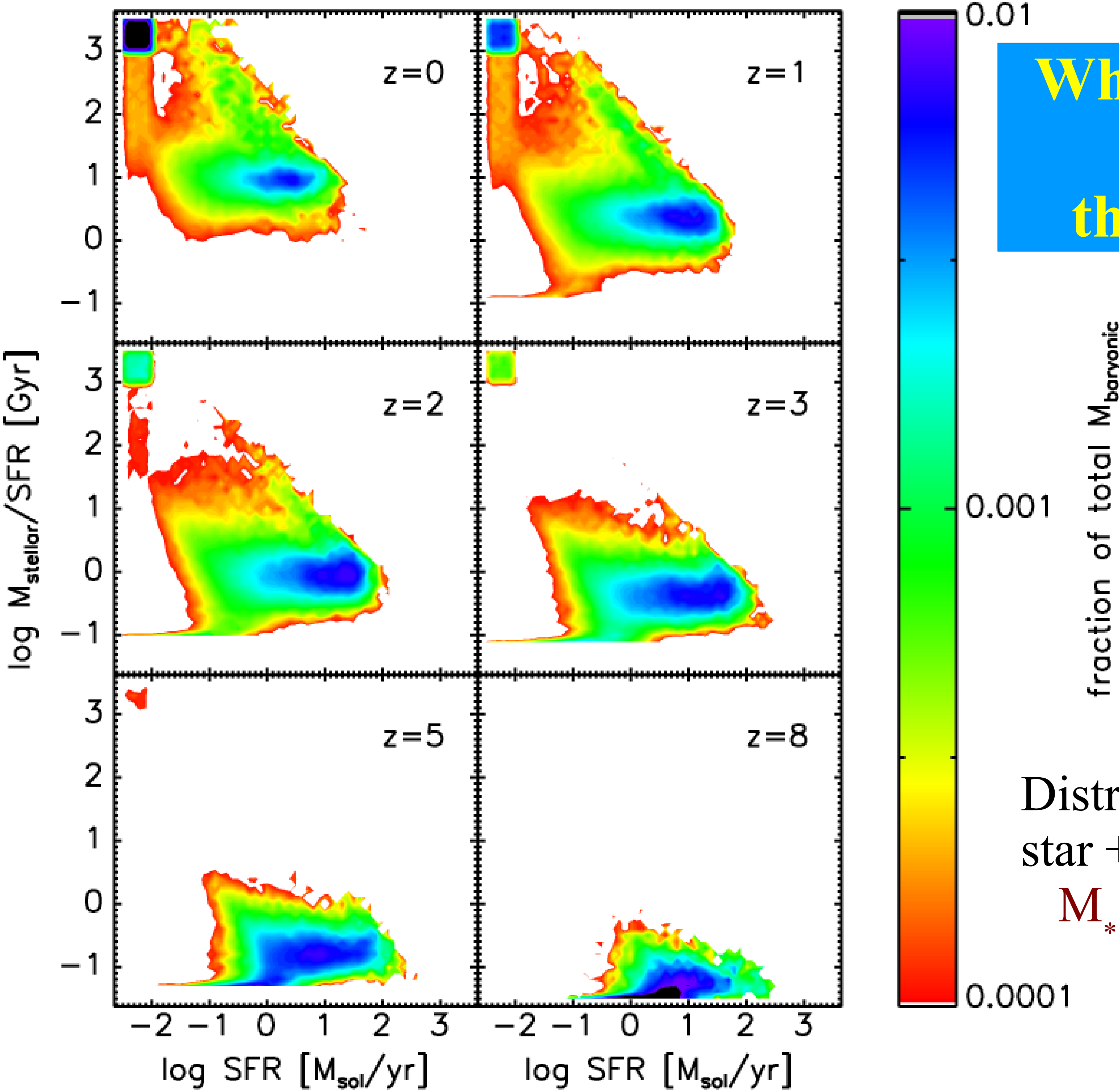


Kitzbichler & White 2008

Distribution of total star + ISM mass over $M_* / \dot{M}_*$ and M_*

Which galaxies host the baryons?

Kitzbichler & White 2008



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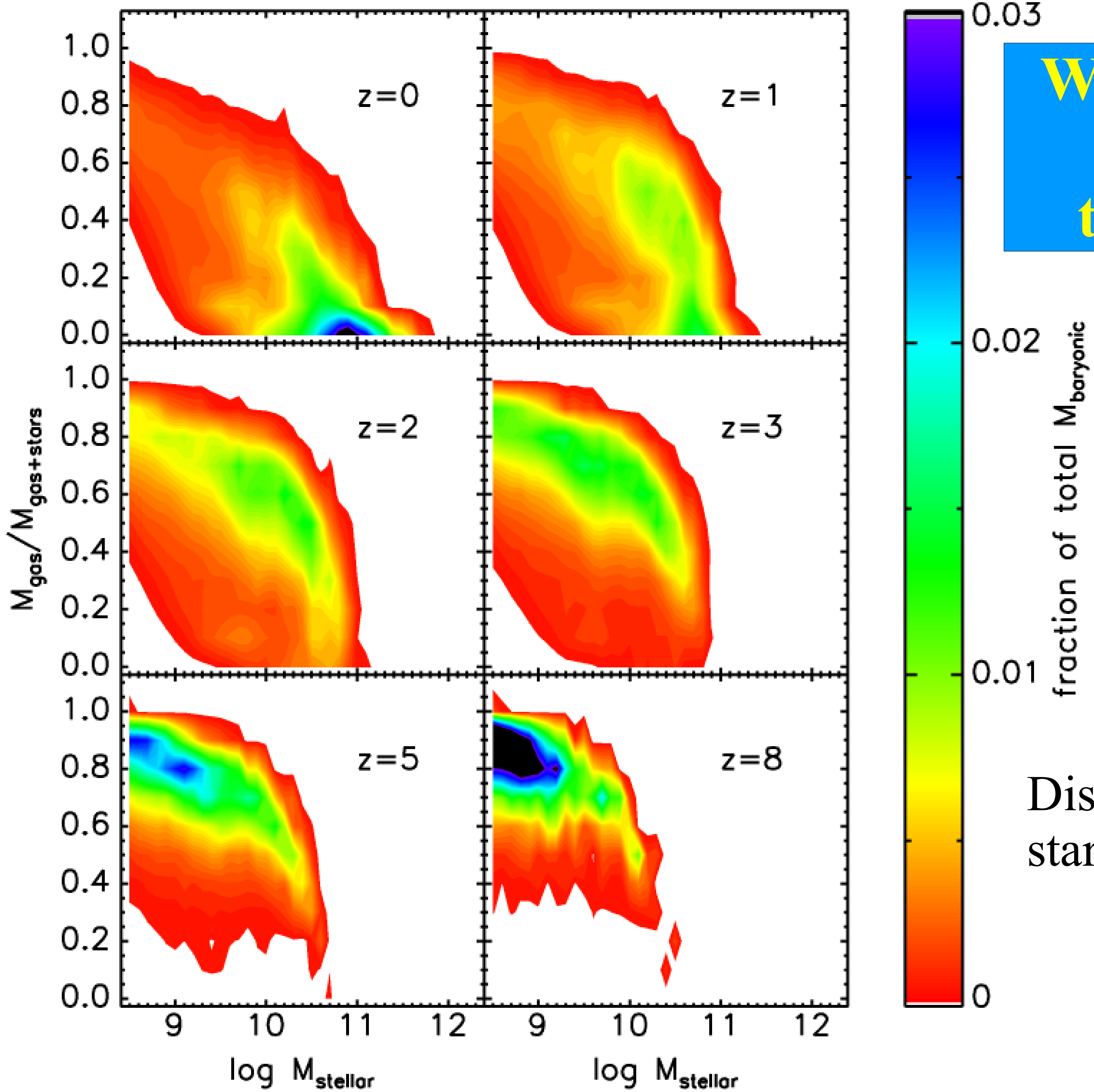
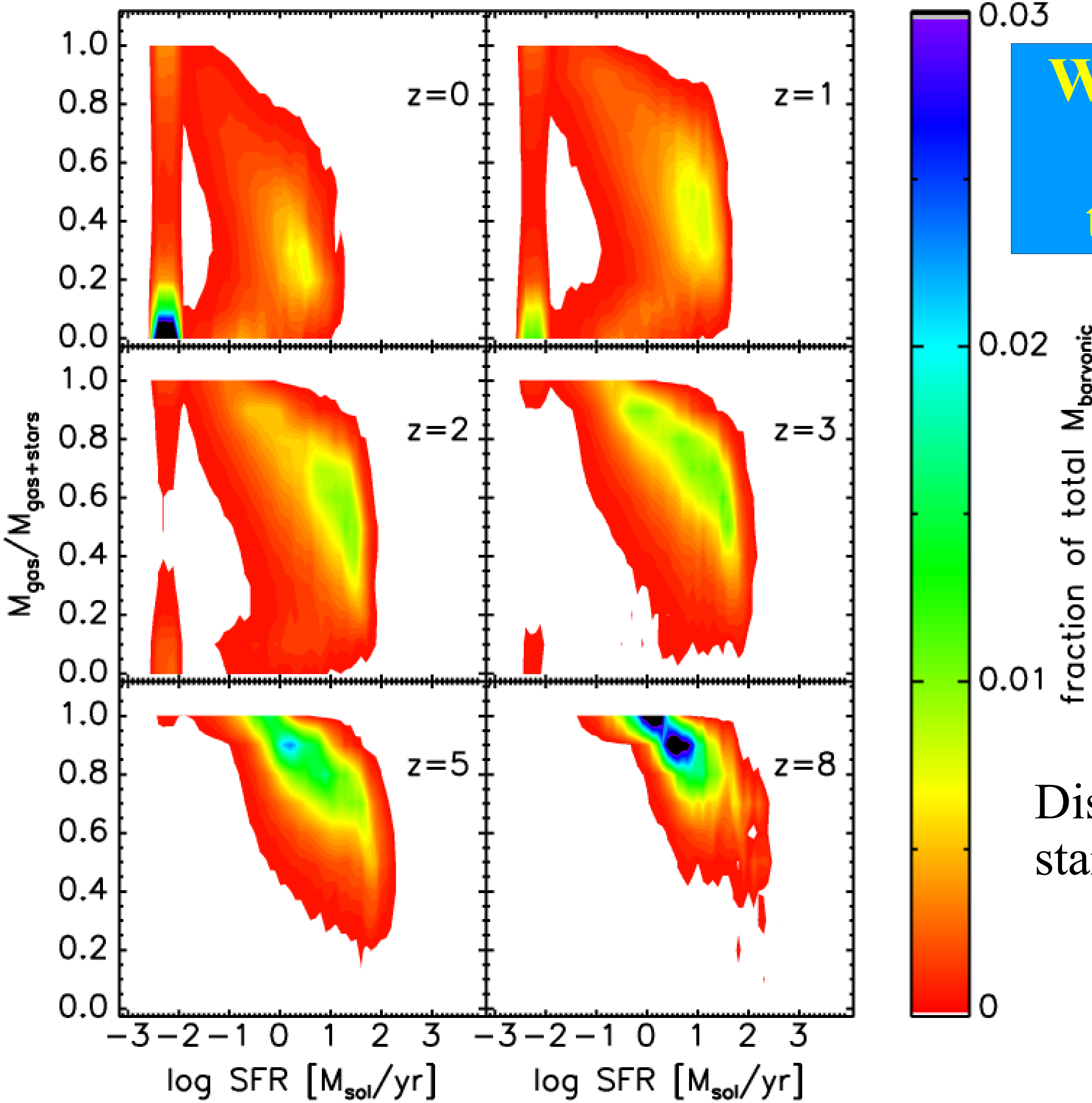


Distribution of total star + ISM mass over F_{gas} and M_*

Which galaxies host the baryons?

Kitzbichler & White 2008



Distribution of total star + ISM mass over F_{gas} and $\dot{M}_*$

- When and where were most stars formed?
  - $\dot{\rho}_*$ - z plots versus ρ_* - z plots
  - LBG's versus SMG's versus LAE's
  - Should we worry about bursts, mergers?
- When were present disks and spheroids formed?
  - Abundance of high z massive galaxies
  - Compactness of high-z massive galaxies
  - Fossil record versus observations at high z
- What (re)ionised the Universe?
  - Why can't we see residual populations at z=6?
  - How should we best observe this epoch?
- Where do the central black holes fit in?
  - Feedback issues – quasars versus radio galaxies
  - The sequence of phases ULIRG → QSO → elliptical?
- How have galaxies interacted with the IGM?
  - Winds from star-forming galaxies? from AGN?
  - Where are all the nucleosynthesis products now?
  - Is our *stellar* physics right?

There's lots left to do!

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Thanks to Rychard, Garth and Rosie for getting us all together to think about it (and for the snow)