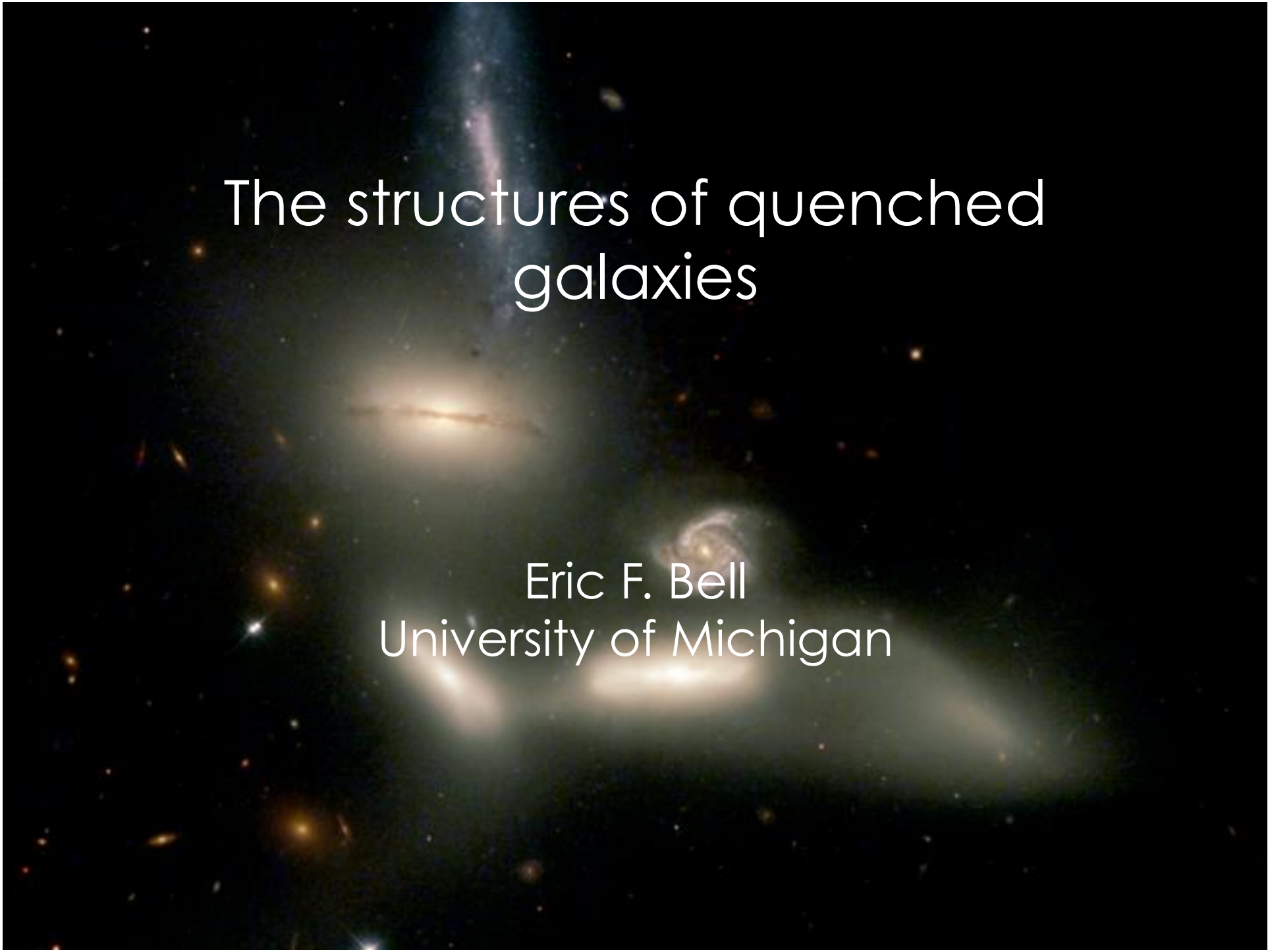
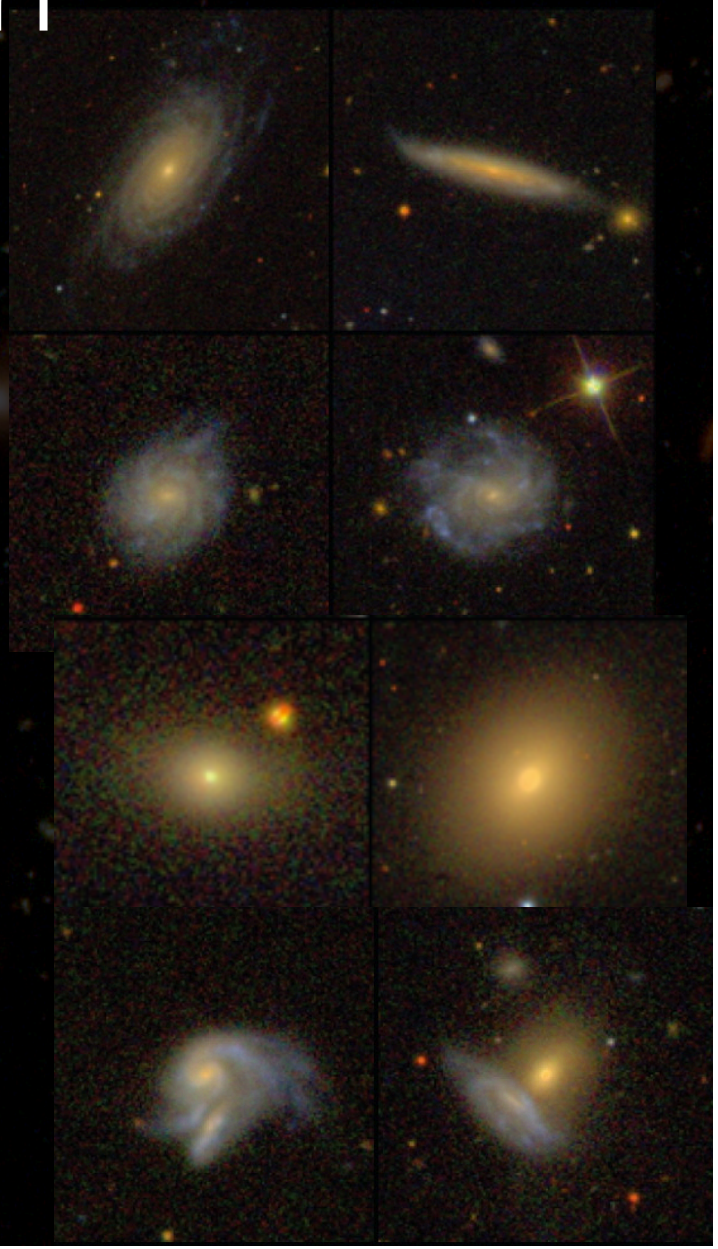


The structures of quenched galaxies

Eric F. Bell
University of Michigan

Motivation

- Structures of galaxies reflect manner of galaxy growth
  - Disks; conservation of some angular momentum
  - Spheroids; violent relaxation, accretion of material from lots of axes
  - Extended vs. compact; how much dissipation of energy, loss of angular momentum?
- Want to know – are structures of quiescent galaxies distinctive? Does that tell us about how they evolve?



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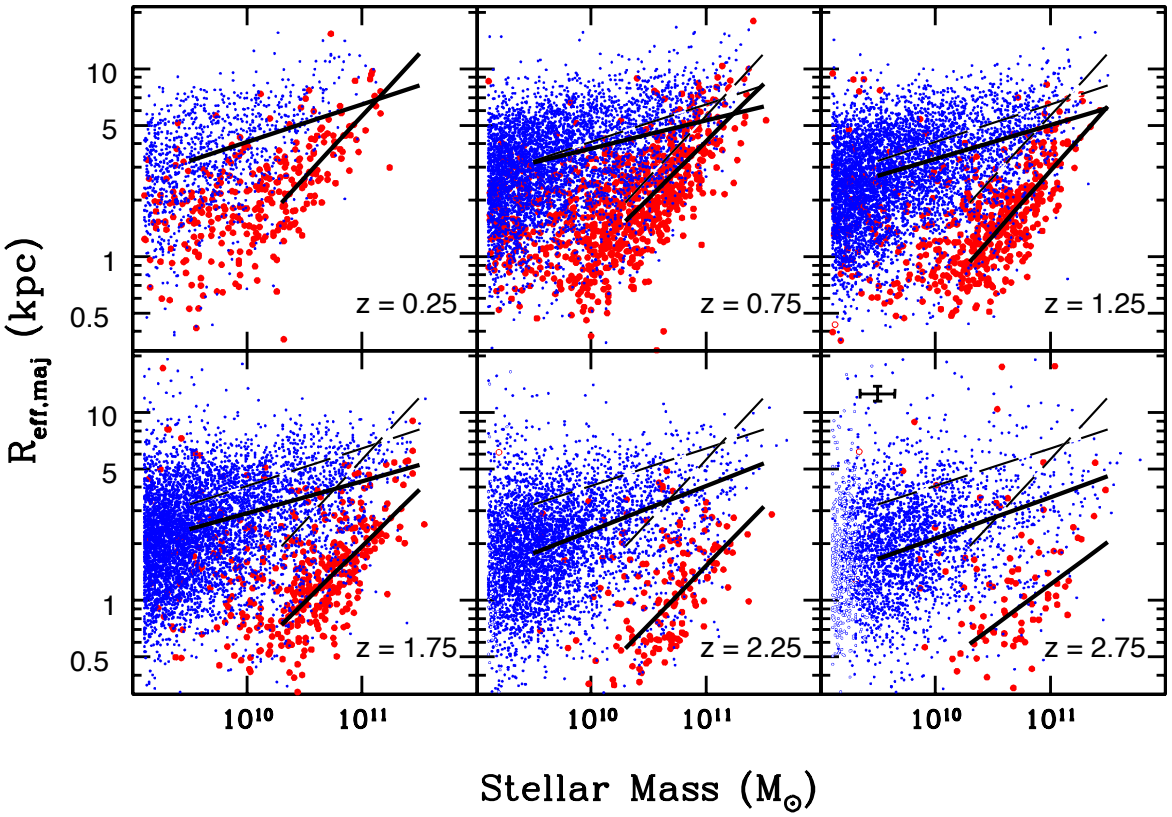

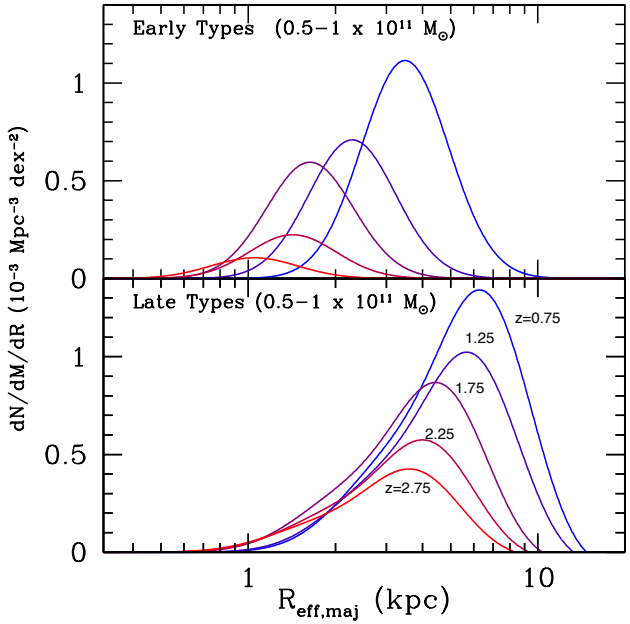

van der Wel et al. (2014)

3D-HST+CANDELS (photz+grism z)

Sersic fits of WFC3 IR data; corrected to rest-frame g

SF much larger than quiescent; dissipation very imp. in setting quiescent sizes
Quiescent population grows in number density z~3 to the present day (at wide range of masses;e.g., Brammer+11, Muzzin+13)

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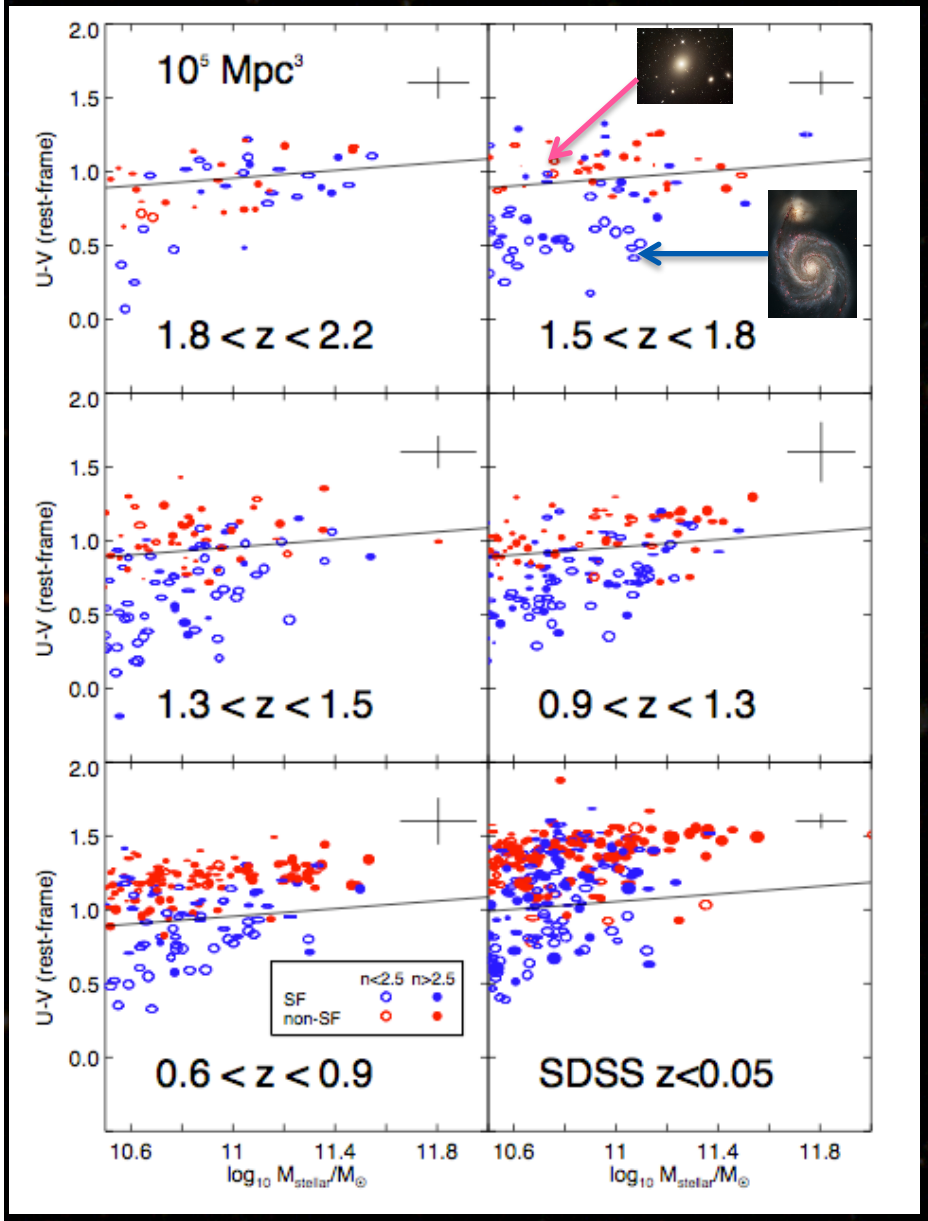
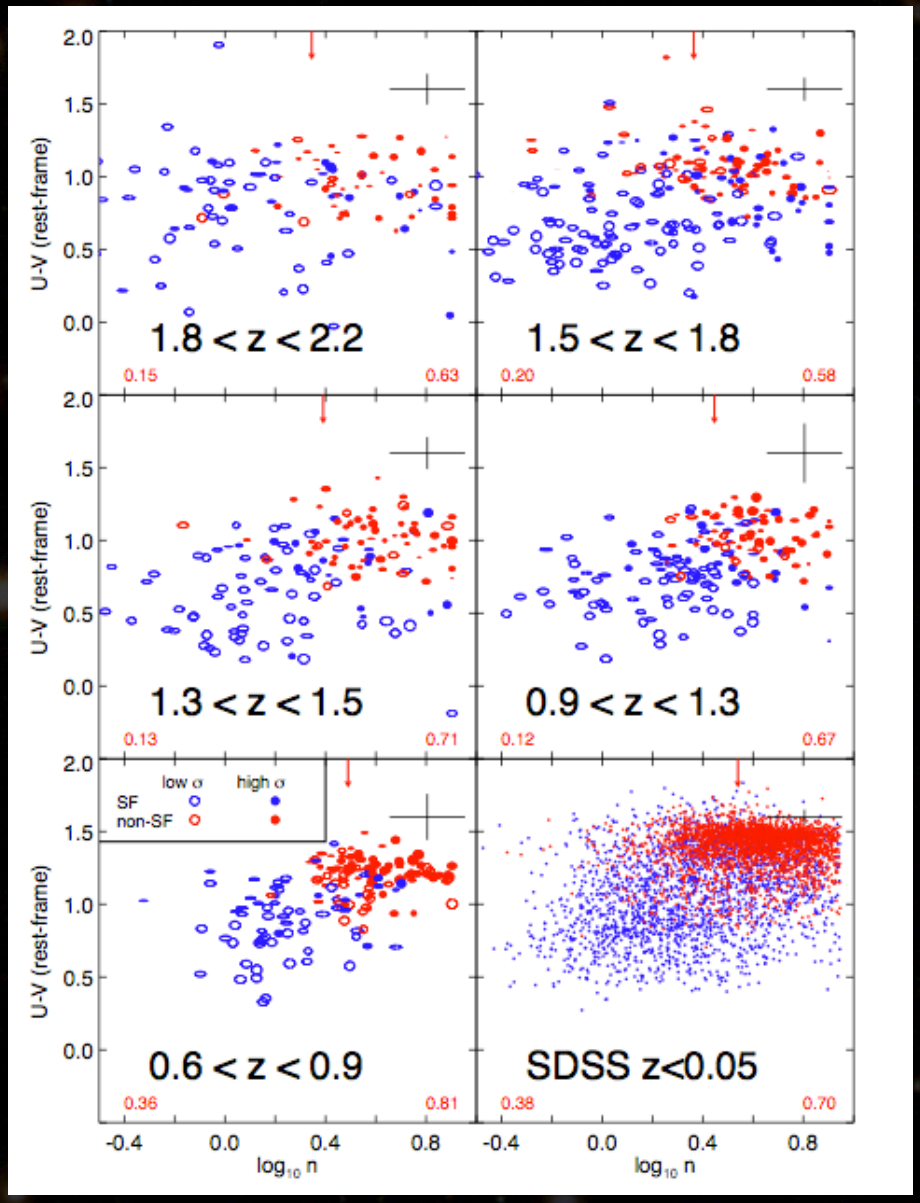




Bell et al. 2012

7/15/14

CANDELS UDS 30'x6'
Williams + photozs
Bell + stellar masses
van der Wel + 2013 Sersic fits (F160W; rest-frame optical)

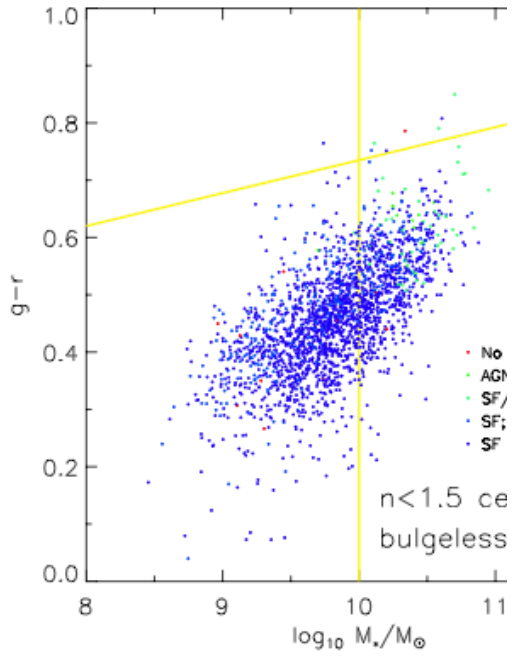
Eric Bell

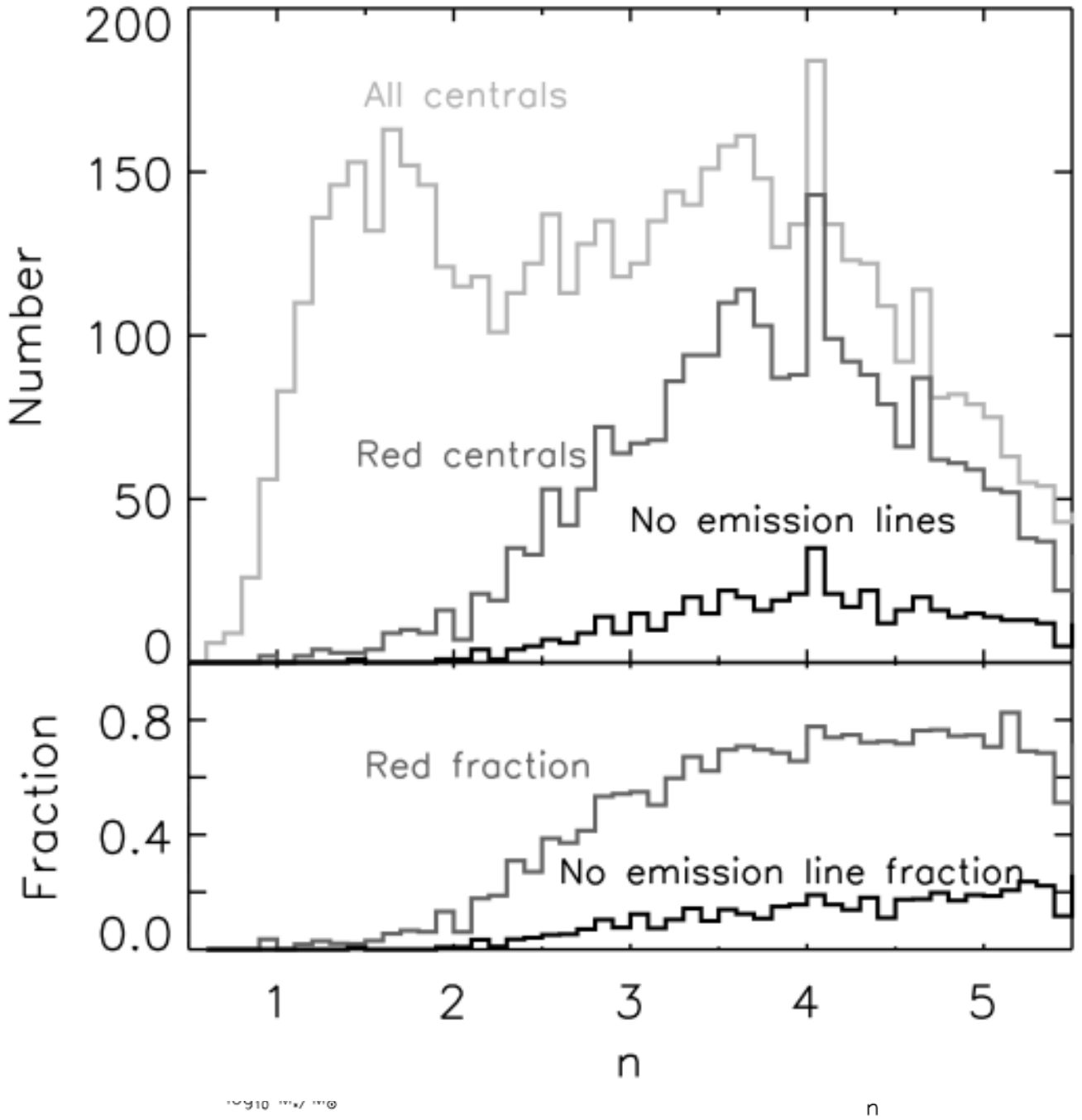
Are there bu

Bell 2008
SDSS NYU/VAGC
Brinchmann et al

>99.5% of red cen

A bulge appears
formation

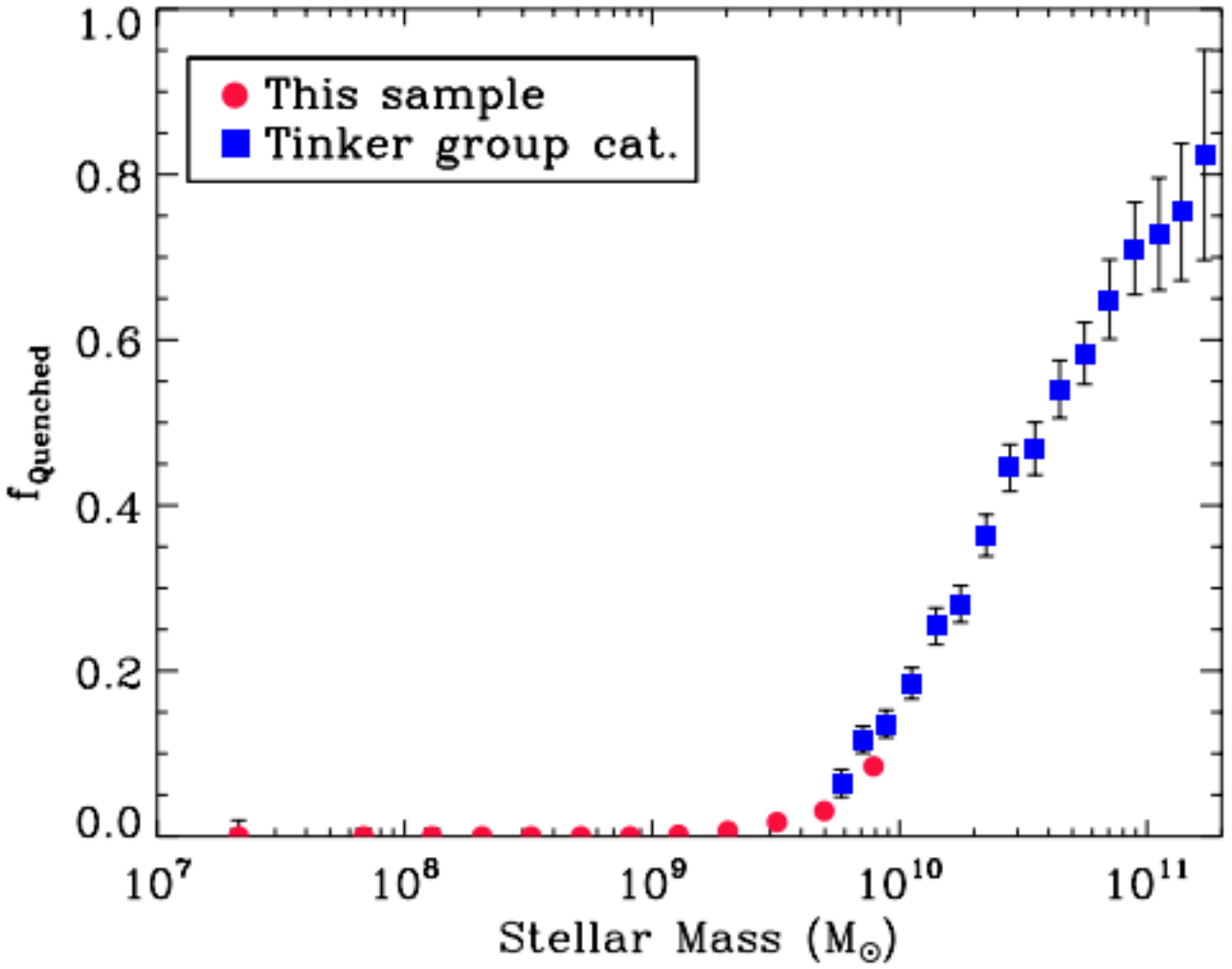




Geha et al. 2012

Quenched central fraction as a function of stellar mass

Below 3×10^9 M_{sun} there are no central quenched galaxies



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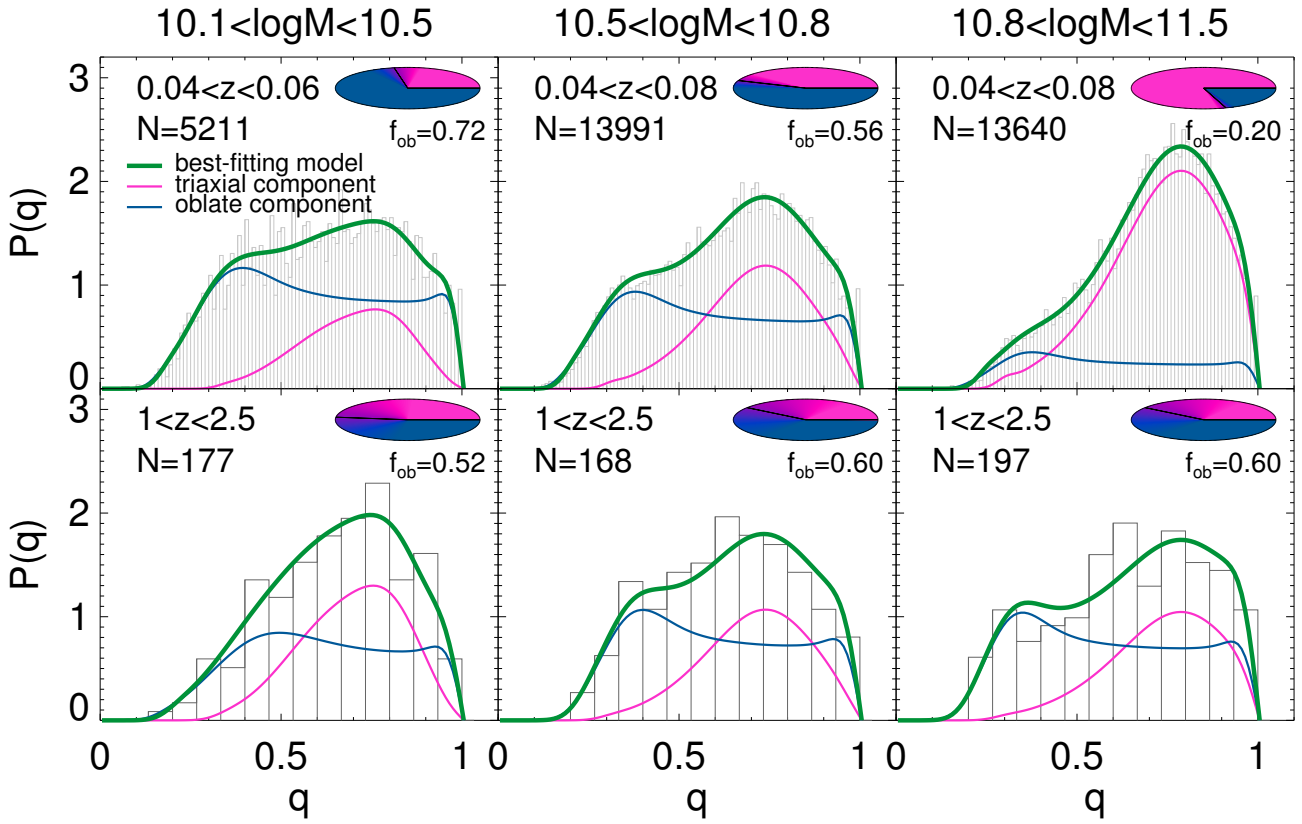
Yu Yen Chang, van der Wel, et al. (2013; submitted)

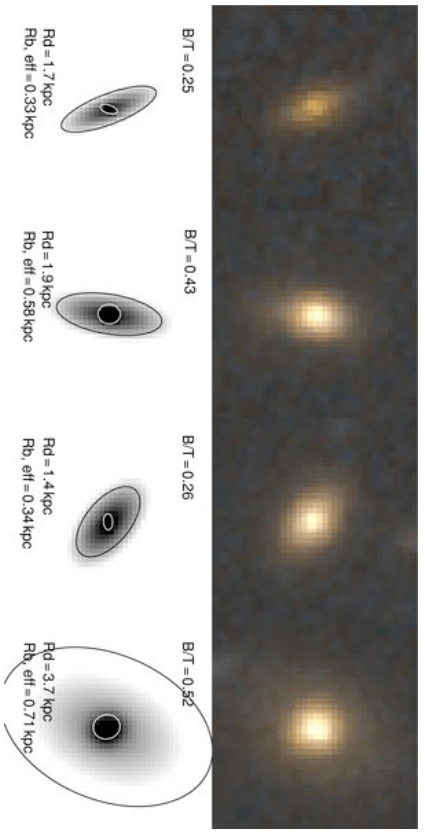
CANDELS Sersic fits + photoz

- Disks common z>~1.5 massive galaxies (quiescent)
- Triaxial by z~0 – merging (major/minor)

van der Wel (2011)

- Quiescent galaxies oblate at lower masses (all z)





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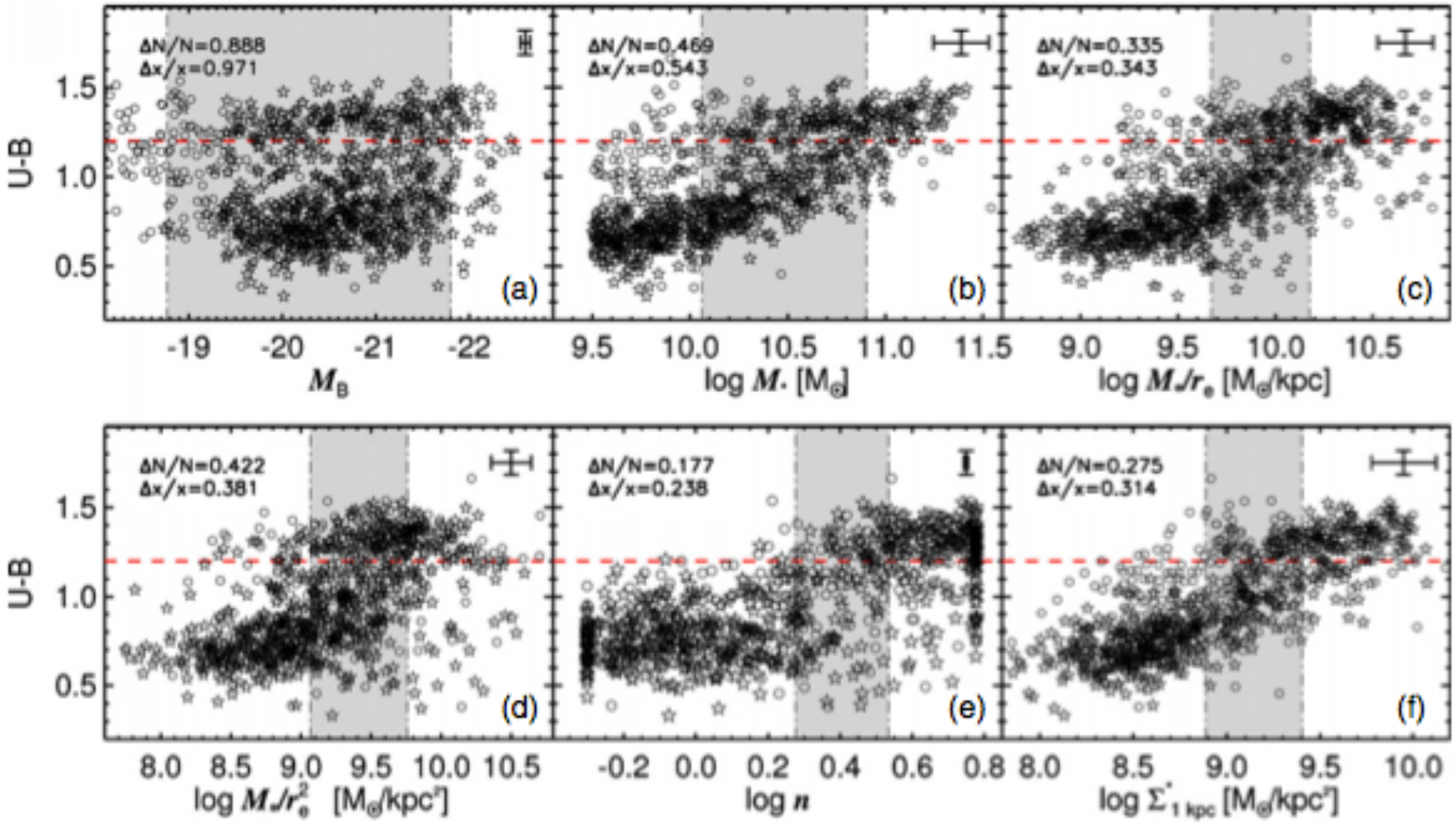
Cheung et al. 2012

Stellar mass and magnitude correlate poorly with quiescence

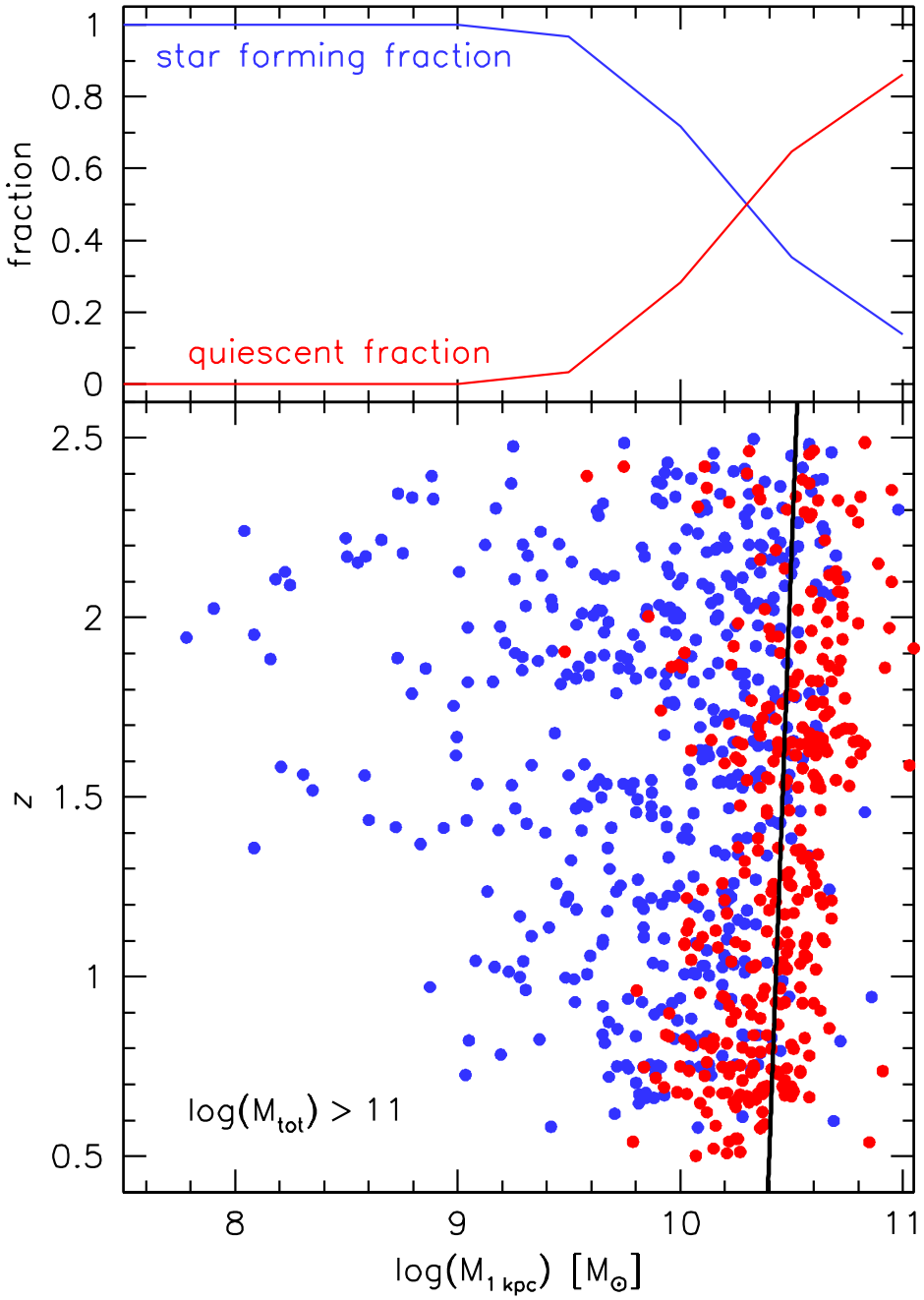
Velocity dispersion, Surface density, Sersic index, projected density in 1kpc correlate well with quiescence

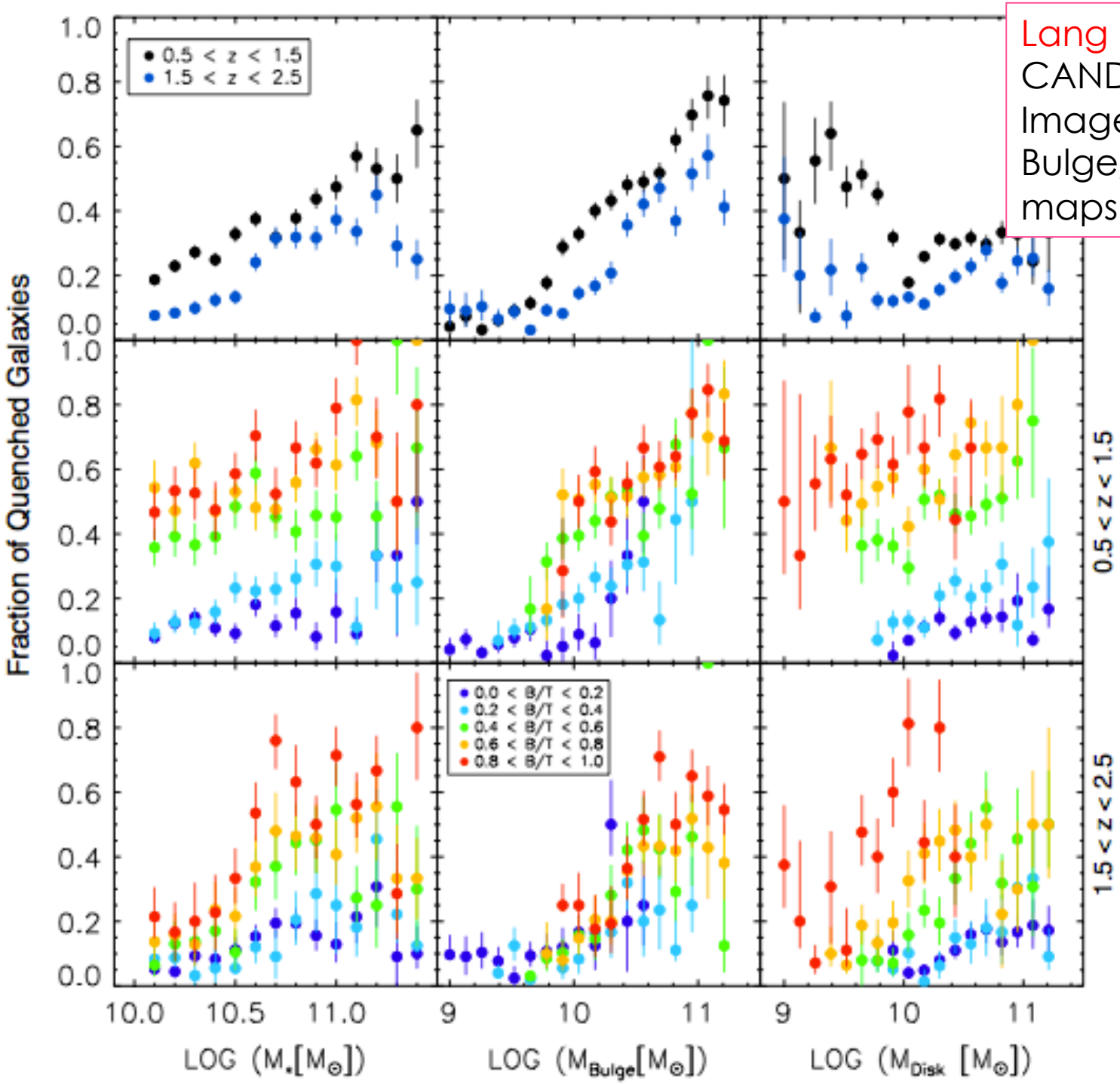


van Dokkum et al. 2014

Estimated mass within 1kpc sphere
Galaxies with total mass above $10^{11}M_{sun}$

Quiescent fraction correlates with core mass….

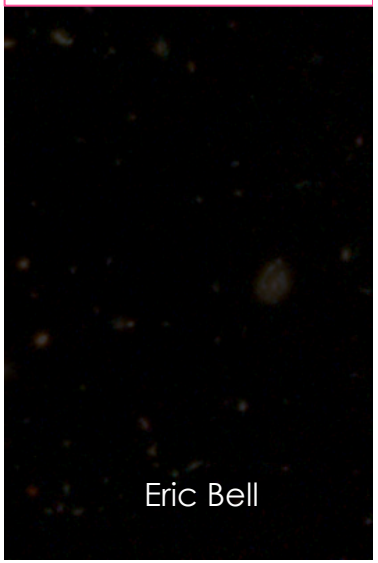




Lang et al 2014
CANDELS + 3D-HST
Images → mass maps
Bulge/disk fit to mass maps

Detailed demographics

Bulge mass correlates with quiescent fraction



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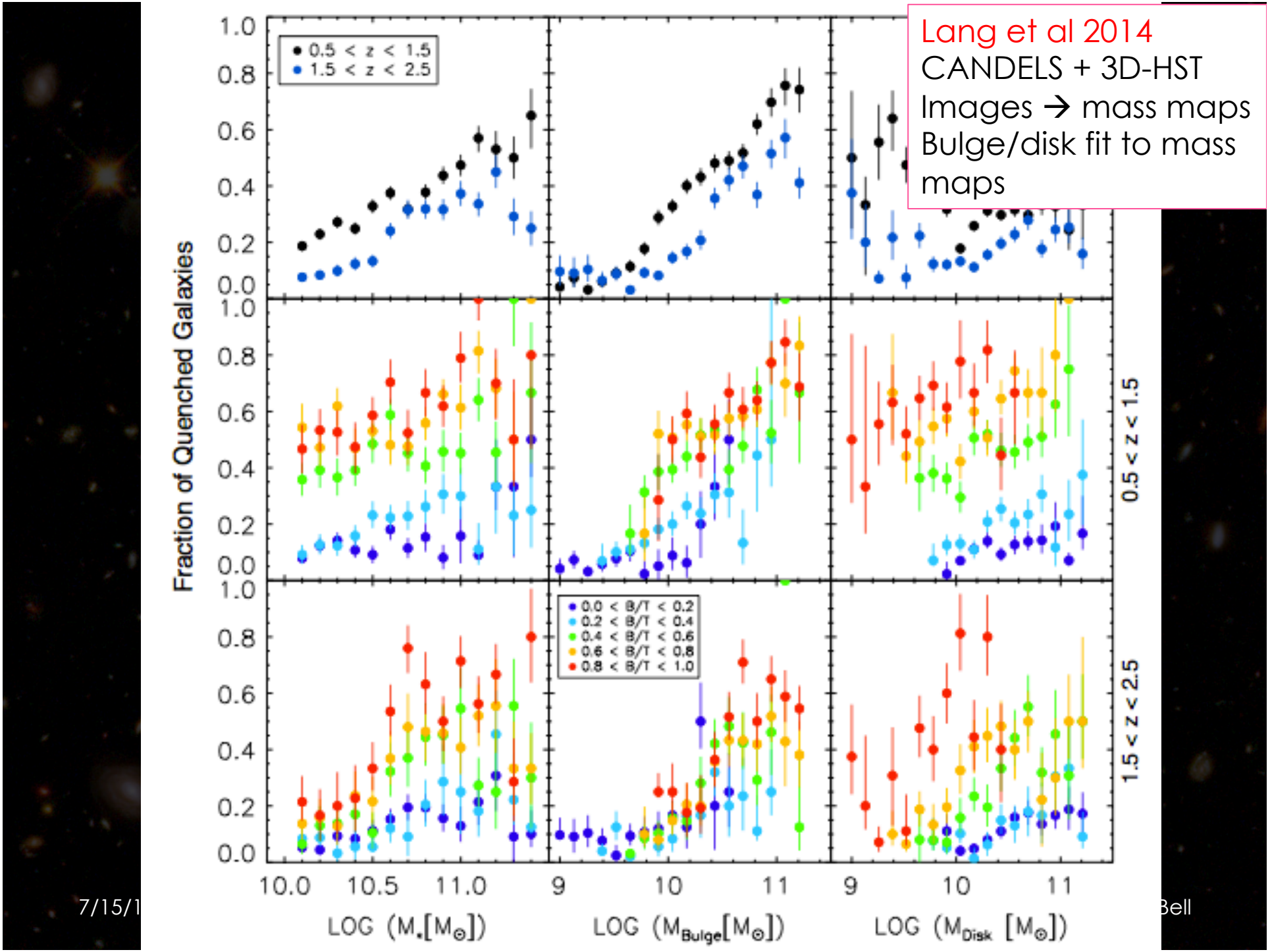
Weak stellar mass correlation
→ Naïve implication that models where quenching is from halo mass alone disfavored
Correlation with bulge or core mass / B/T / Sersic / core density
→ May be consistent with pictures where bulge formation heats or ejects gas, or large black holes provide feedback


Lang et al 2014
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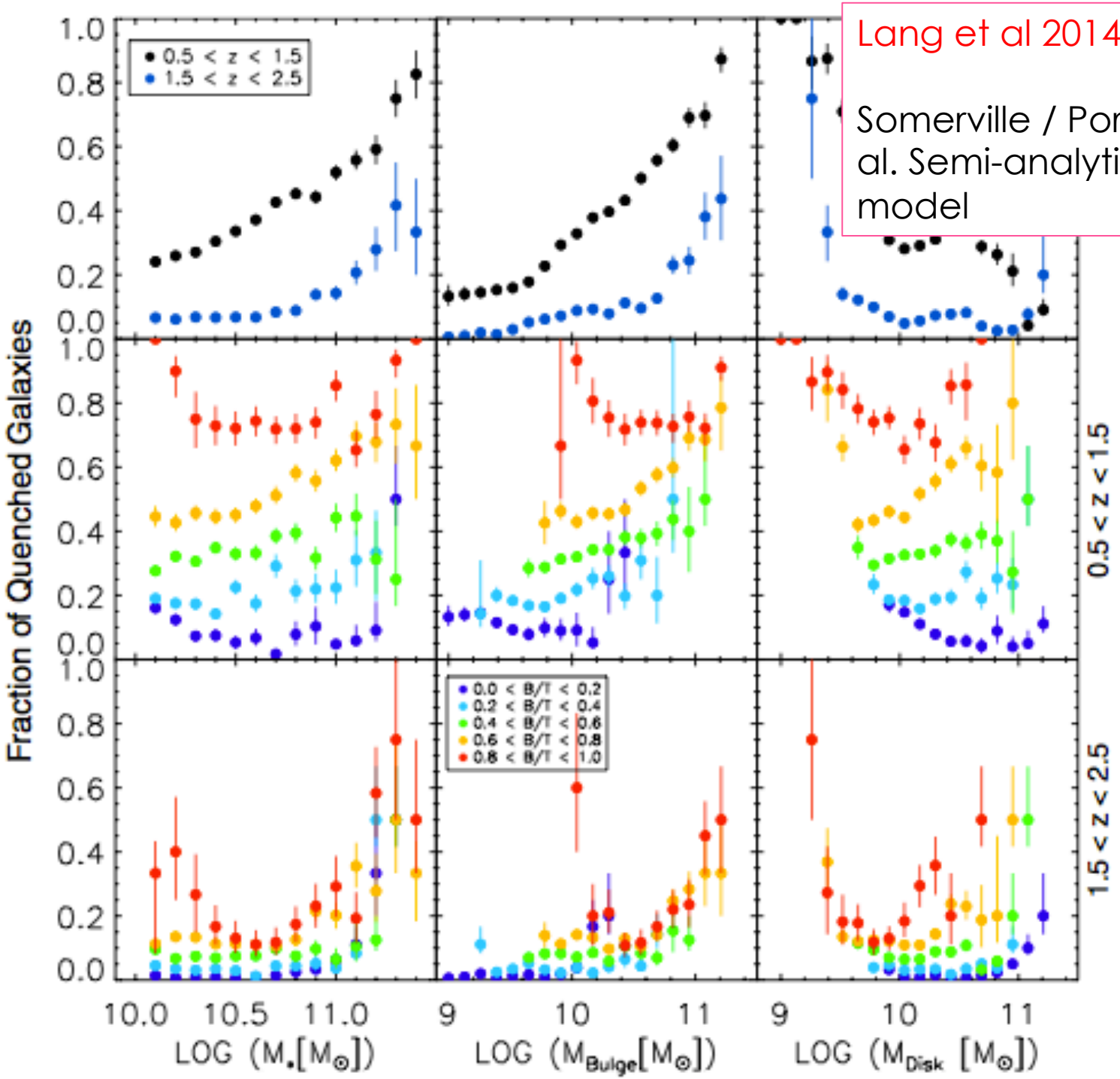
Bulge/disk fit to mass maps
Fraction of Quenched Galaxies
0.5 < z < 1.5
1.5 < z < 2.5
0.0 < B/T < 0.2
0.2 < B/T < 0.4
0.4 < B/T < 0.6
0.6 < B/T < 0.8
0.8 < B/T < 1.0
0.5 < z < 1.5
1.5 < z < 2.5
LOG (M*[M⊙])
LOG (MBulge[M⊙])
LOG (MDisk [M⊙])



Lang et al 2014

Somerville / Porter et al. Semi-analytic model

What is halo and bulge mass doing?

Quiescent fraction varies strongly with black hole mass.

Little variation with halo mass.

In this model the AGN is the agent of quenching