Stellar Mass Growth of Massive Central Galaxies

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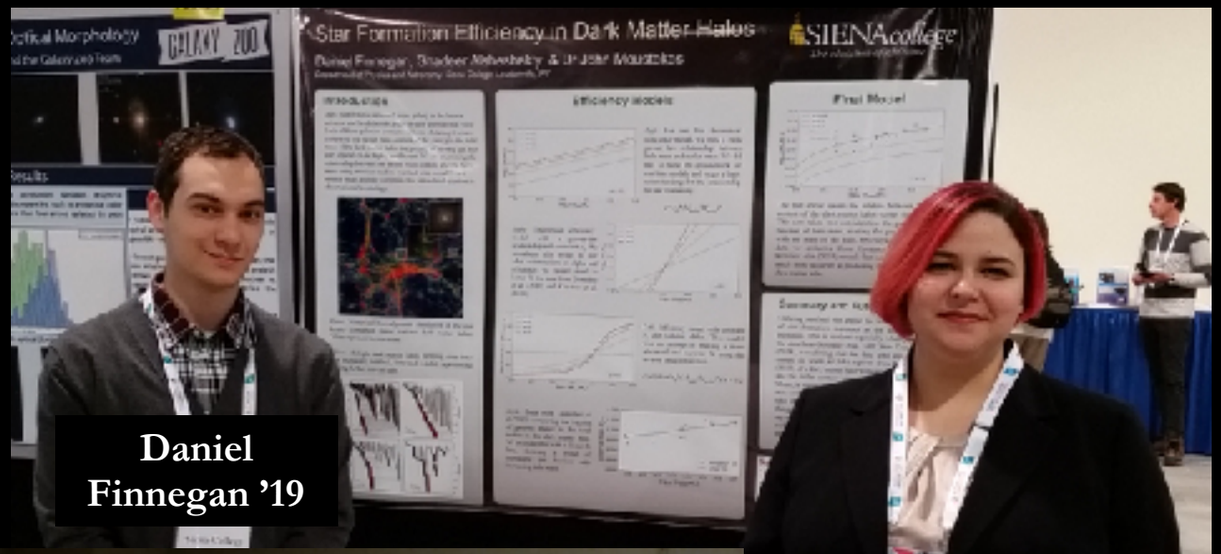
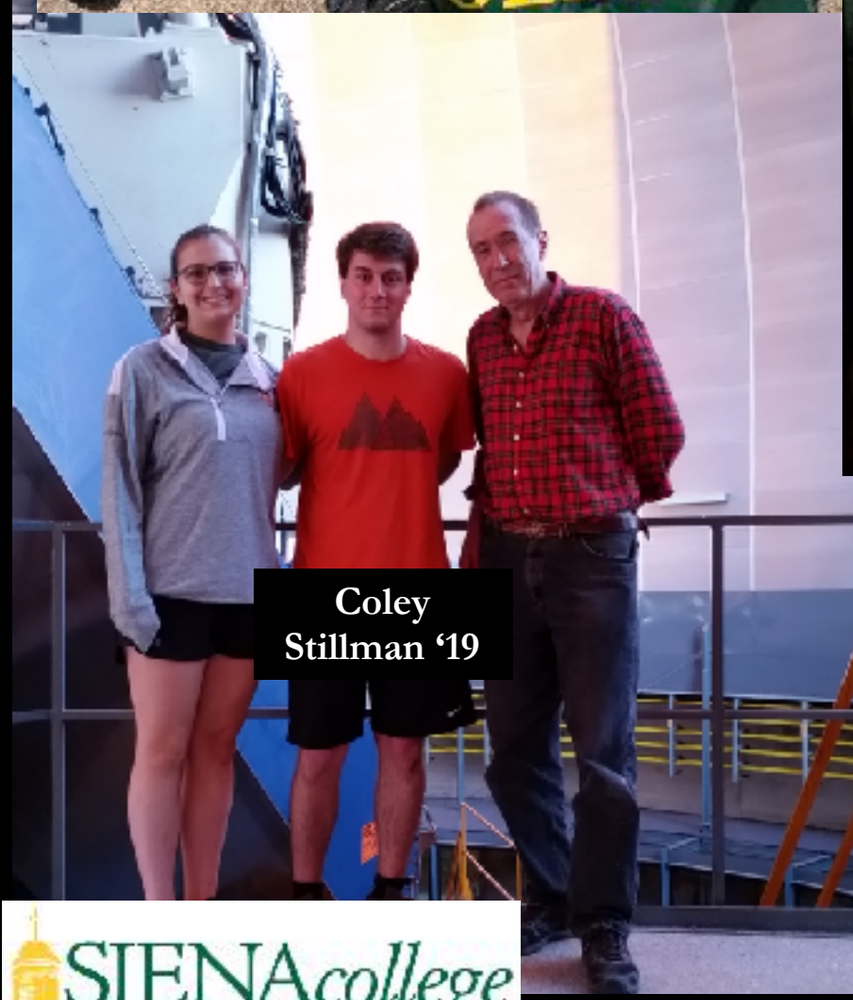


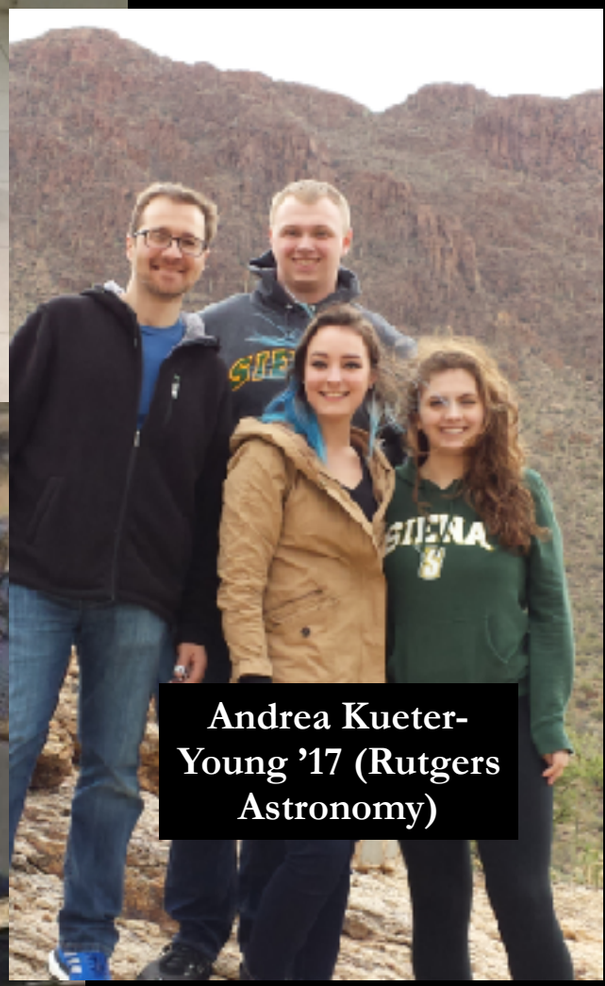
Daniel Finnegan ’19

Ghadeer Alsheshakly ’19

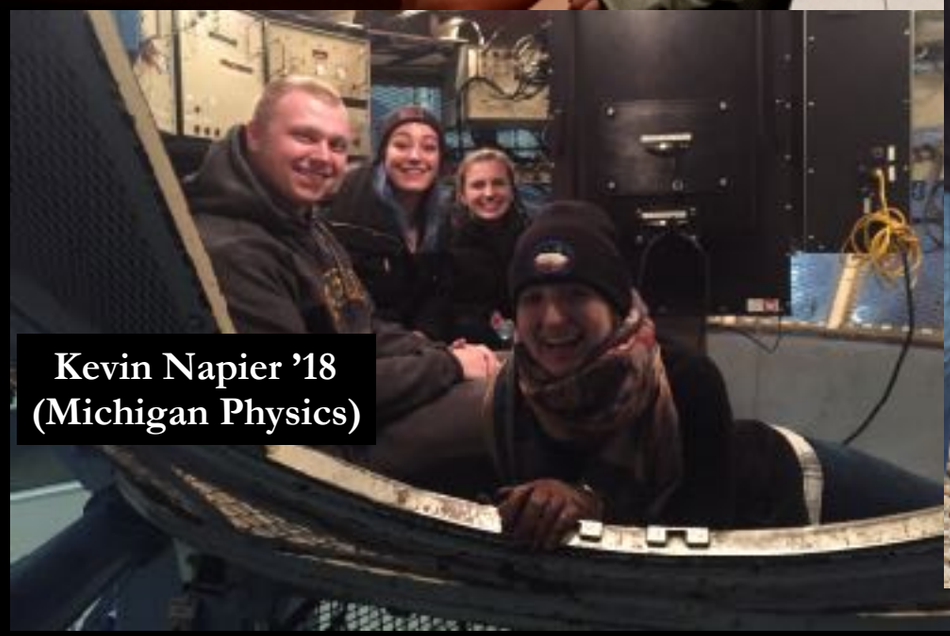
Megan Poremba ‘20



Coley Stillman ‘19



Andrea Kueter-Young ’17 (Rutgers Astronomy)

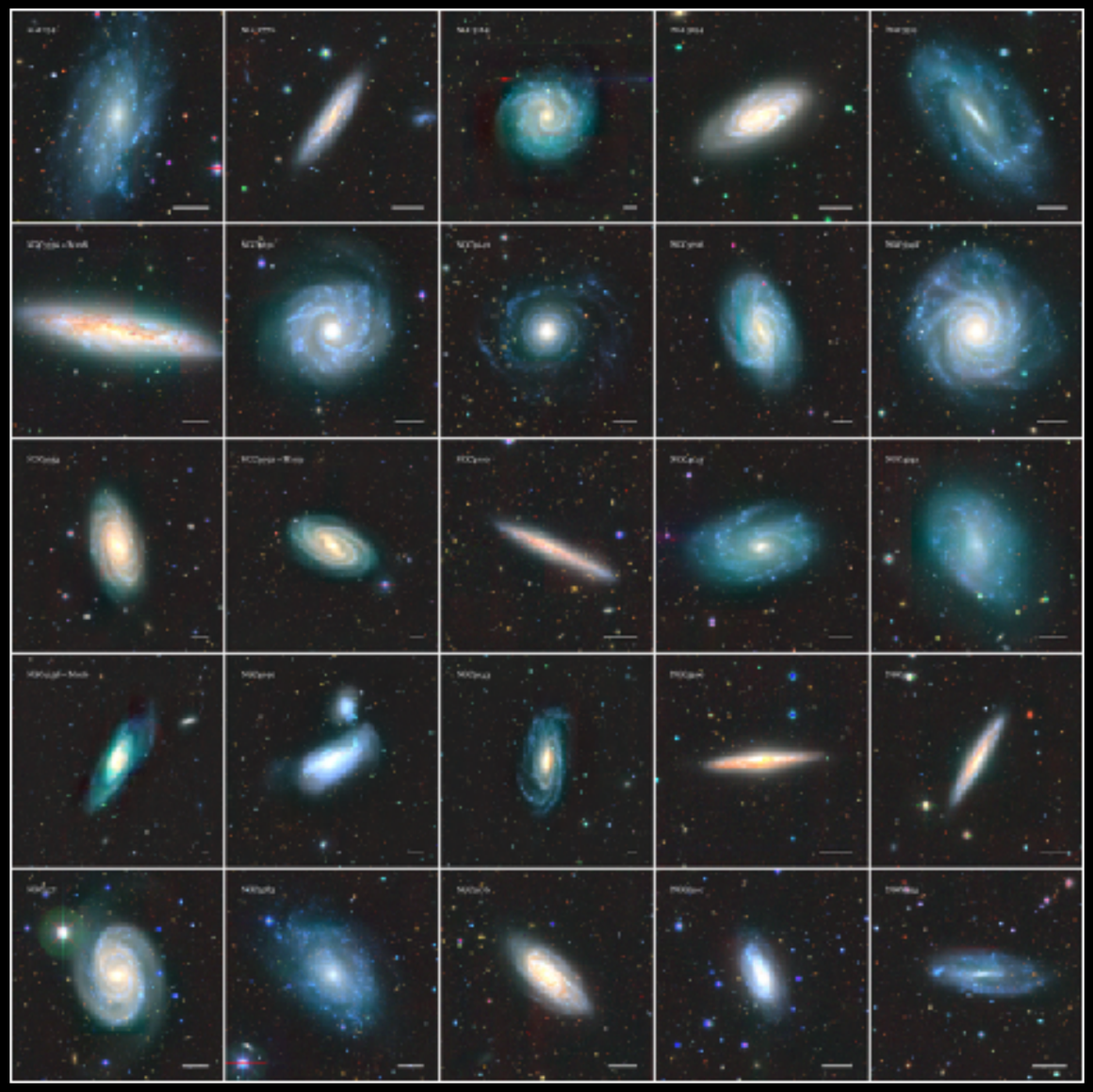


Kevin Napier ’18 (Michigan Physics)

SIENAcollege
Physics and Astronomy

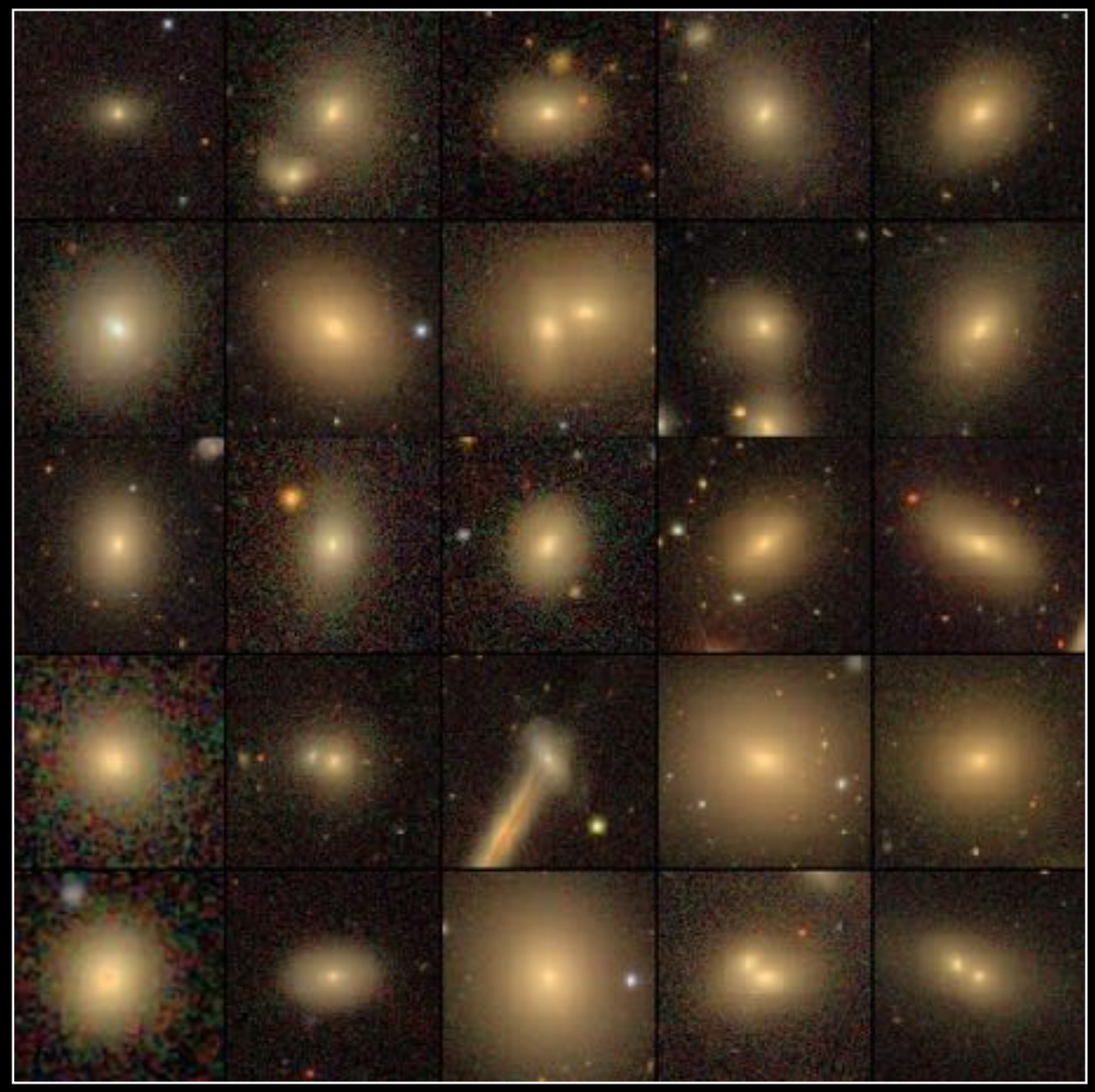
Approximately 60% of the stellar mass in galaxies at z~0 resides in massive, spheroidal galaxies.

Spiral galaxies



legacysurvey.org

Blanton & Moustakas 2009



Spheroidal (elliptical) galaxies

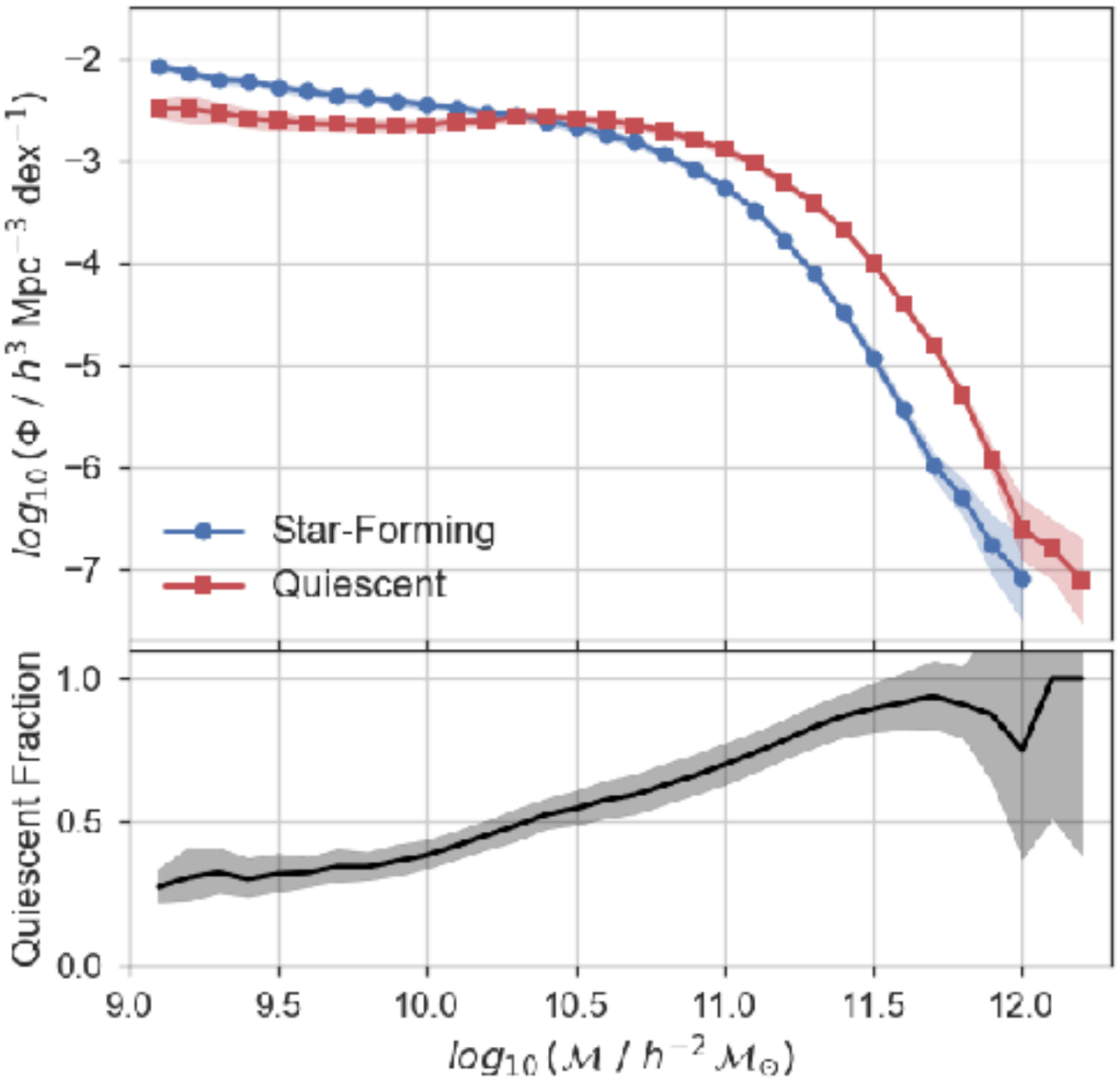
Tracing the stellar mass growth of massive central galaxies.

- Observed properties of massive spheroidal galaxies—

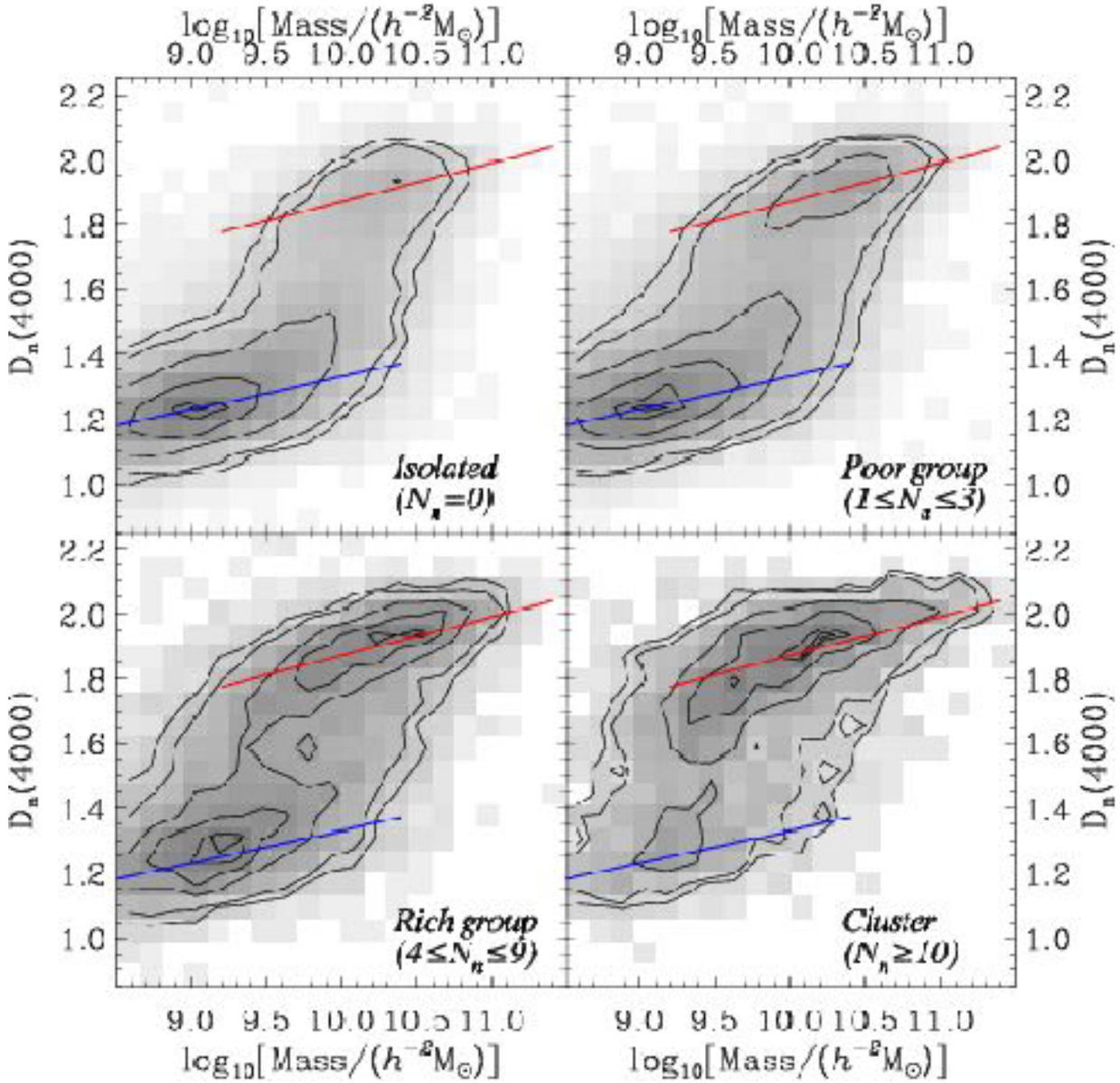
- Tension with hierarchical galaxy assembly models—

- Detailed stellar masses for >100,000 central galaxies—

Spheroidal galaxies tend to be massive, quiescent, and to be found in dense environments.



Moustakas et al. 2013

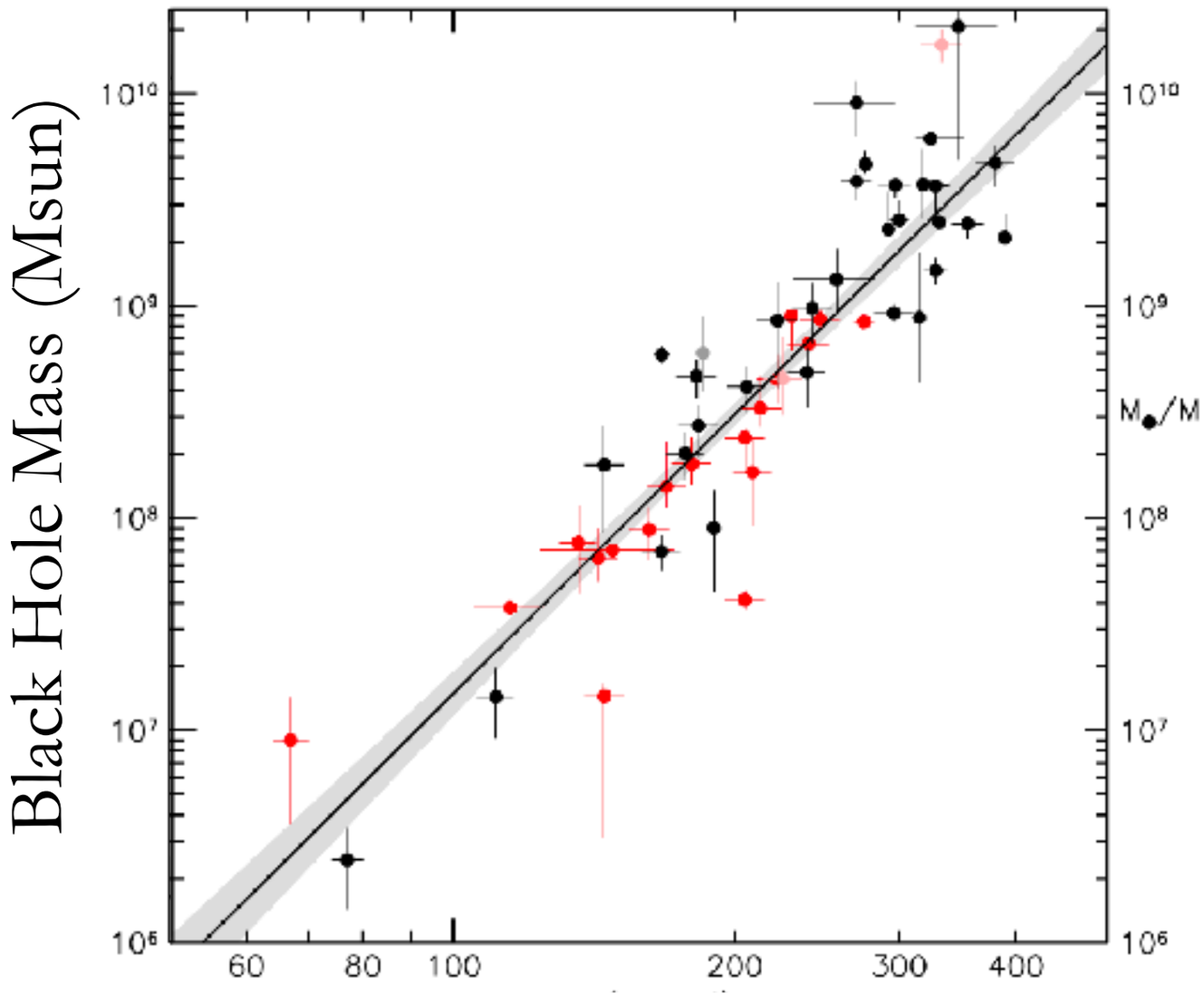


Blanton & Moustakas 2009

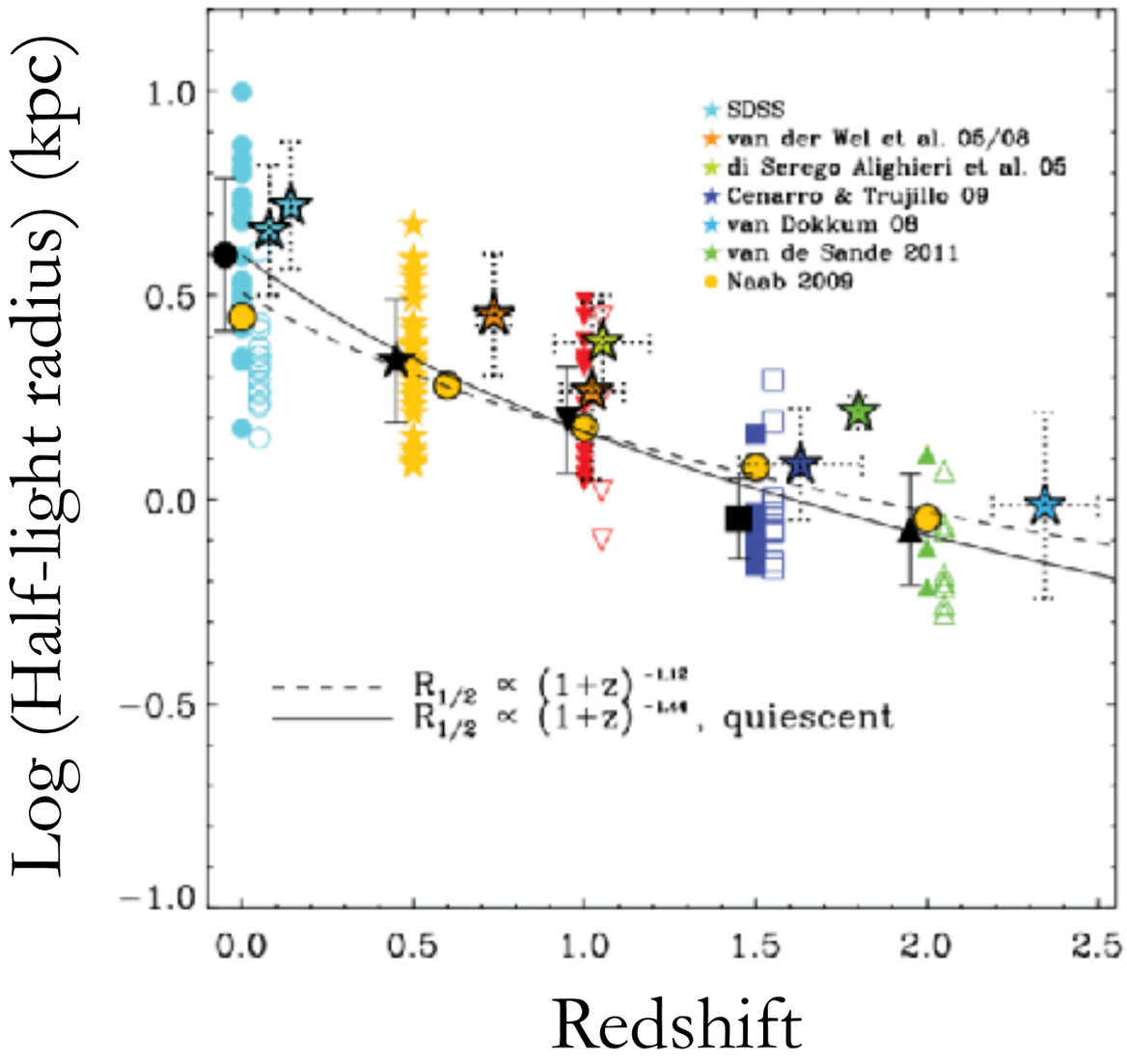
Many spheroidal galaxies show evidence of past interactions and (all?) host supermassive black holes.

Duc et al. 2015

Kormendy & Ho 2013

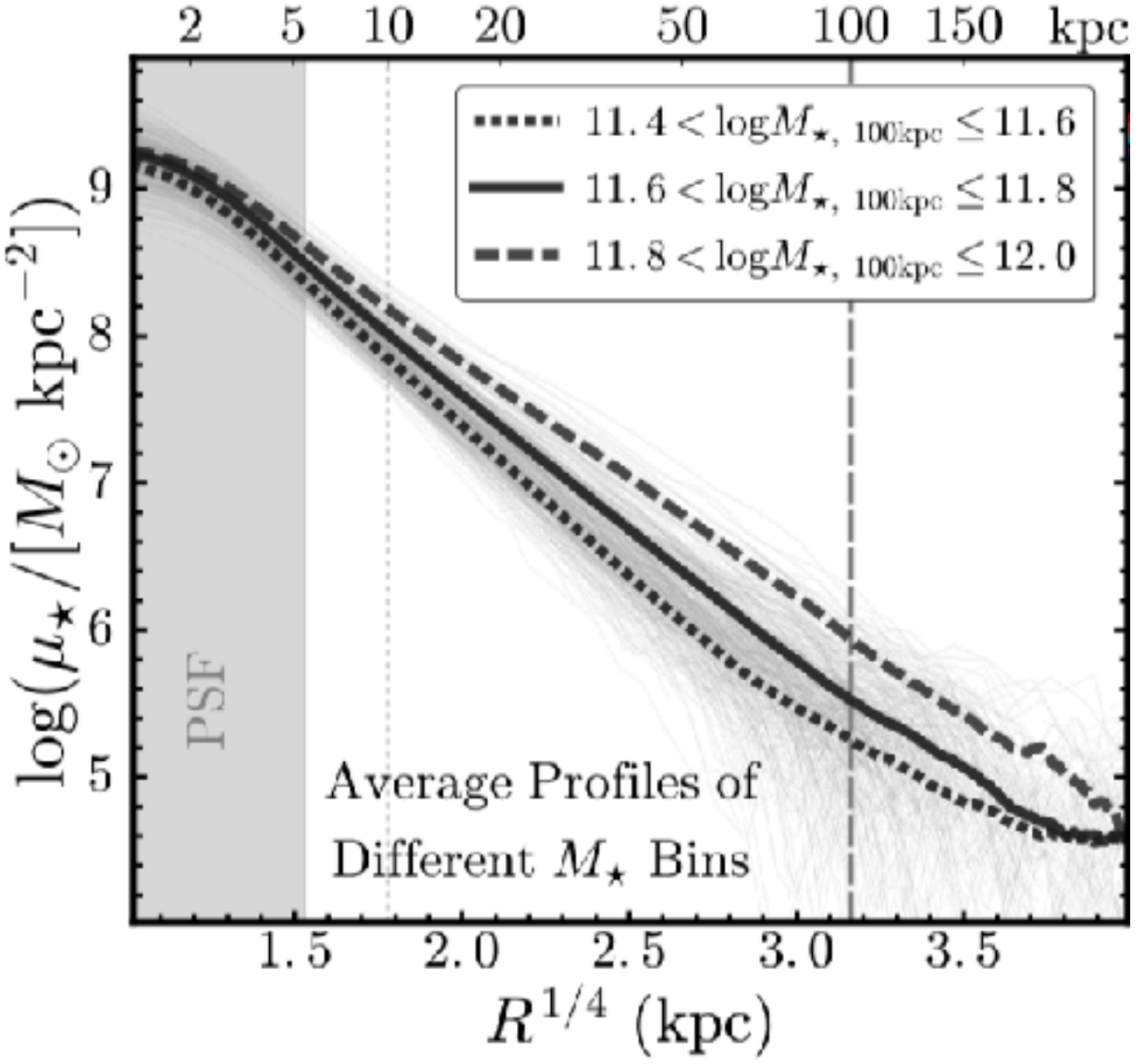


Massive, quiescent galaxies have grown in size by a factor of 4-5 since z~3, largely *inside, out*.



Oser et al. 2012

Huang et al. 2018



Tracing the stellar mass growth of massive central galaxies.

- Observed properties of massive spheroidal galaxies—
  - Little or no star formation; prevalent in dense environments.
  - Signs of past interactions; M_{BH}-sigma relation.
- Tension with hierarchical galaxy assembly models—
- Detailed stellar masses for >100,000 central galaxies—

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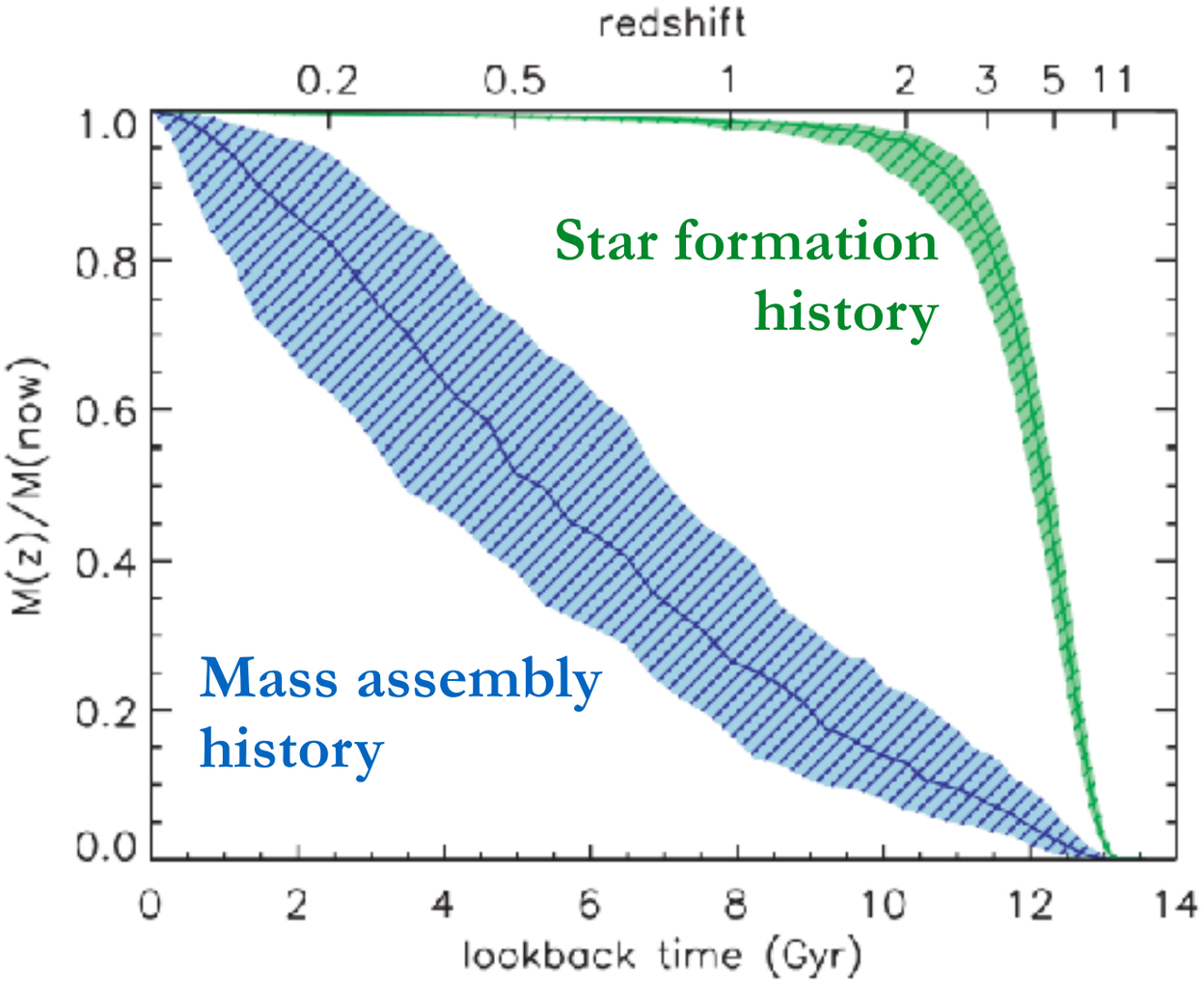
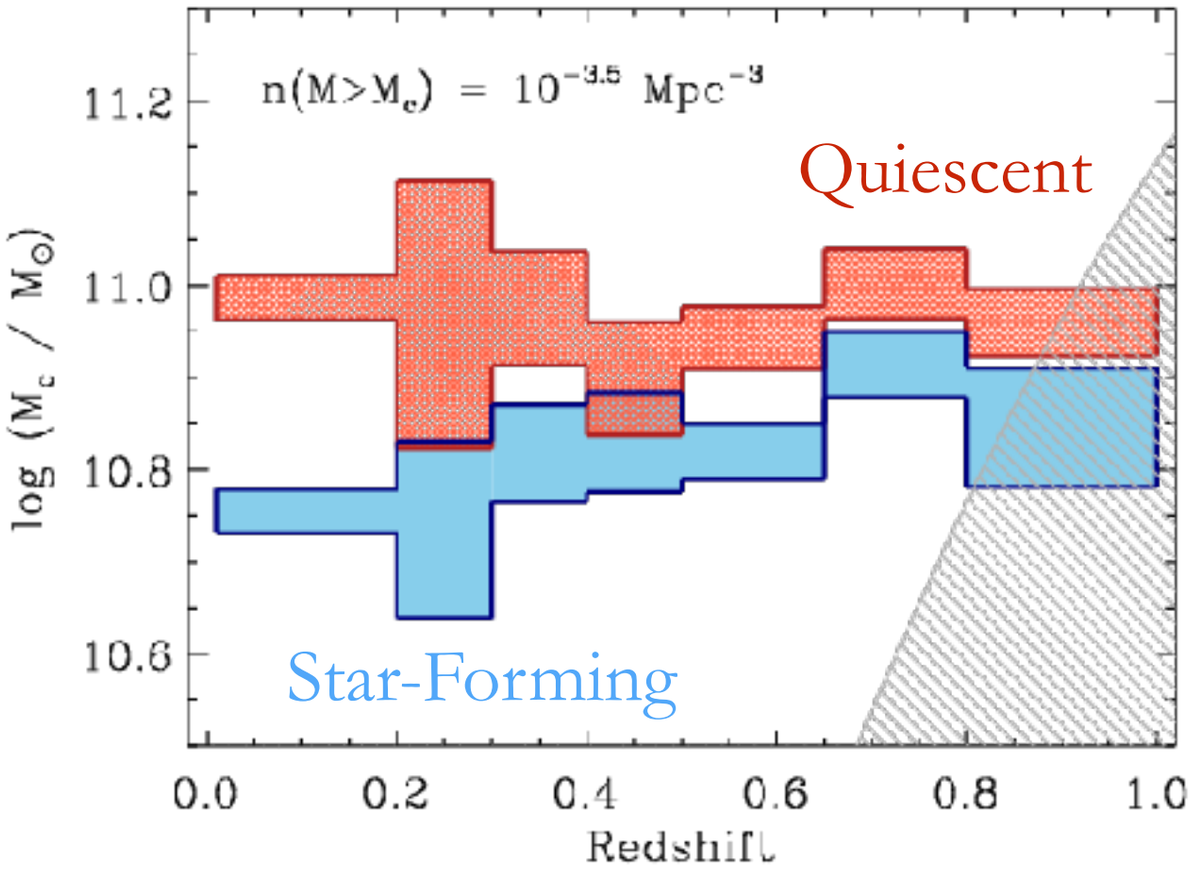
Many/most/all hierarchical galaxy growth models for massive galaxies are in tension with observations.

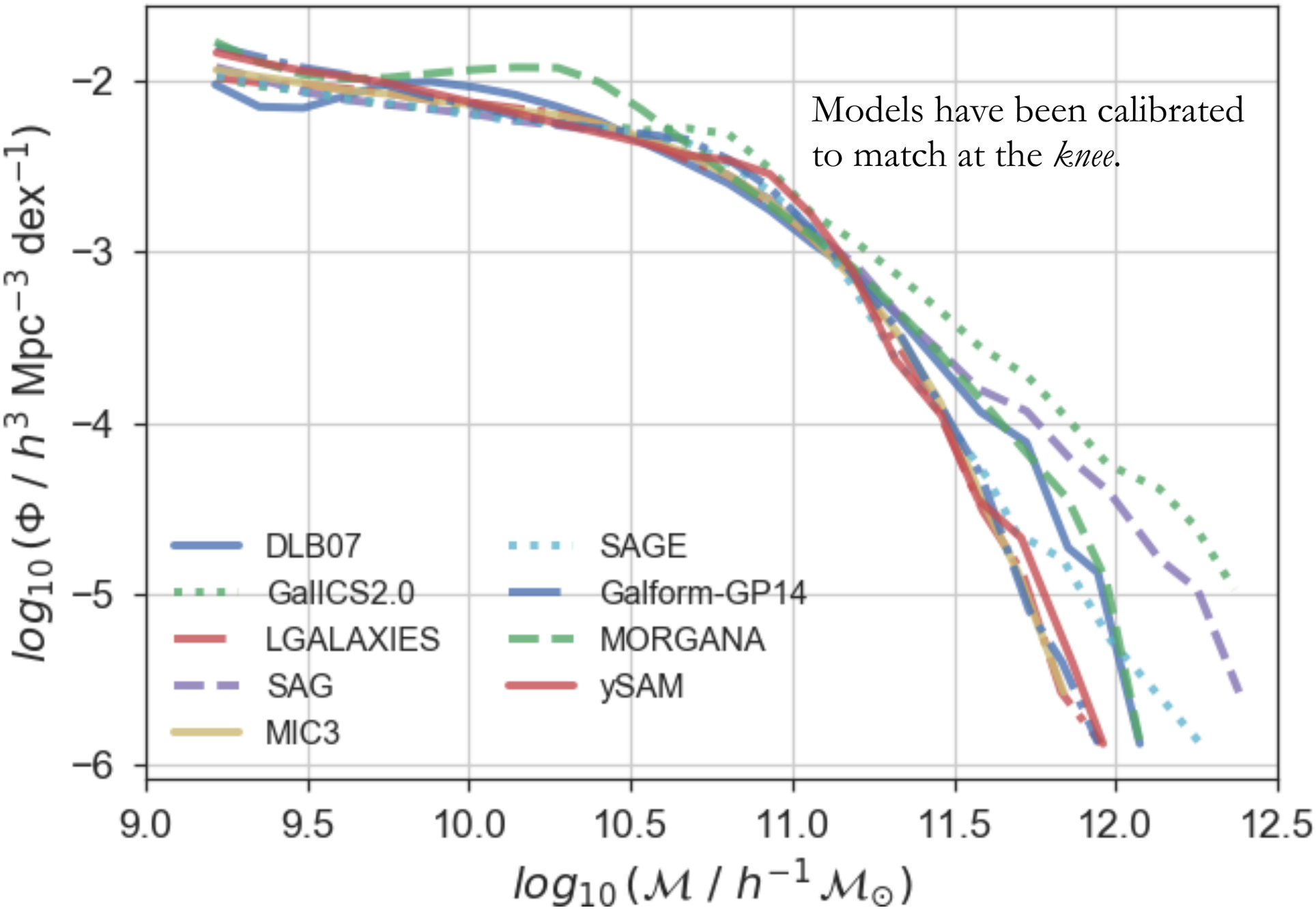


De Lucia & Blaizot 2007



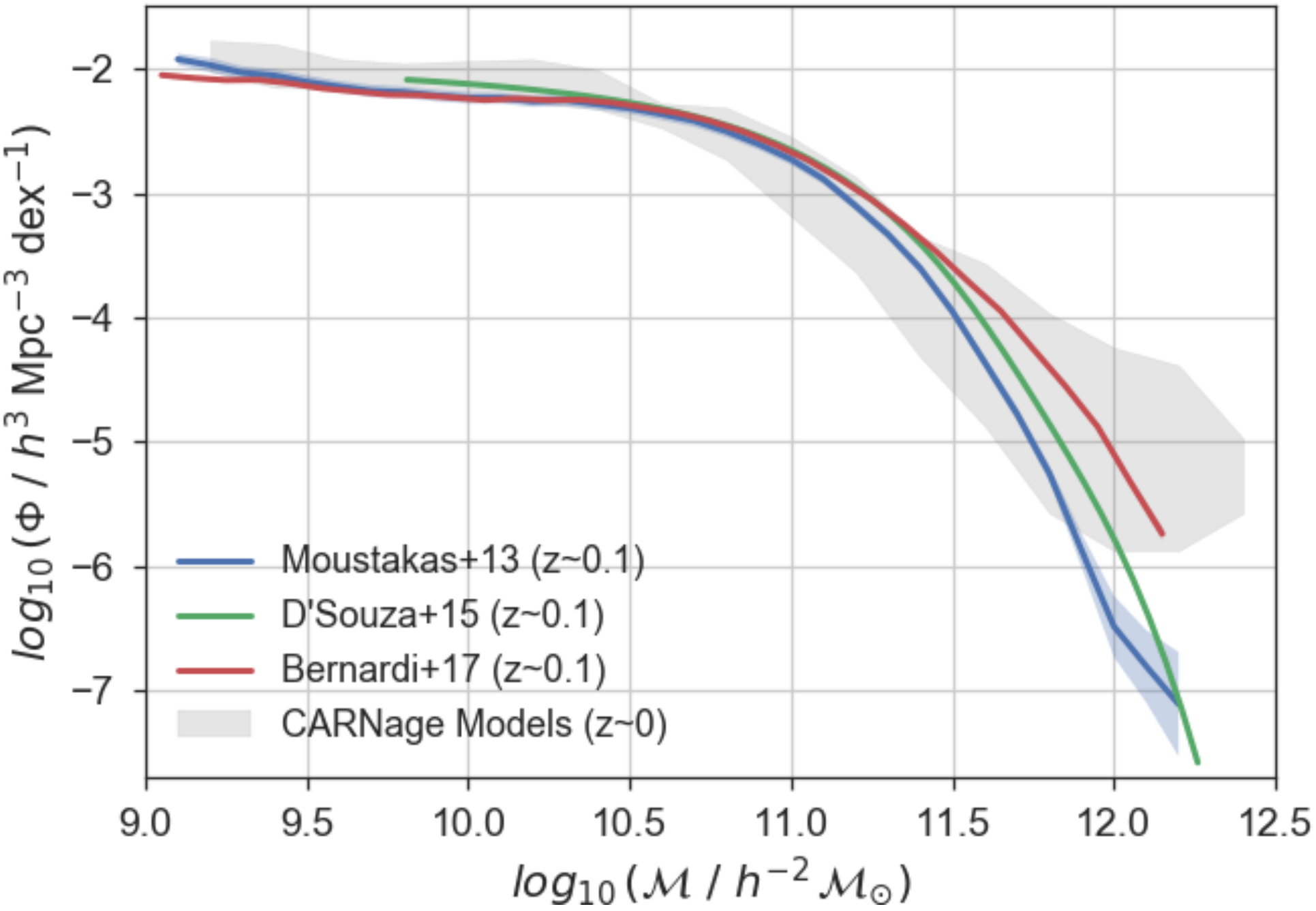
Moustakas et al. 2013

Theoretical models differ widely, especially at the massive end of the z~0 stellar mass function.



Cosmic CARNage: Knebe et al. 2018

Measurements of the massive end of the stellar mass function are also discrepant, even at z~0.



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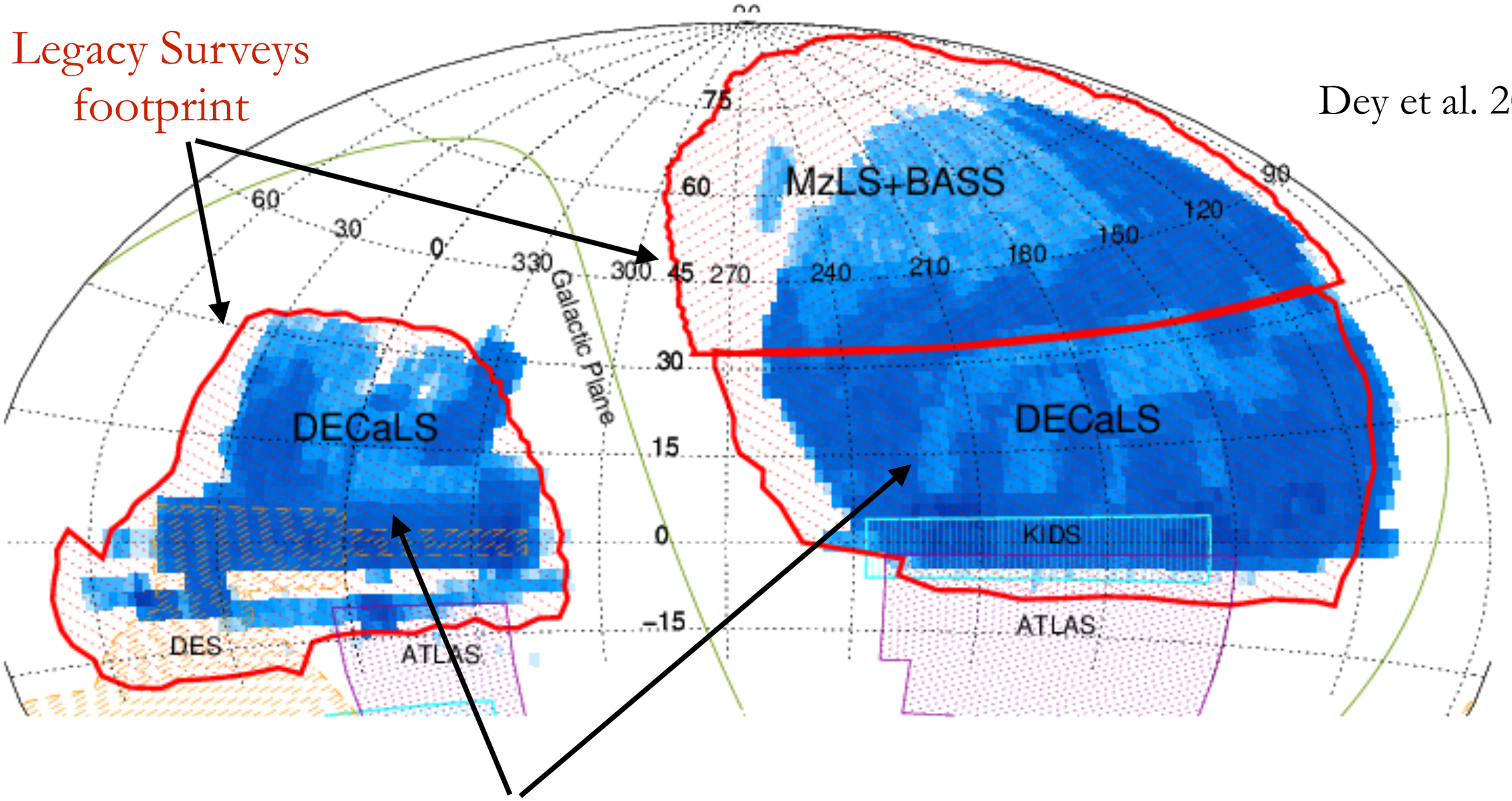
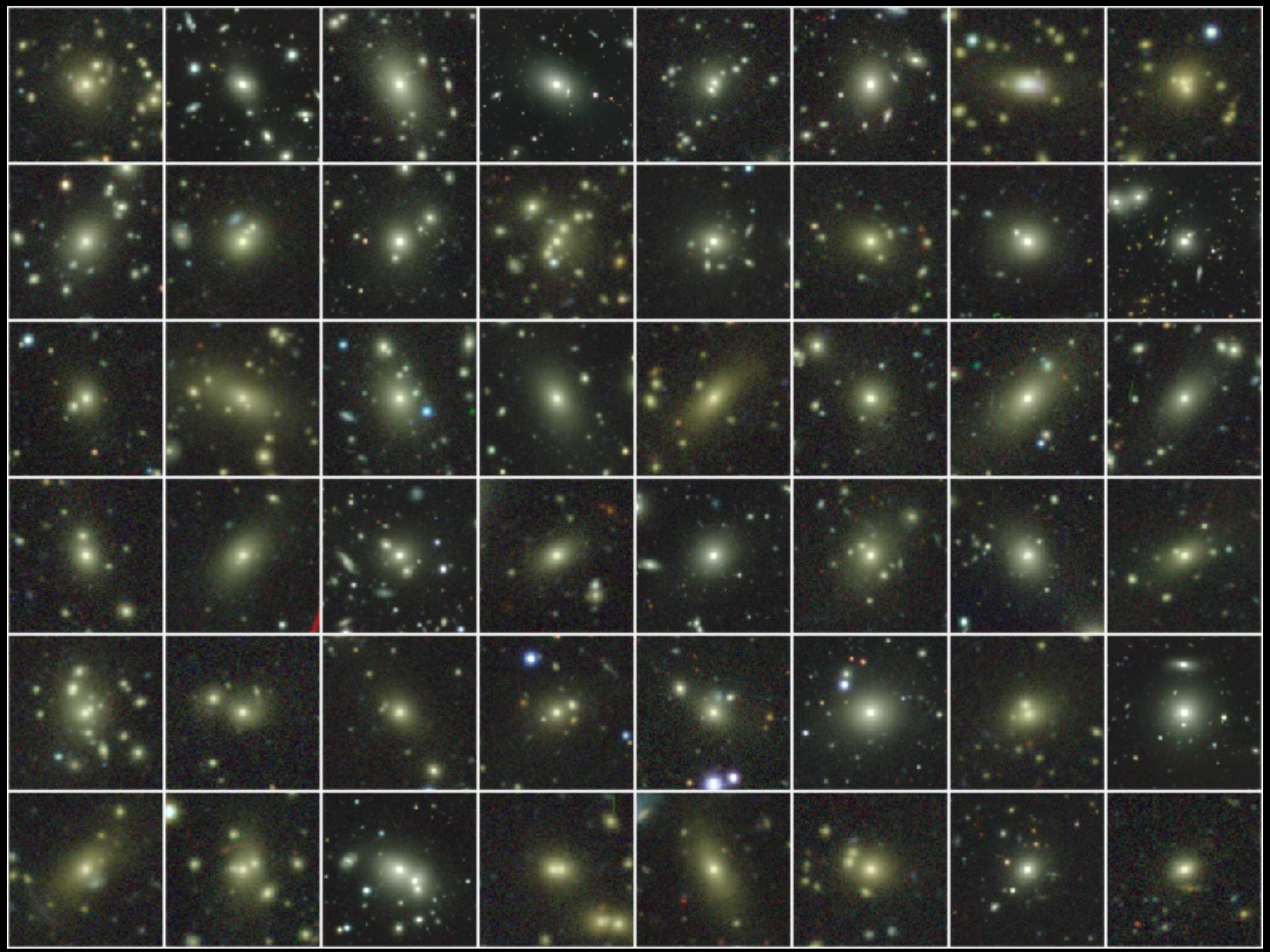
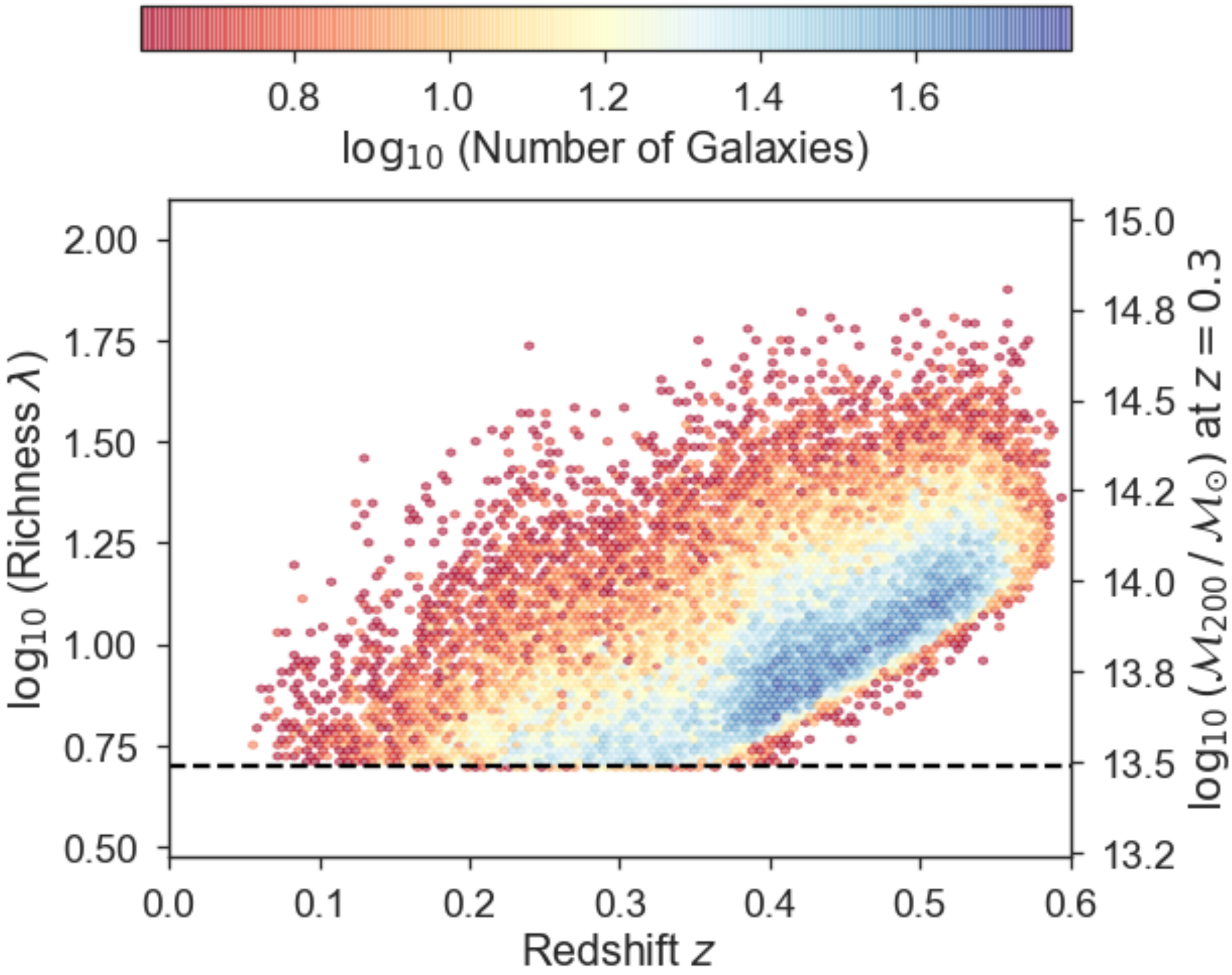
The Legacy Surveys are delivering deep optical & mid-IR imaging over 14,000 deg^2 of the extragalactic sky.



We have assembled a sample of ~100,000 central galaxies at z<0.6 with Legacy Surveys imaging.



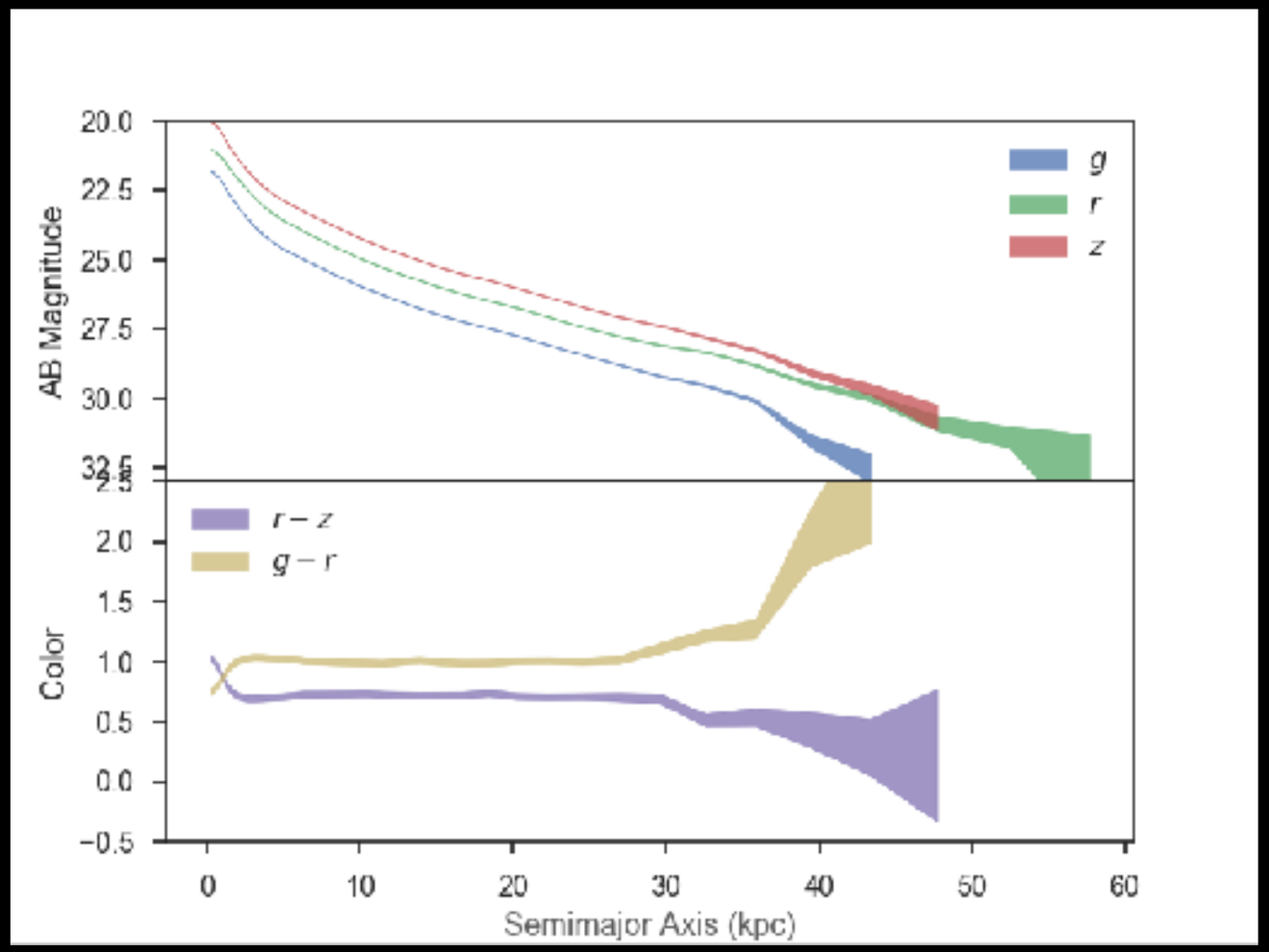
Our central-galaxy sample spans a wide range of halo mass, redshift, and cosmological volume.



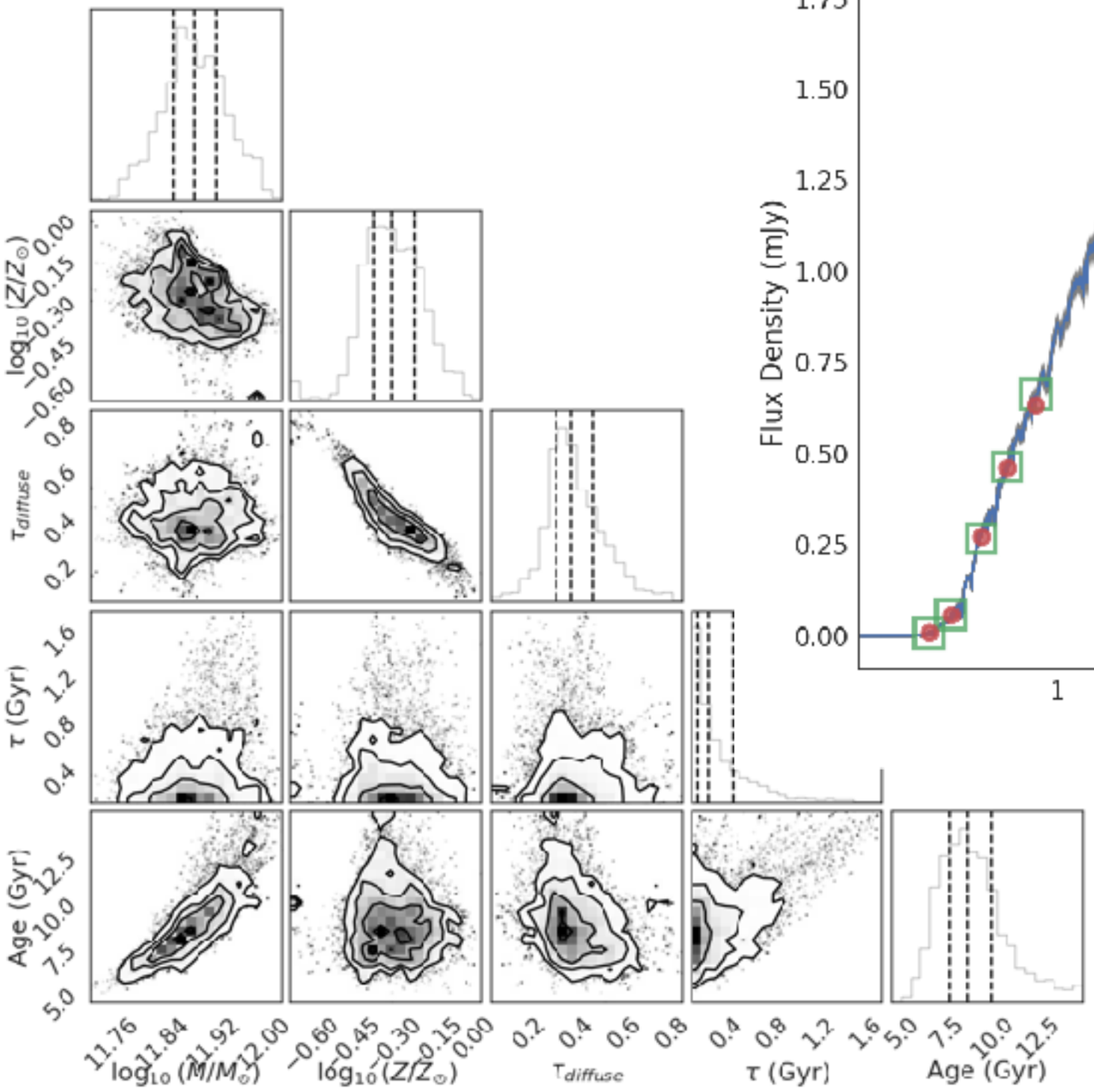
Rykoff et al. 2014

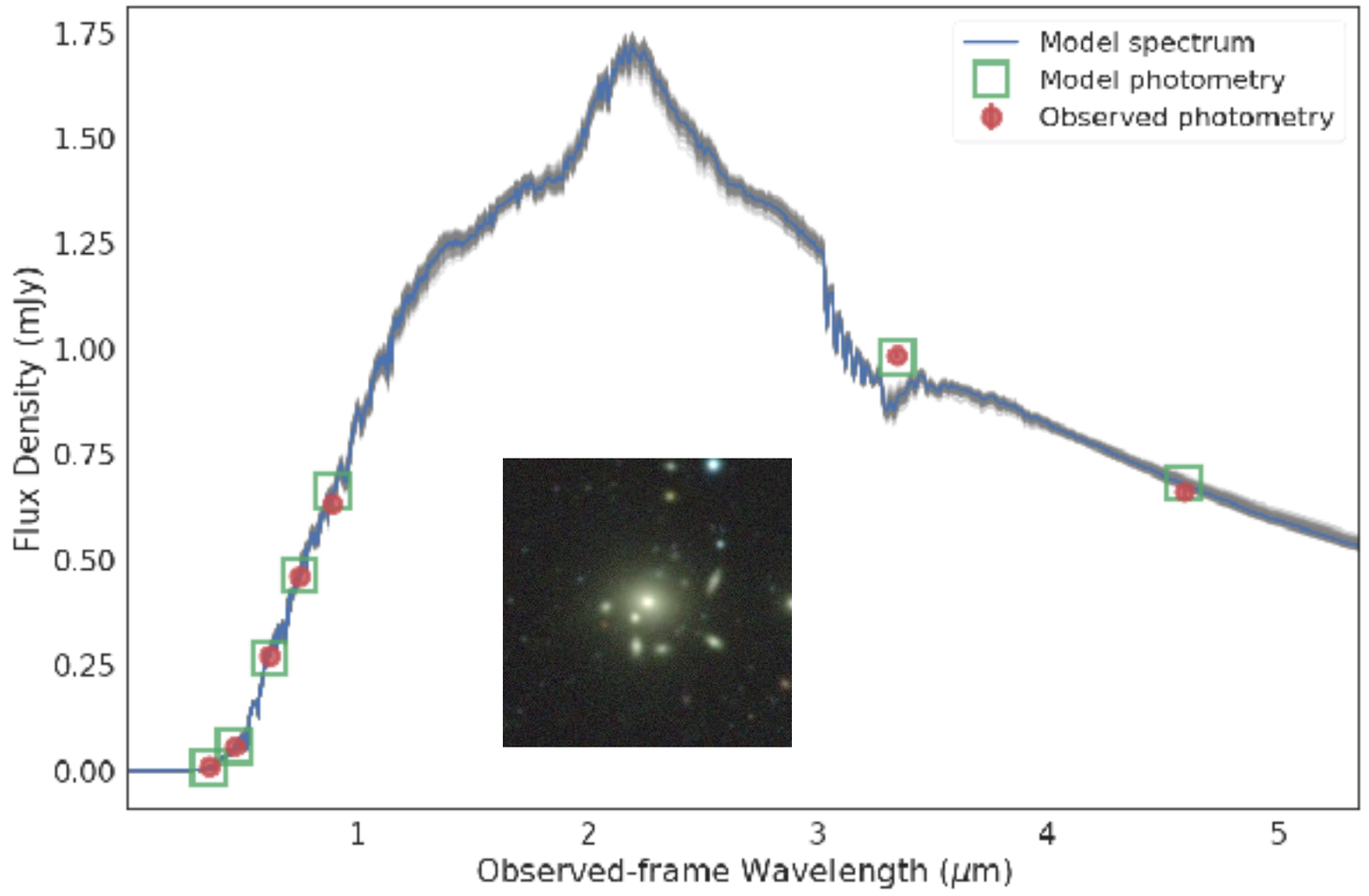
We use *the Tractor* to isolate the light of the central galaxy, and measure its surface brightness profile.

100 kpc



We use state-of-the-art stellar population synthesis modeling to infer the stellar mass content.





http://prospect.readthedocs.io

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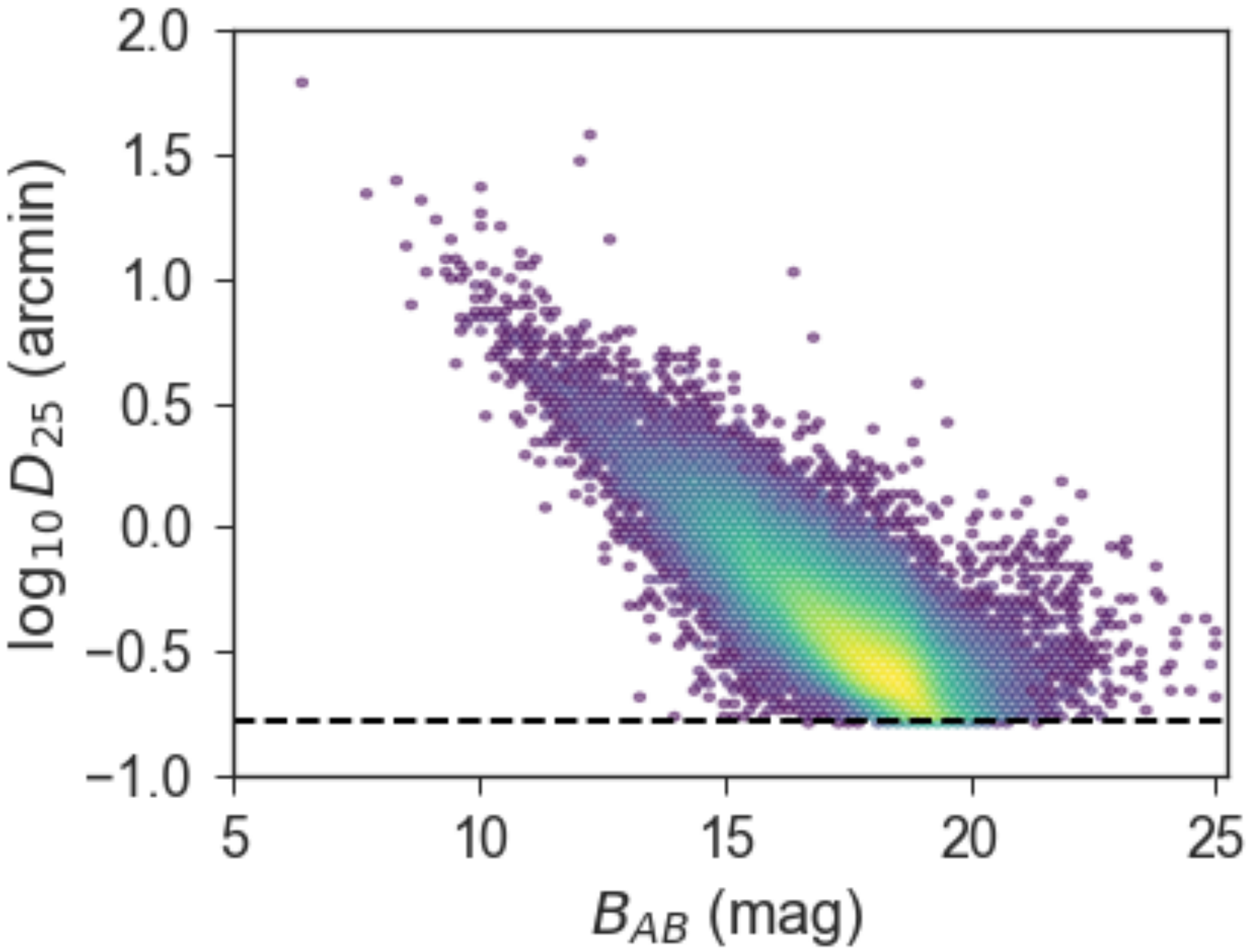
  - Stay tuned for results on: stellar mass function; stellar mass density profiles; scatter in stellar mass at fixed halo mass; baryon budget; etc.

NASA Legacy Surveys Galaxy Atlas

with Lang, Dey, Schlegel, Blanton, & Schiminovich



- ~1M galaxies with D_{25}>10 arcsec
- GALEX+LS+WISE from 0.1-22 μm

NGC3938

NGC5322

IC4182

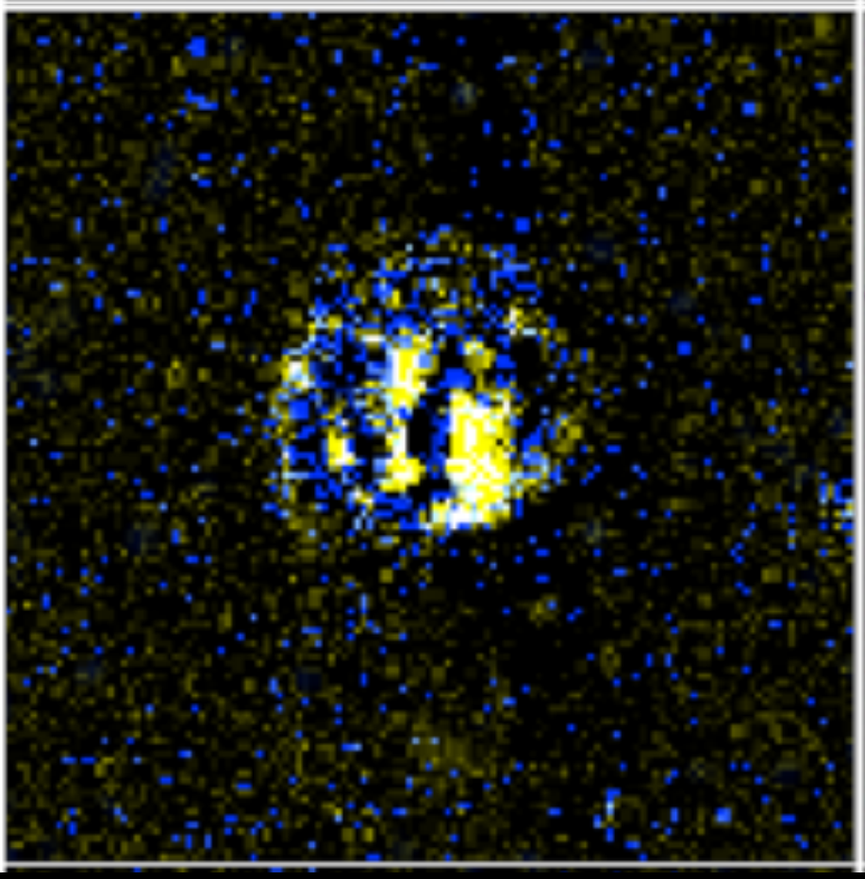
NGC3719 / NGC3720 Group

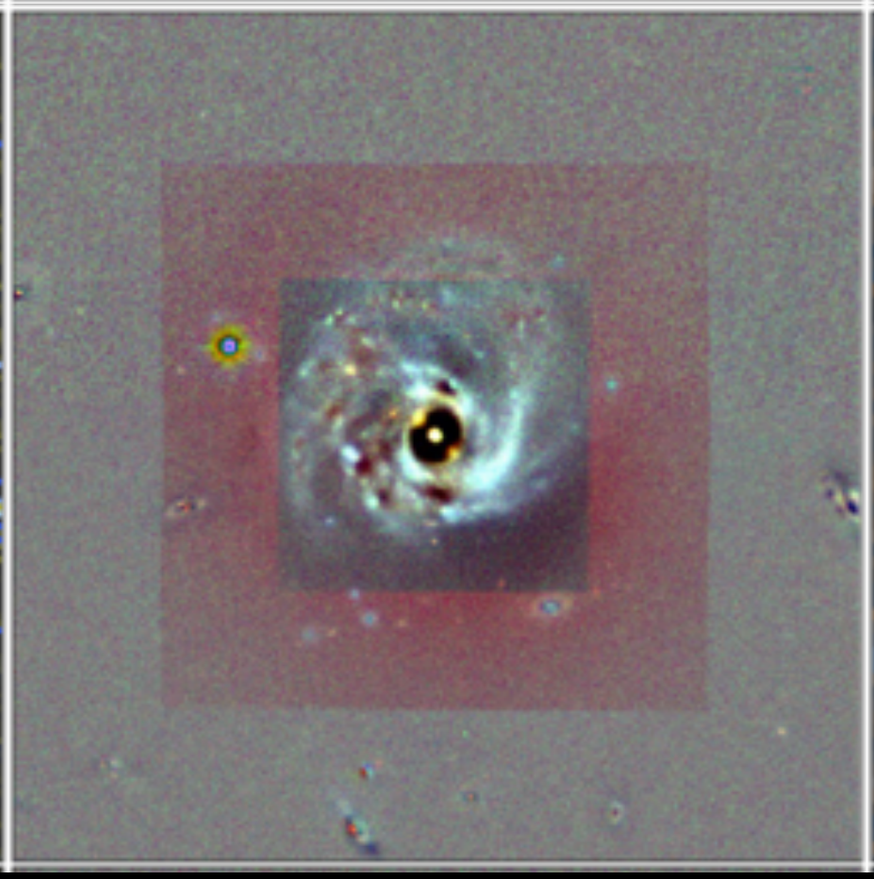
FUV/NUV

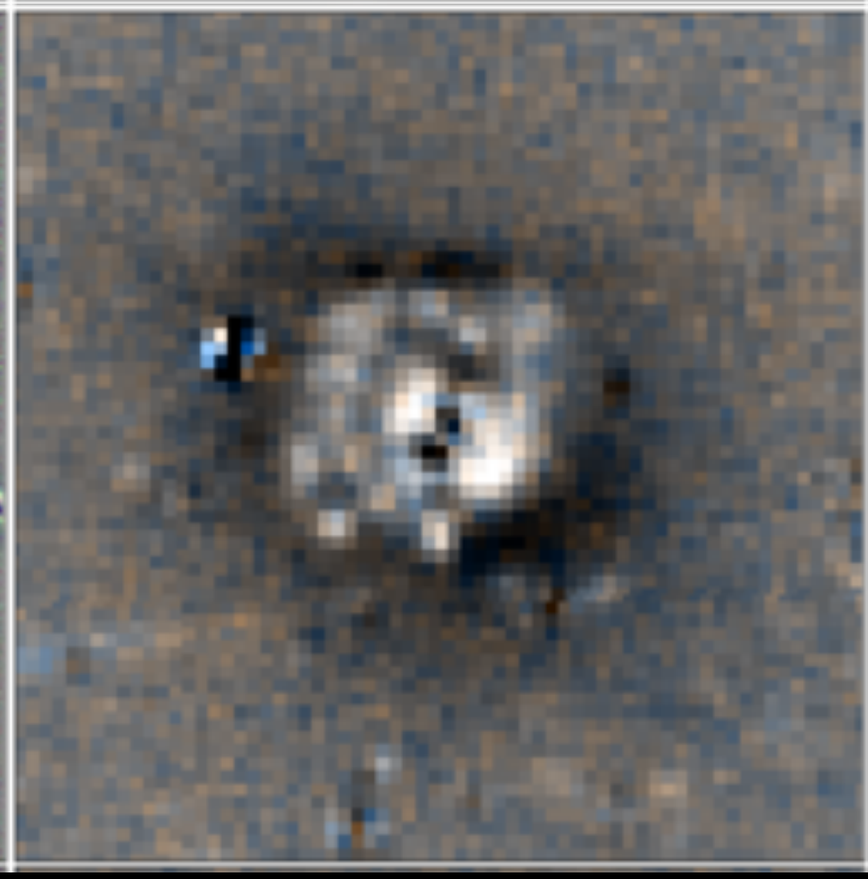
grz

W1/W2

FUV/NUV *grz* W1/W2







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