ICRAR

International Centre for Radio Astronomy Research

Little Blue Spheroids and Disk Evolution in GAMA

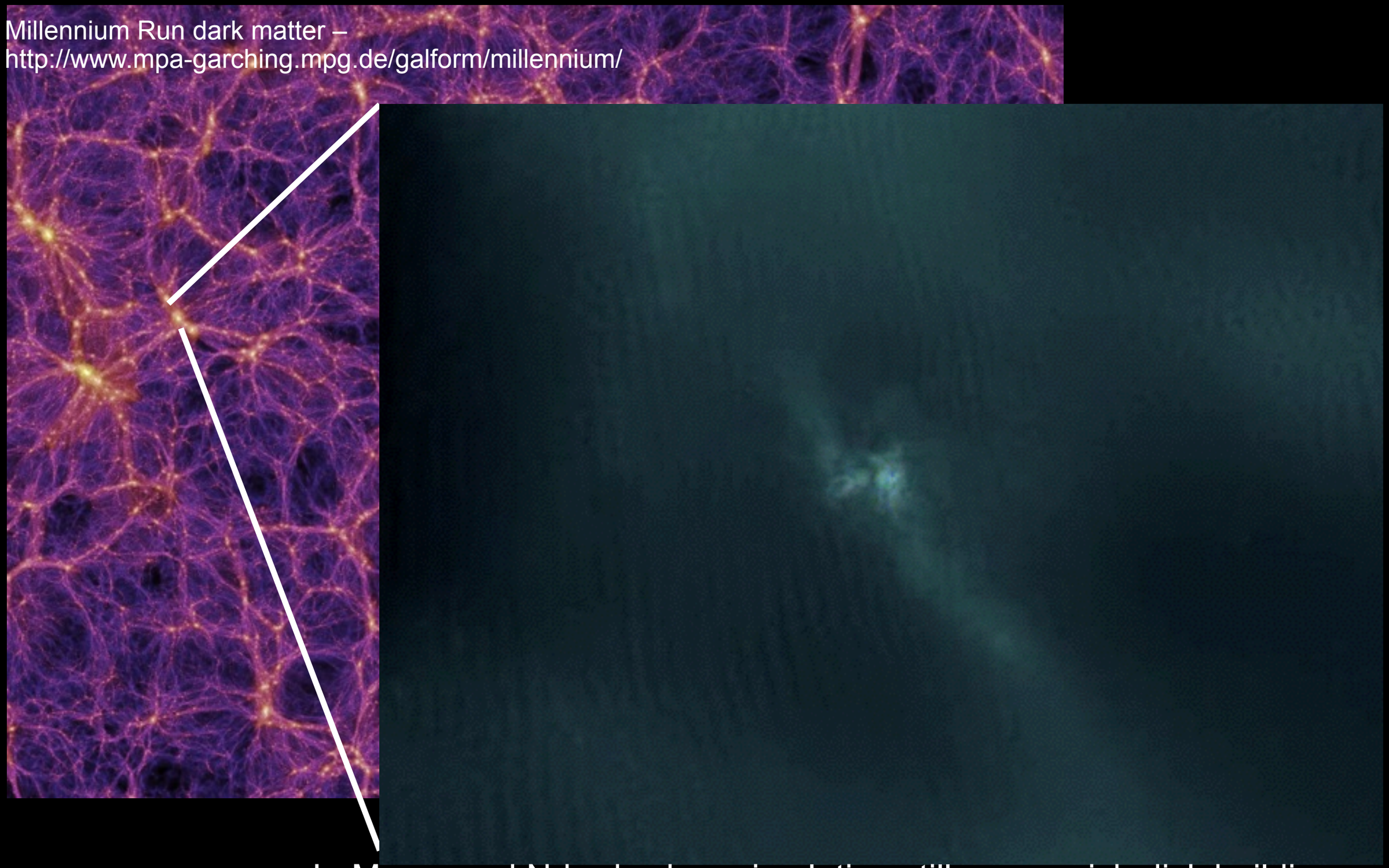
Amanda Moffett
with Simon Driver and the GAMA team

GAMA

Curtin University

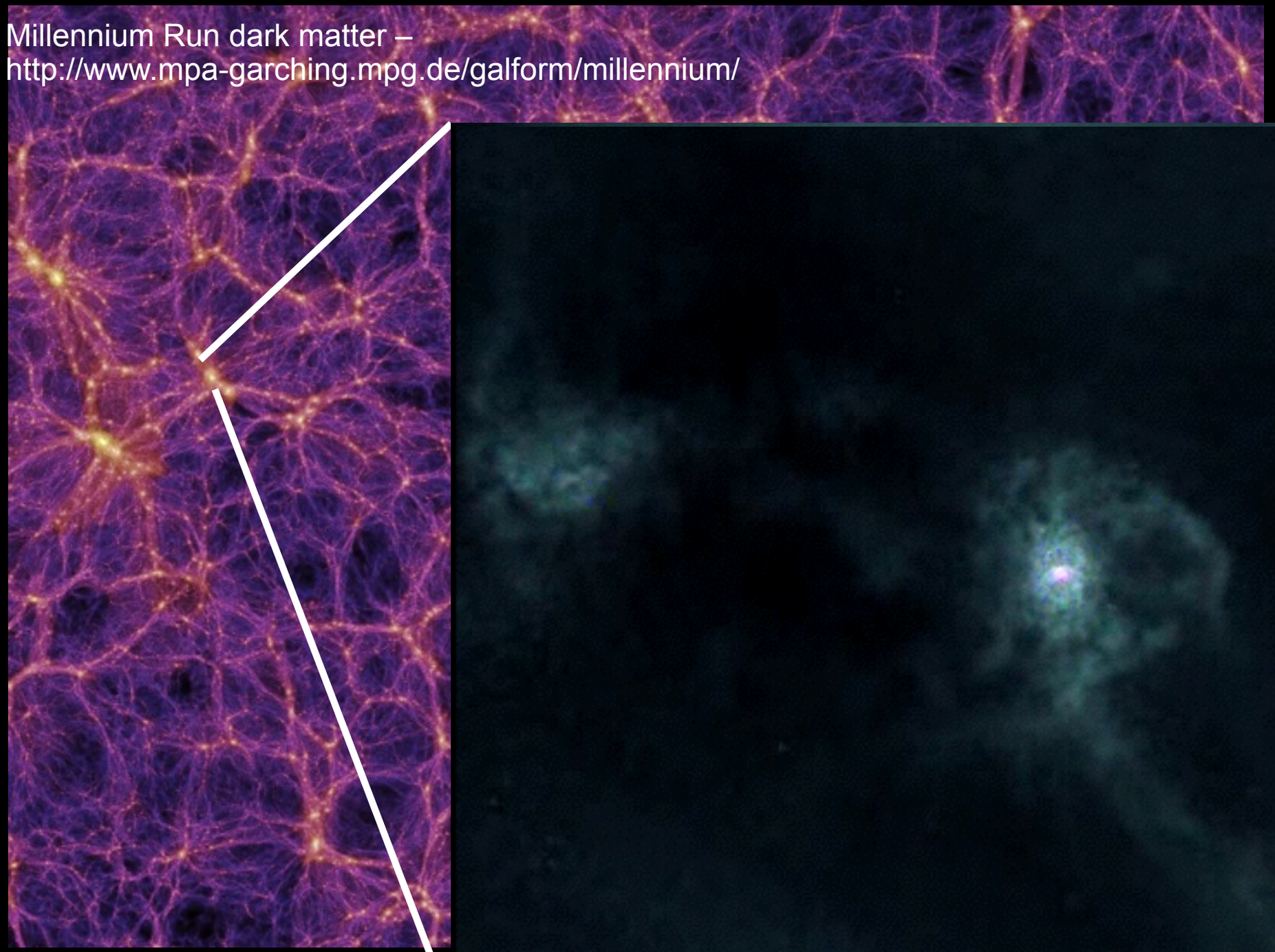
The University of Western Australia

Galaxy Disk Growth and Regrowth



L. Mayer and N-body shop simulation stills – gas-rich disk building

Galaxy Disk Growth and Regrowth



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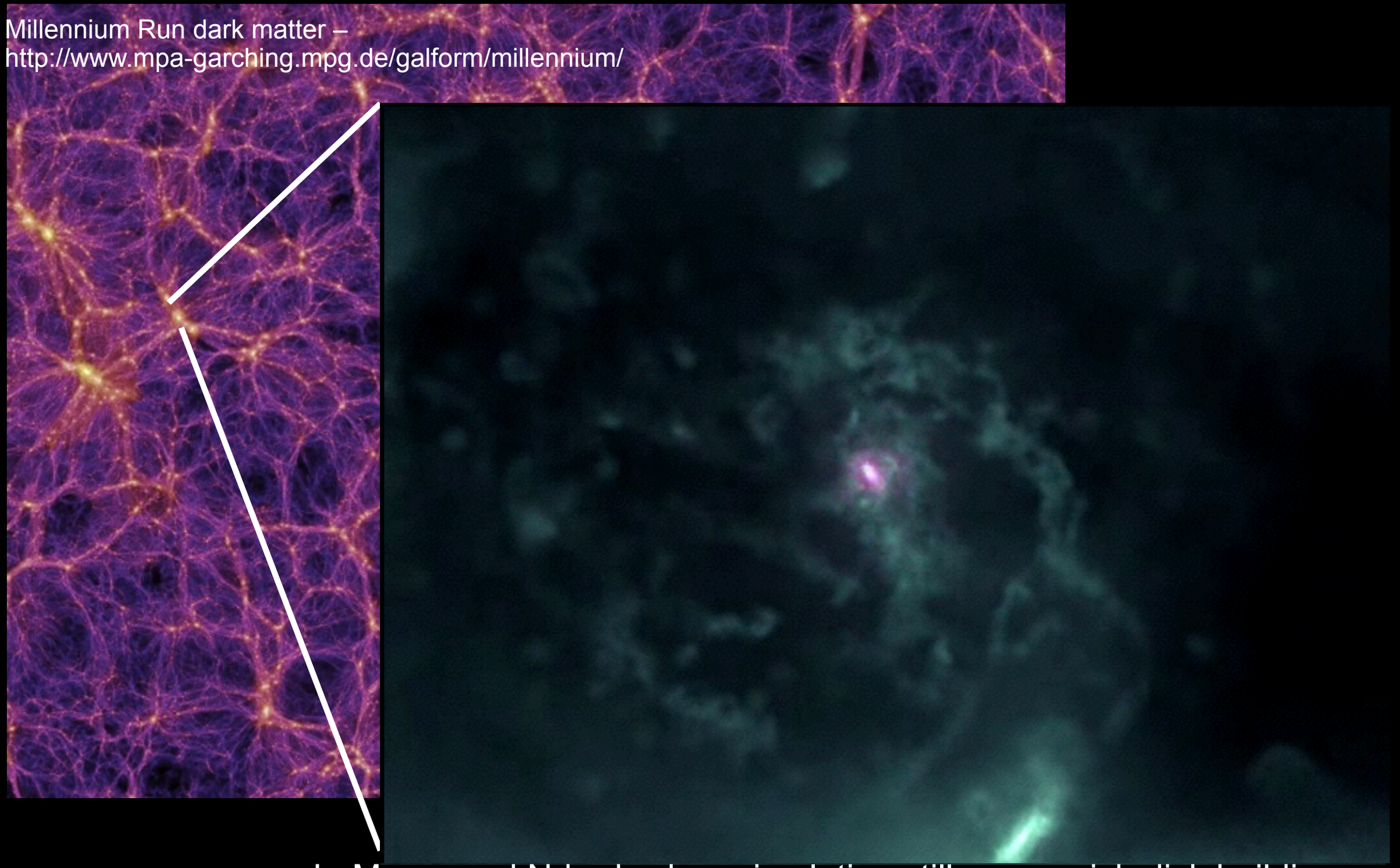
Galaxy Disk Growth and Regrowth

Millennium Run dark matter –
http://www.mpa-garching.mpg.de/galform/millennium/



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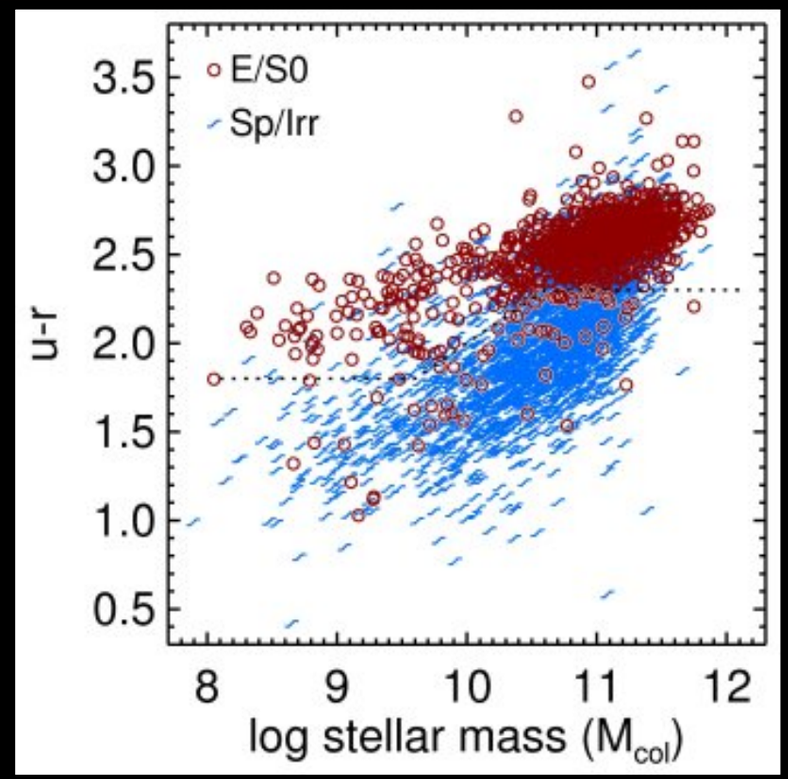
Galaxy Disk Growth and Regrowth

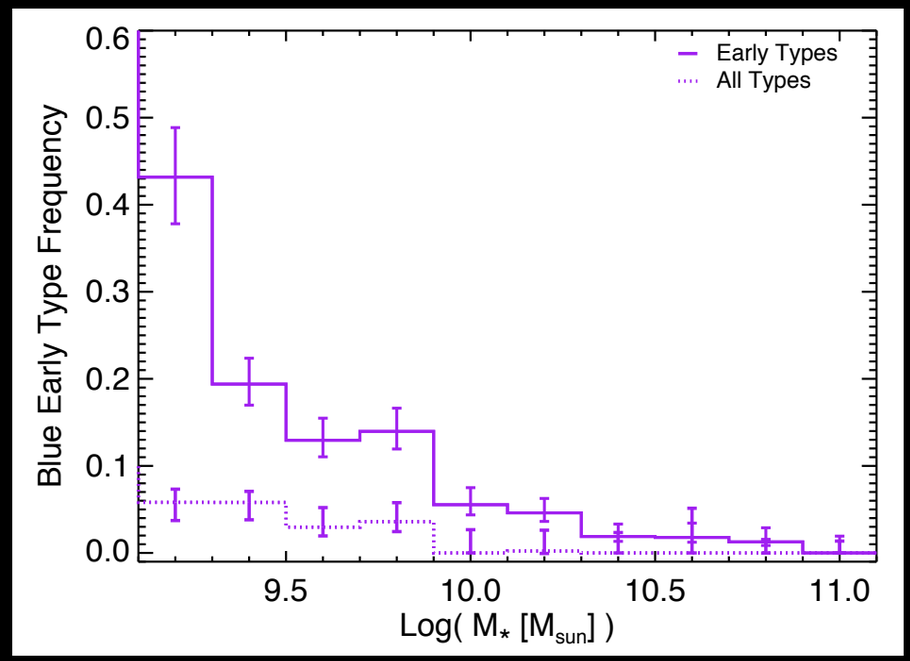
L. Mayer and N-body shop simulation stills – gas-rich disk building

Disk Regrowth and Blue Early-type Galaxies

- ET galaxies with blue colors - generally thought of as small population (e.g., Schawinski+ 2009)
- Frequency increases at low stellar mass
- Gas reservoirs and specific star formation rates -> significant stellar disk growth potential (KGB; Wei+ 2010)
- ~60% display UV bright disks (Moffett+ 2012)
- Objects in transition, (re)building disks?



Kannappan, Guie, & Baker 2009



Moffett+ submitted

GAMA in Brief

- Spectroscopic and vastly multi-wavelength survey of ~300,000 galaxies
- Mature and constantly growing database of **derived data products**
  - variety of aperture-matched photometry
  - redshifts and spectral line measurements
  - stellar mass estimates
  - morphology and structural fits

GAMA Scientific and Strategic Advisory Committee

MG member	Dr. Ivan Baldry	Liverpool JMU
	Dr. Steven Bamford	U of Nottingham
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MG member	Dr. Michael Brown	Monash U
	Prof. Michael Drinkwater	U of Queensland
Principal Investigator	Prof. Simon Driver	ICRAR / U of St Andrews
Principal Investigator	A/Prof. Andrew Hopkins	AAO
Project Manager	Dr. Joe Liske	ESO
	Dr. Jon Loveday	U of Sussex
	Dr. Martin Meyer	UWA
Head of SSAC	Dr. Peder Norberg	Durham U
	Prof. John Peacock	U of Edinburgh
Science Coordinator	Dr. Aaron Robotham	ICRAR / U of St Andrews
	Dr. Richard Tuffs	MPIfK

MG = Management Group

GAMA Members …so many we just can't fit! see http://www.gama-survey.org/team/

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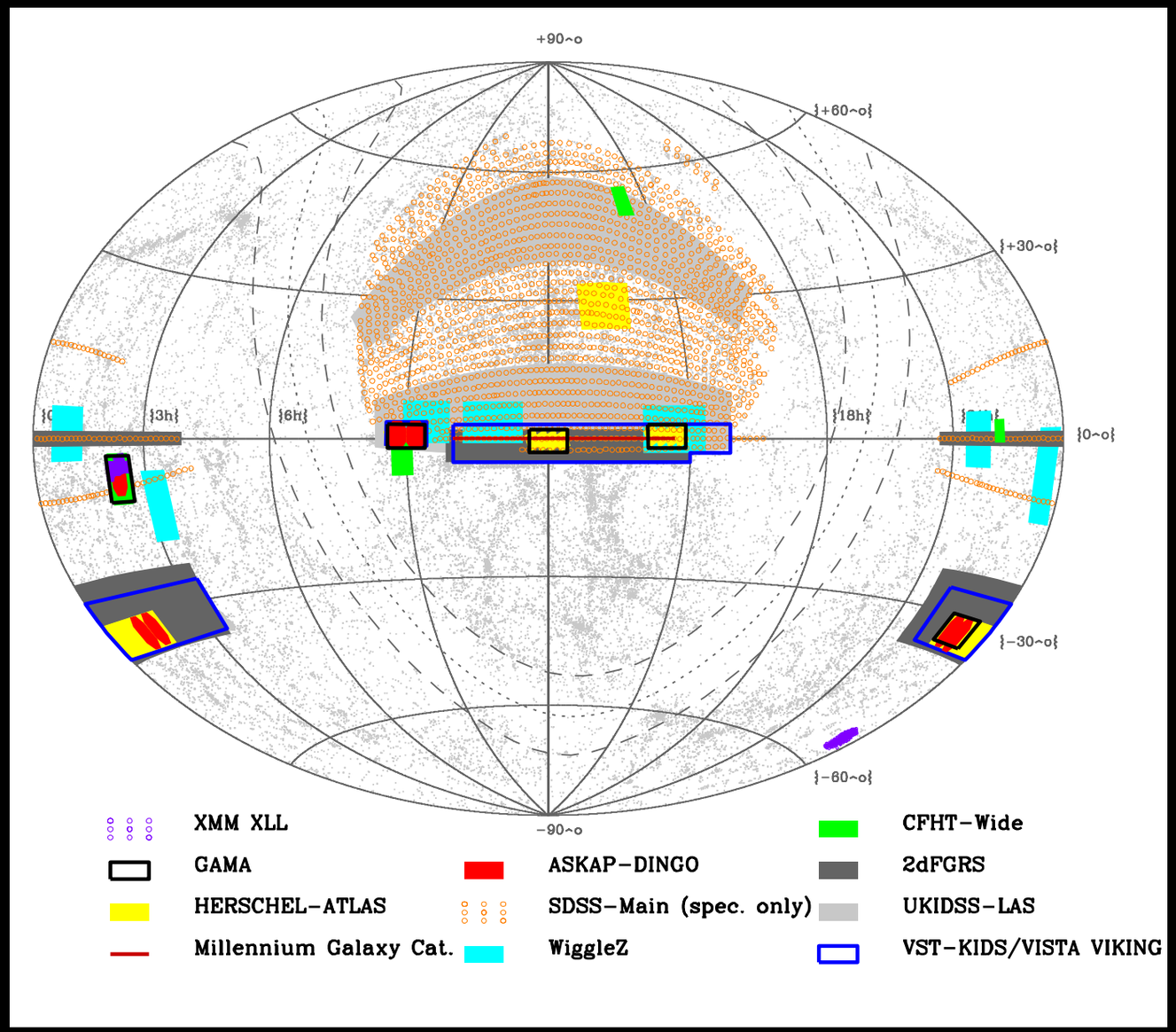
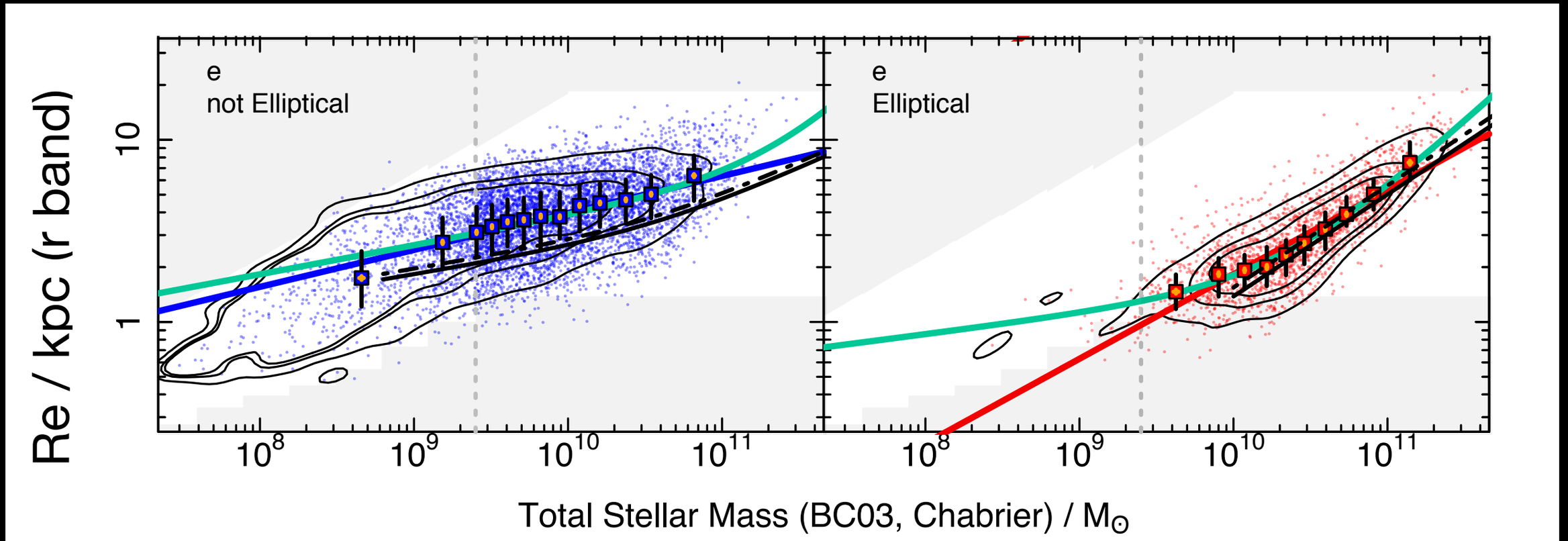


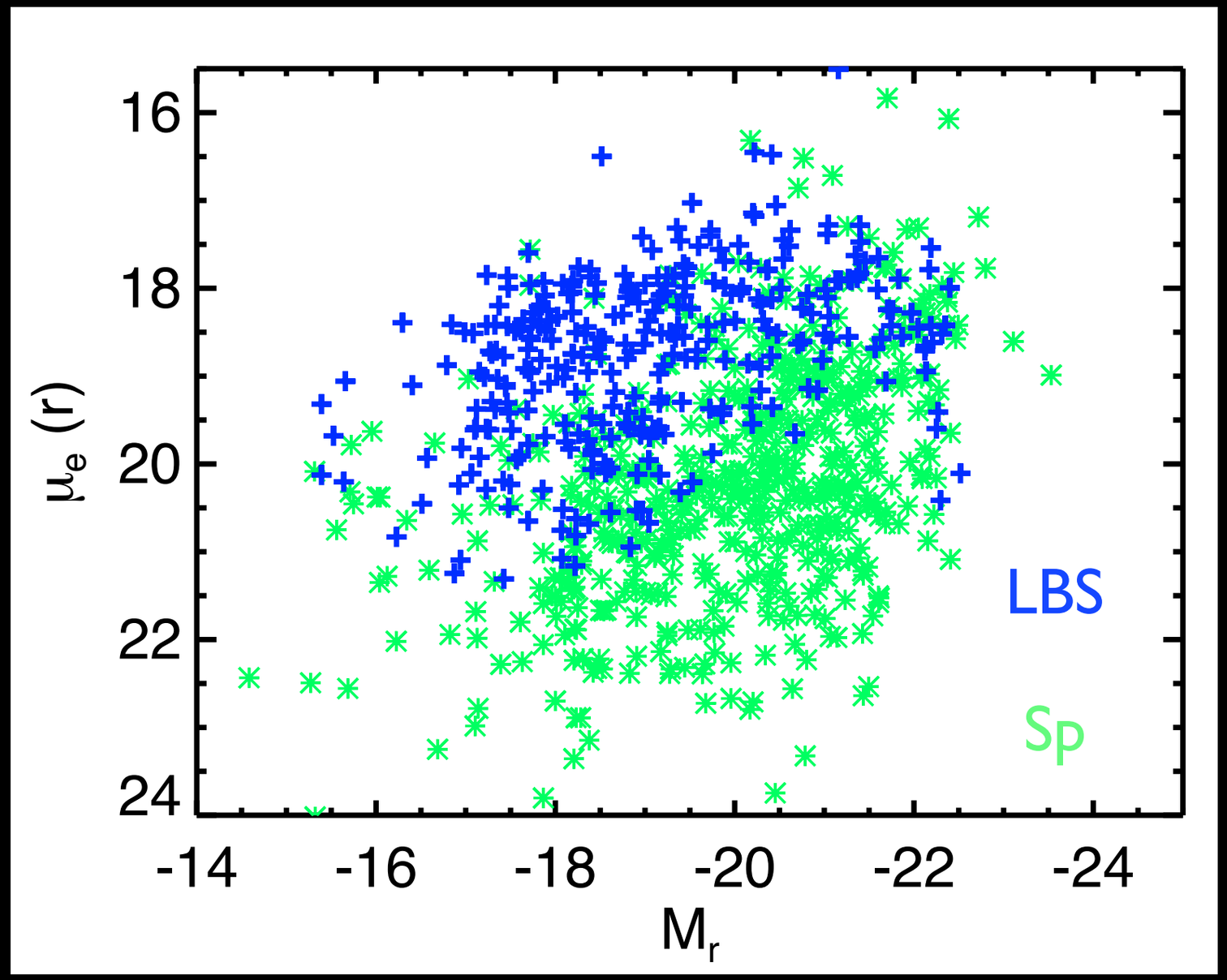
GAMA Galaxy Structure Efforts

- Structural Investigation of Galaxies via Model Analysis (SIGMA) - GALFIT wrapper (Kelvin+ 2012)
- Lange+ 2014 (submitted) mass-size relations for ~12,000 galaxy volume-limited sample (SDSS and VIKING)
- Bulge/disk decompositions and extension to smaller/ higher redshift objects with KiDS/HST data ongoing



Little Blue Spheroids in GAMA

- LBSs are a visual morphology class in GAMA
- Found to be ~7% of volume-limited sample with 0.025<z<0.06 and Mr < –17.4 (Kelvin+ 2014)
- New GAMA II classifications ~half mag deeper yields nearly 900 LBSs



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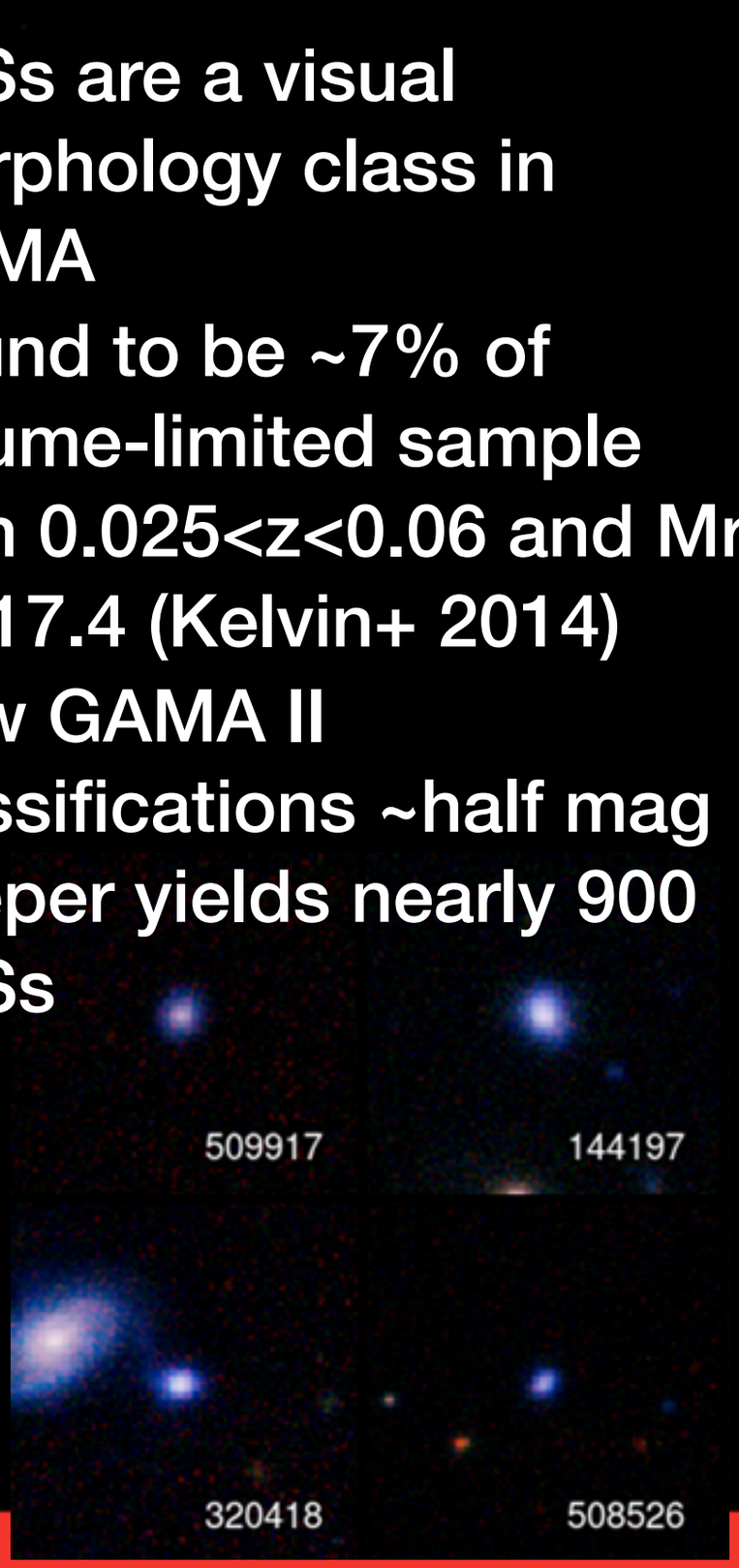
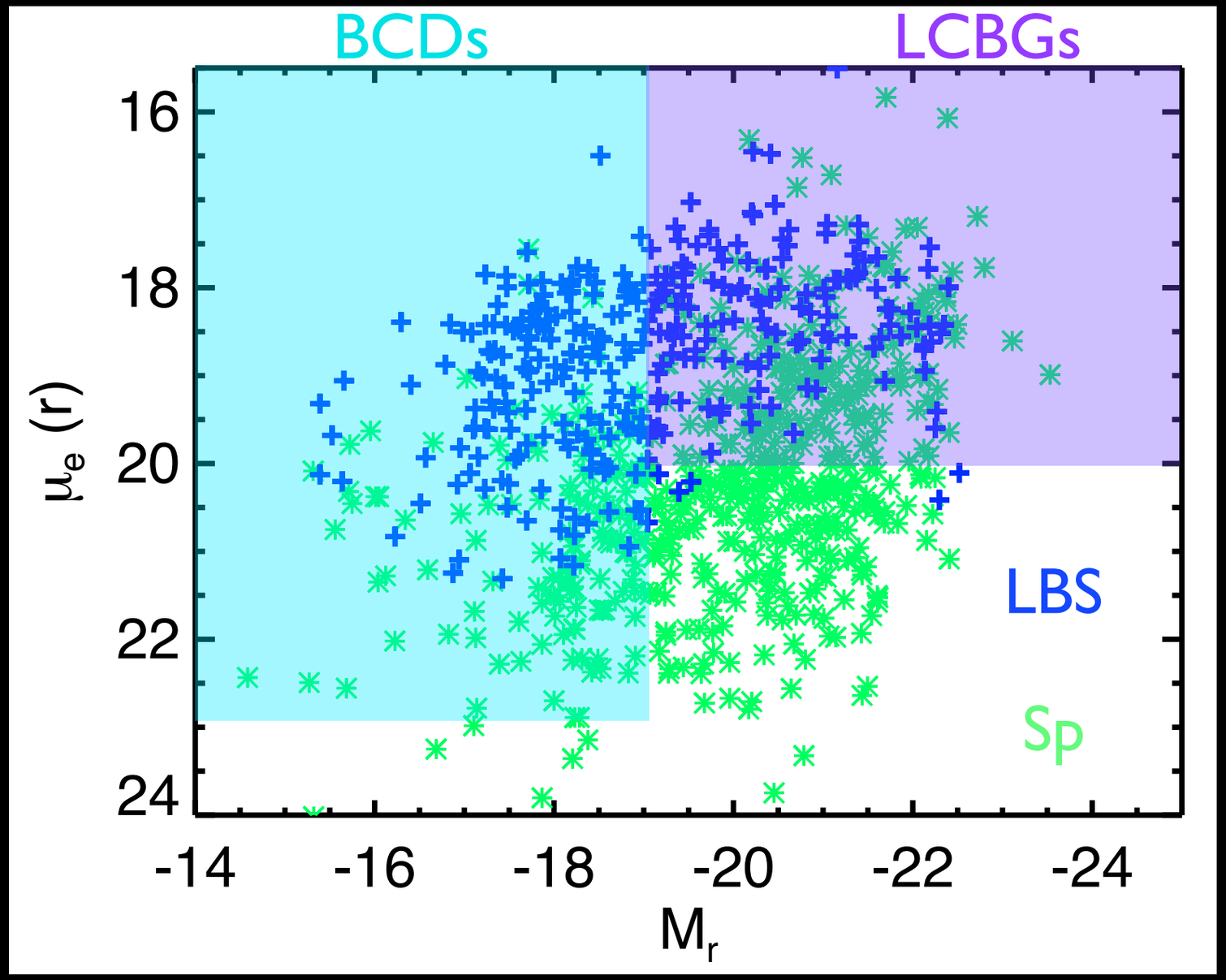
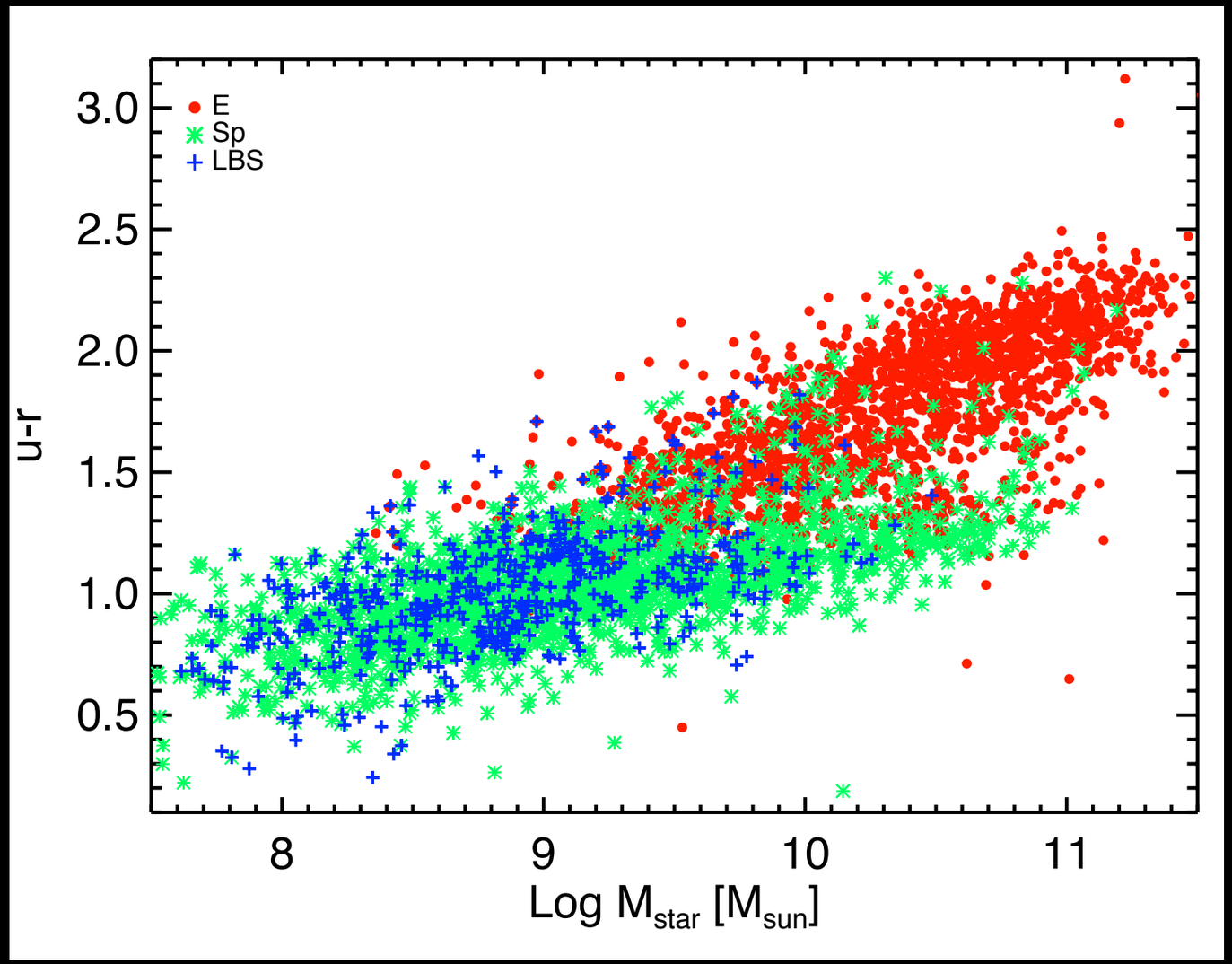




Little Blue Spheroids in GAMA

- Colors imply star forming & SSFRs comparable to spirals
- In mass-size space, intermediate between Es and spirals



masses and extinction-corrected colors Taylor+ 2011

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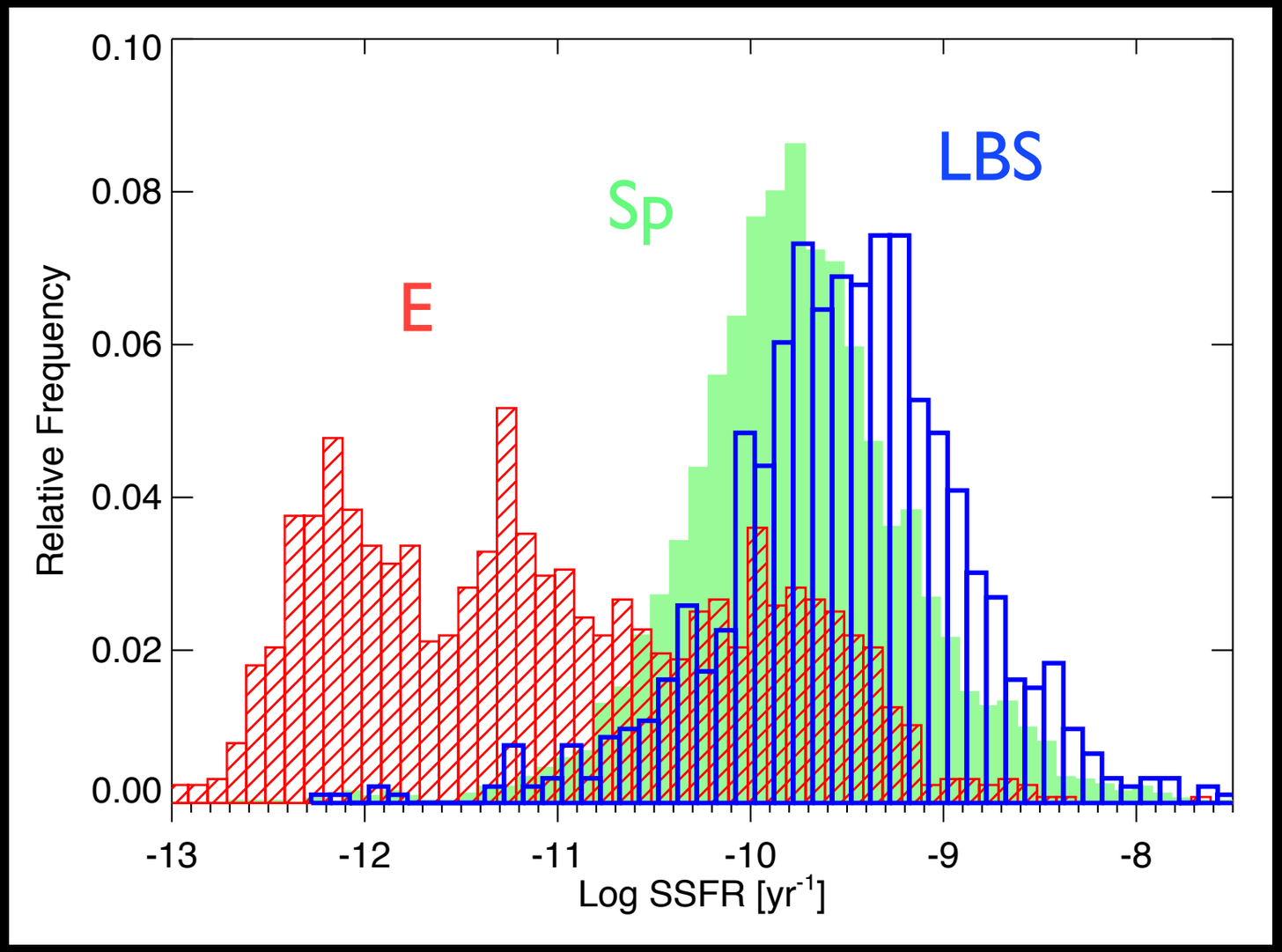

Hα SFRs Hopkins+ 2013/Gunawardhana+ 2013

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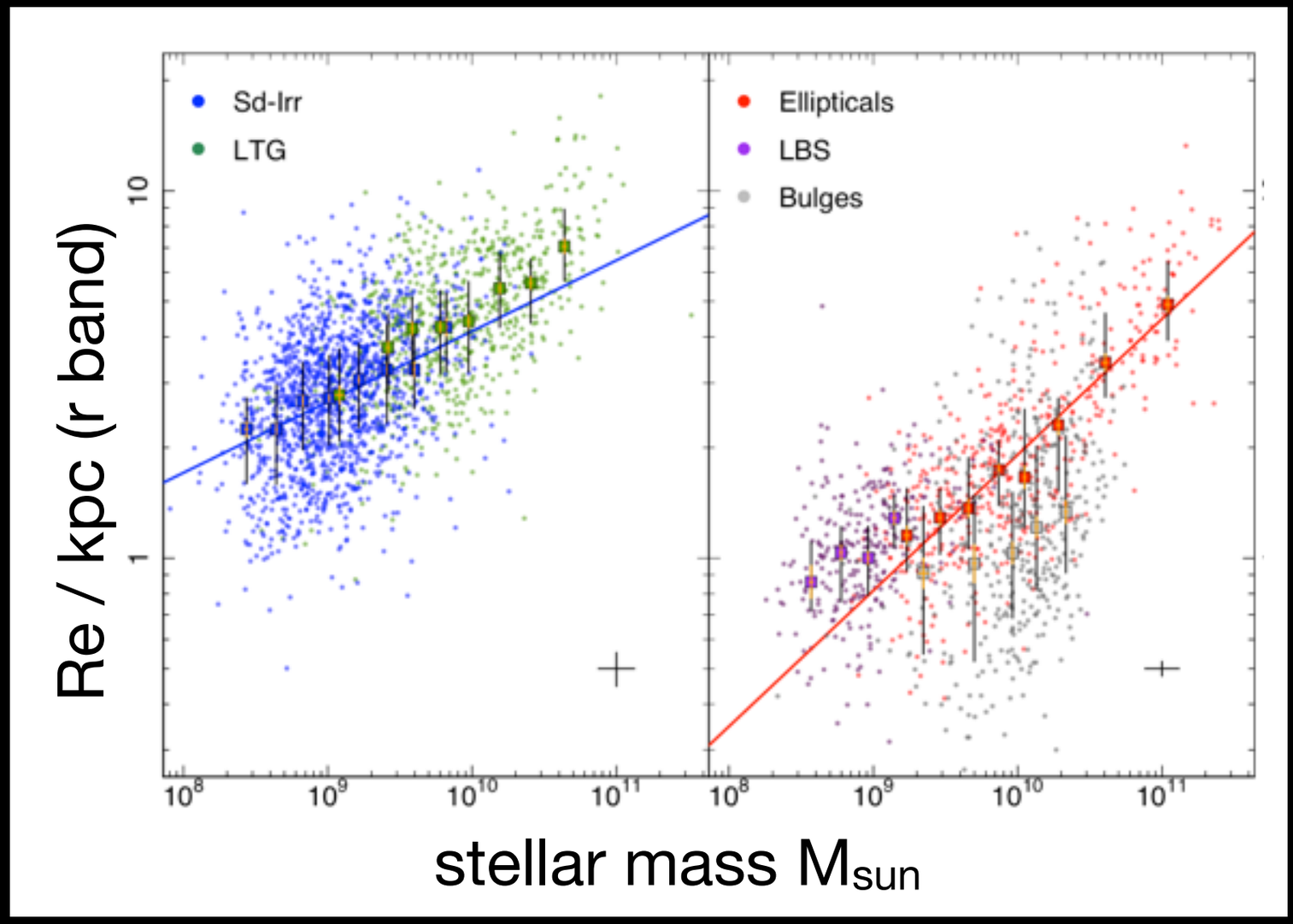
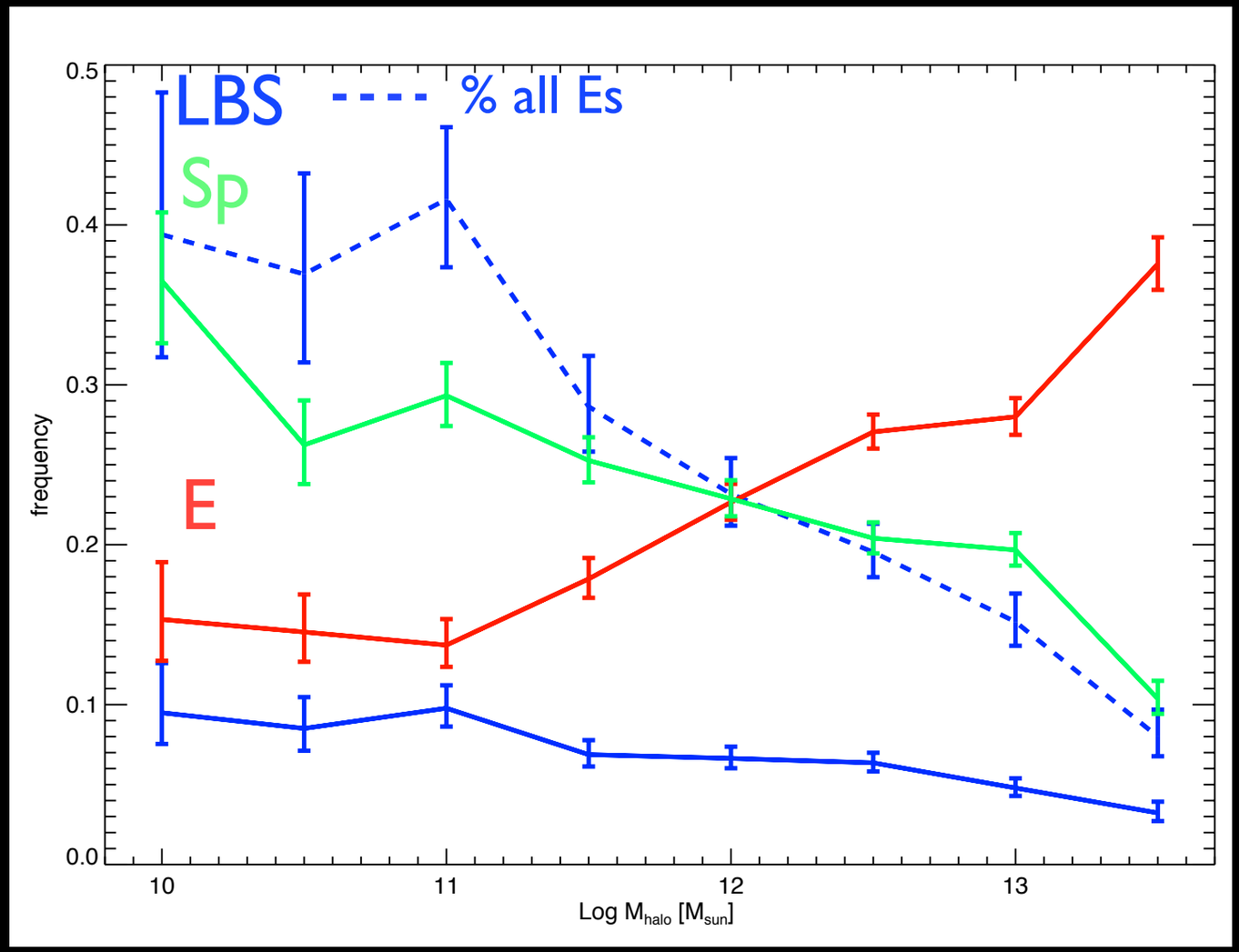


preliminary results from Lange+, in prep.

What are they?
Primordial objects? Fading remnants? Objects in transition?

Environments of LBSs

- LBS frequency increases for low group halo masses
- Overall LBS pair fraction lower than for Es or spirals (Robotham + 2011 pair IDs) -> some recent mergers?
- ~20-30% LBSs in voids, ~40% in tendrils, higher fractions than for E/Sp (Alpaslan+ 2014 cat.)



group catalog Robotham+ 2011

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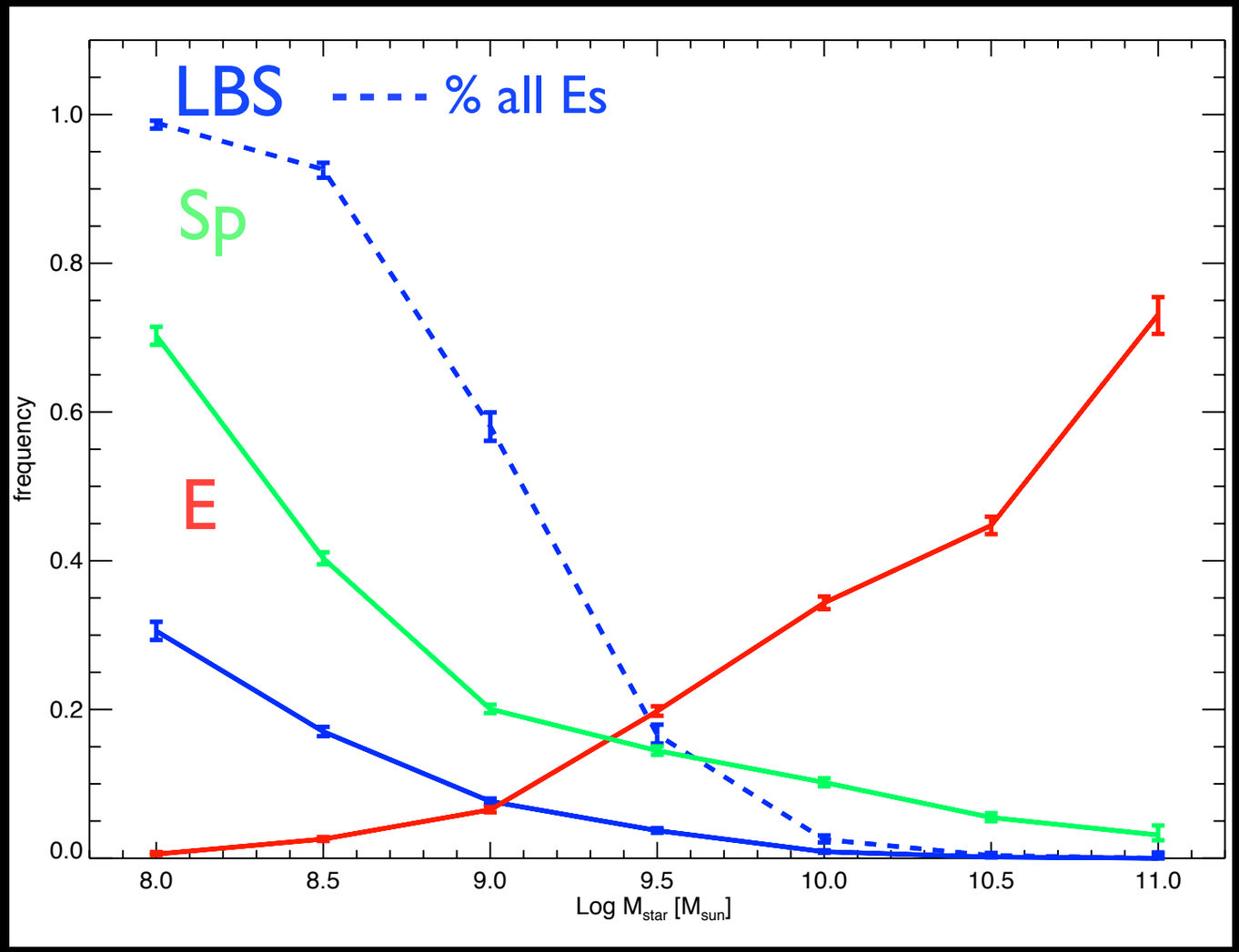

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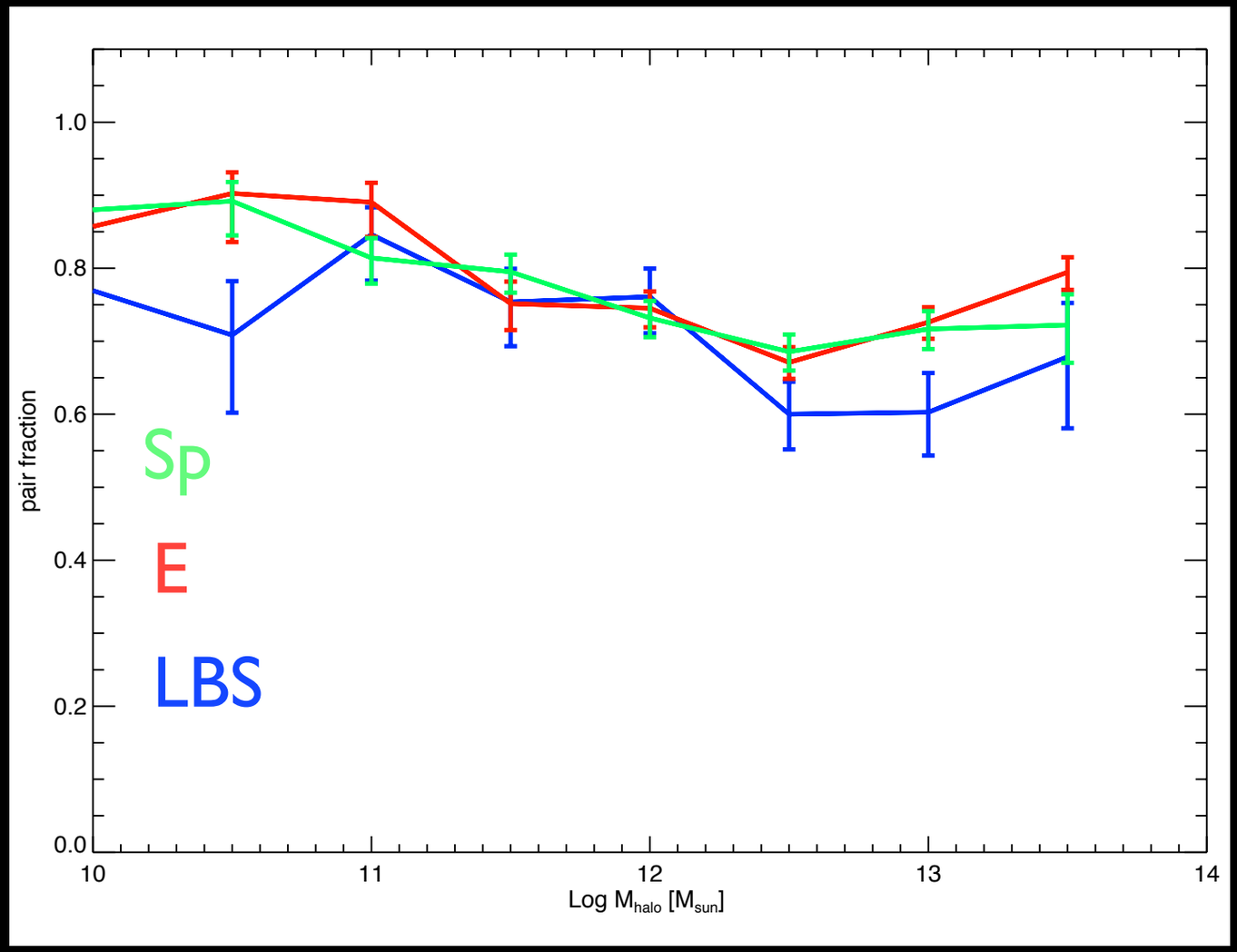
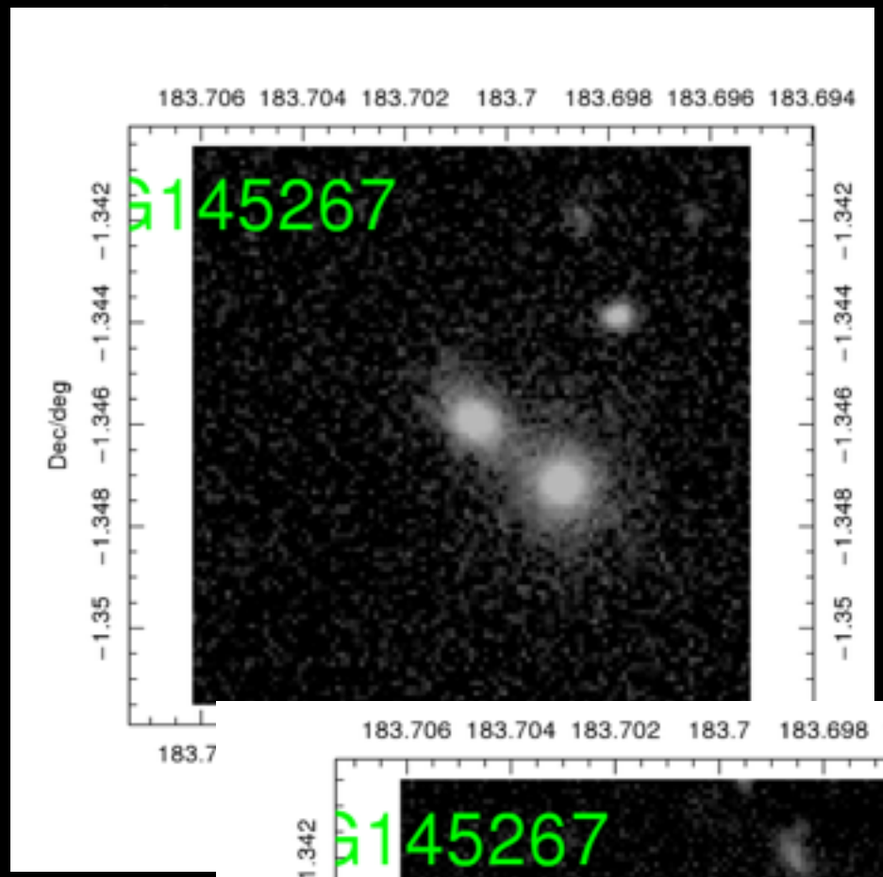
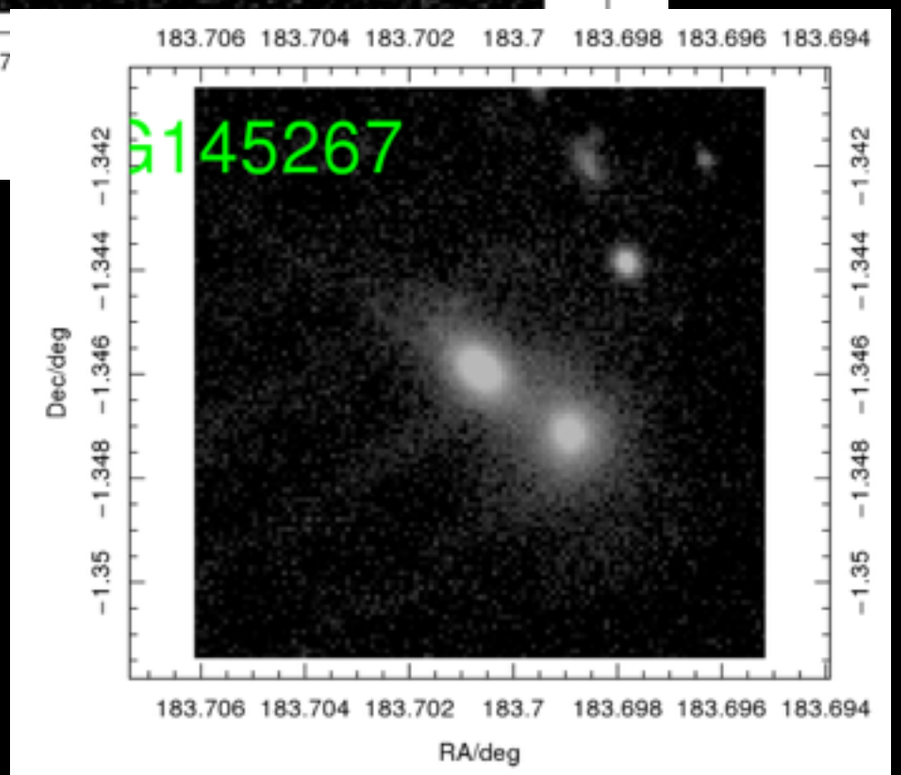


group catalog Robotham+ 2011

Little Blue Spheroids with KiDS



SDSS

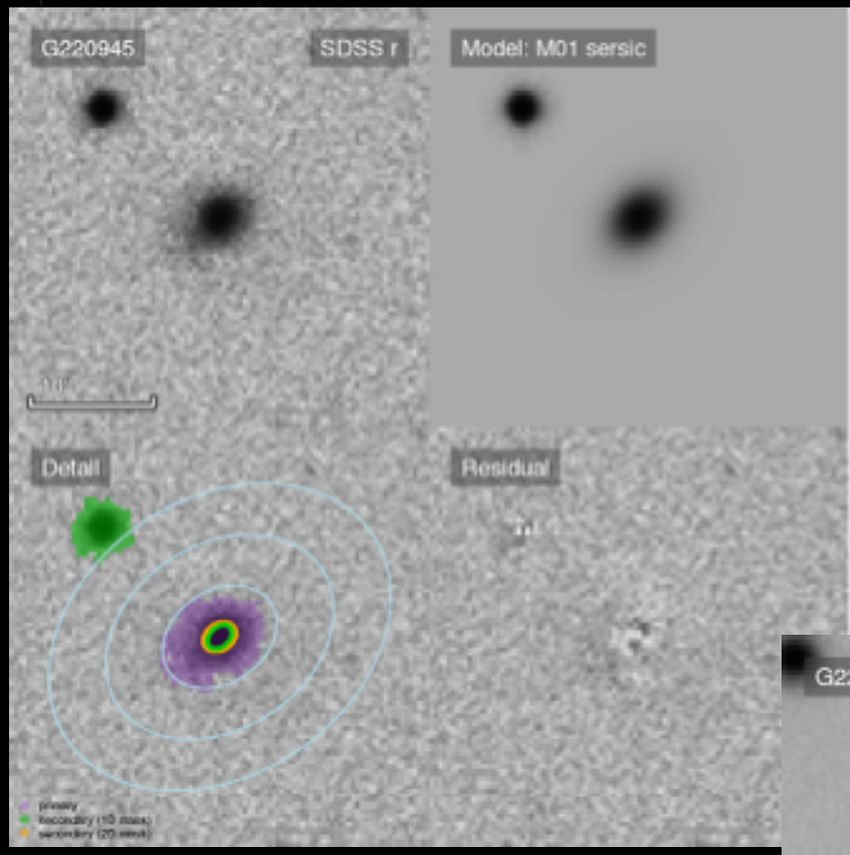


KiDS

GAMA cutout tool - A. Wright

- **Kilo Degree Survey (PI Konrad Kuijken)**
  - VLT Survey Telescope with OmegaCAM - 1 sq. degree FOV
  - ugri imaging ~2 mag deeper than SDSS
  - KiDS typical seeing ~0.6” in r, compare to SDSS r ~1.3”
- **First 50 square degrees now public - DR1, with scattered GAMA coverage**

LBS Model Fits with KiDS



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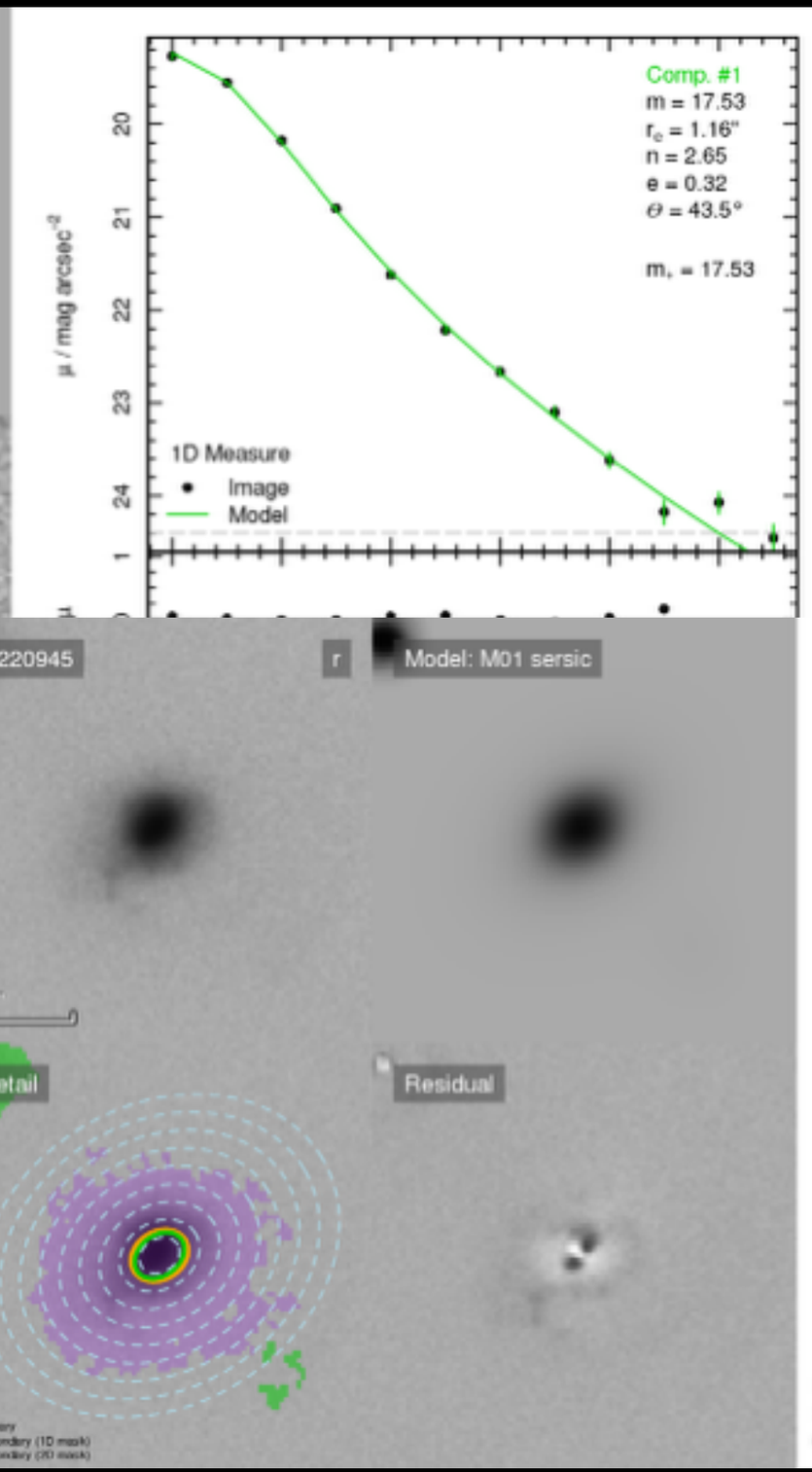
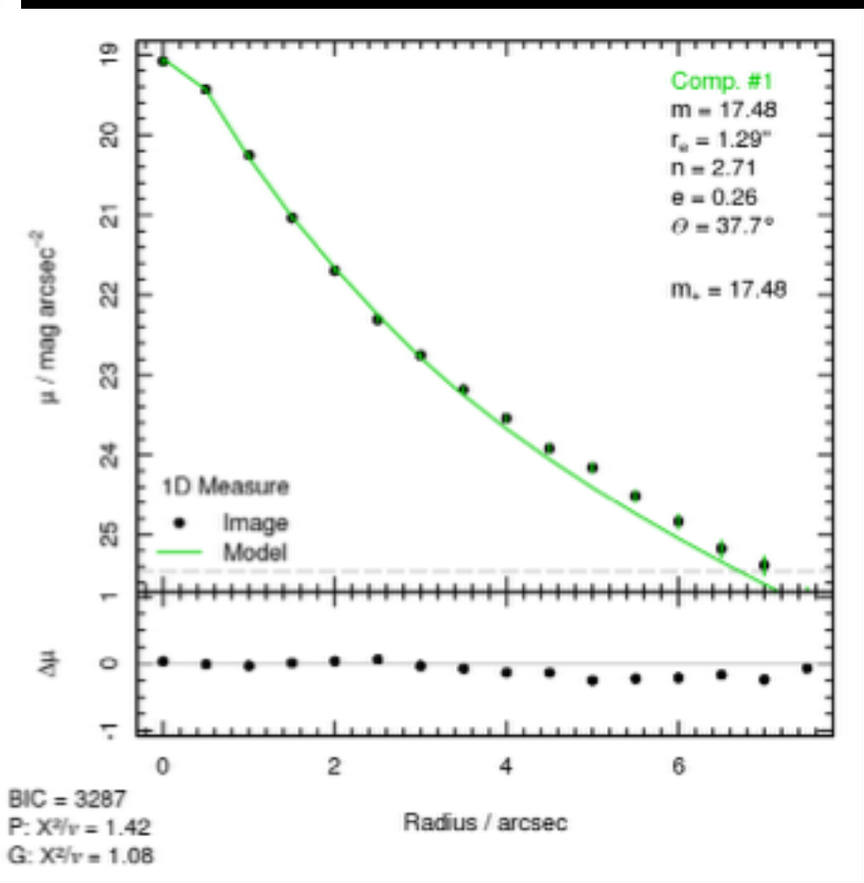


- By Bayesian information criterion (BIC) find ~60% prefer 2 components

KiDS



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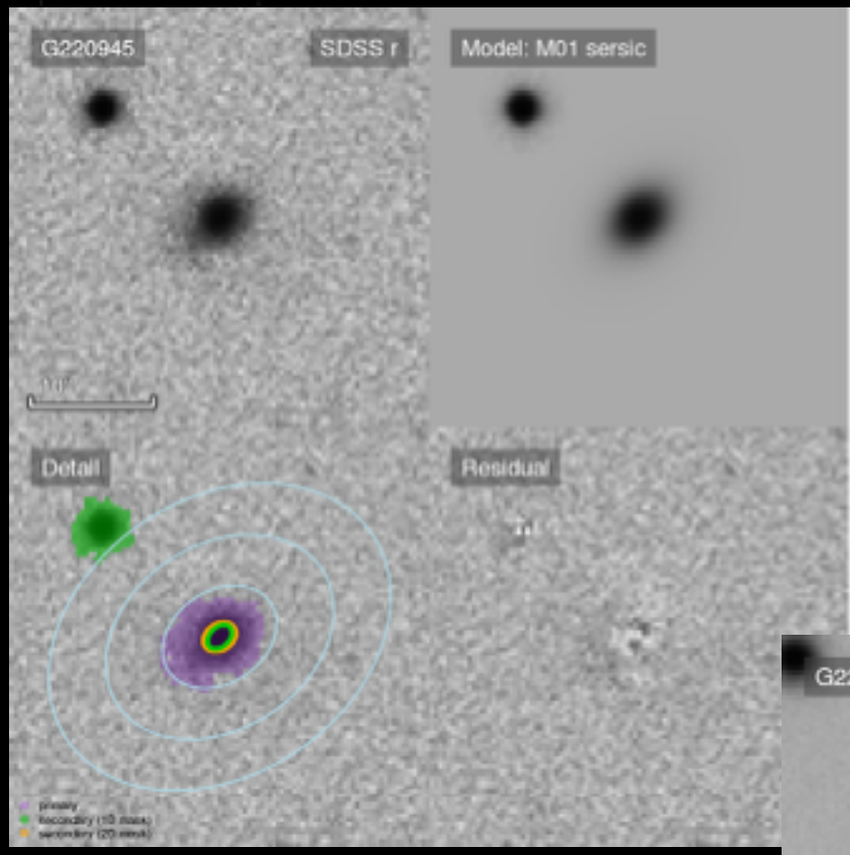

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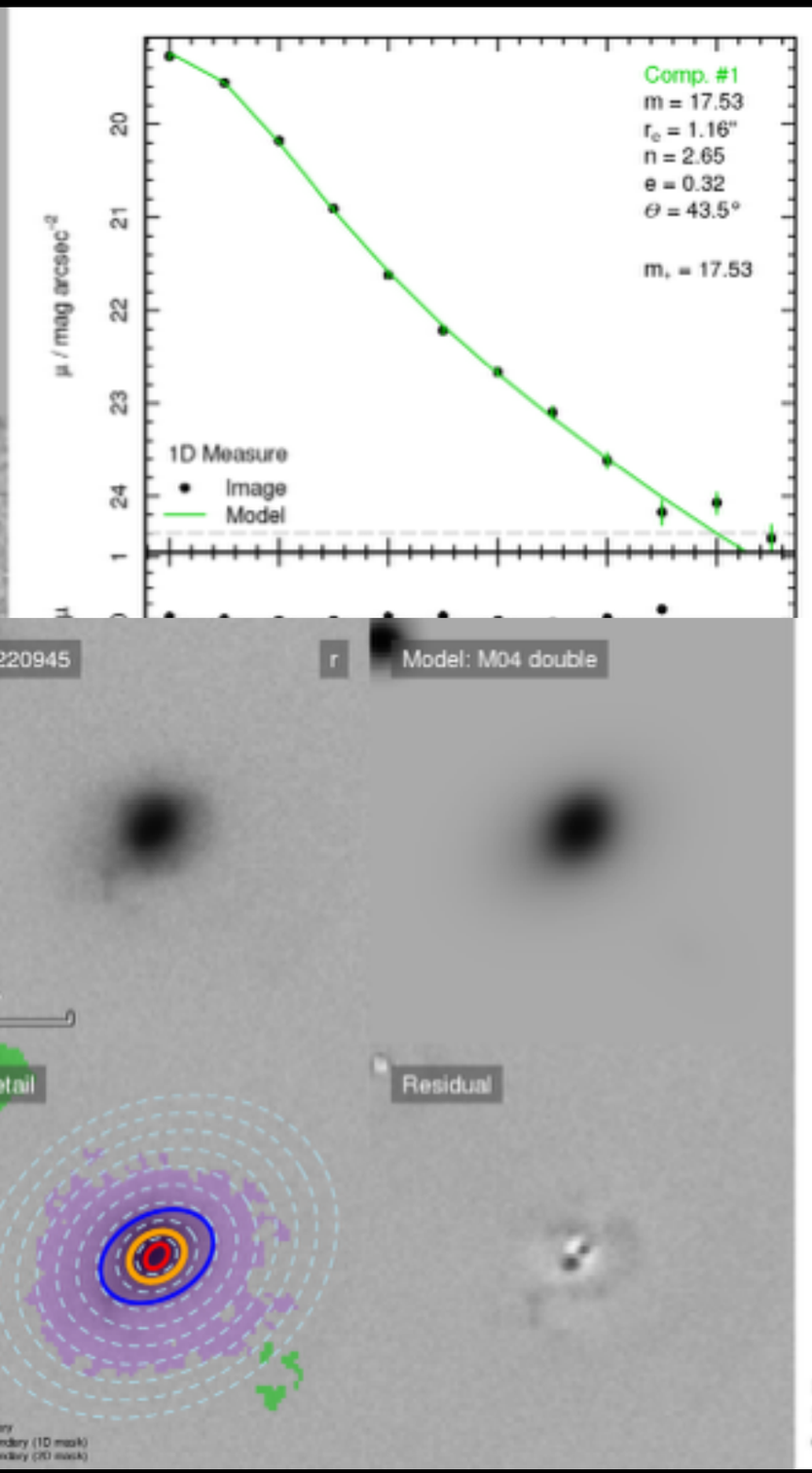

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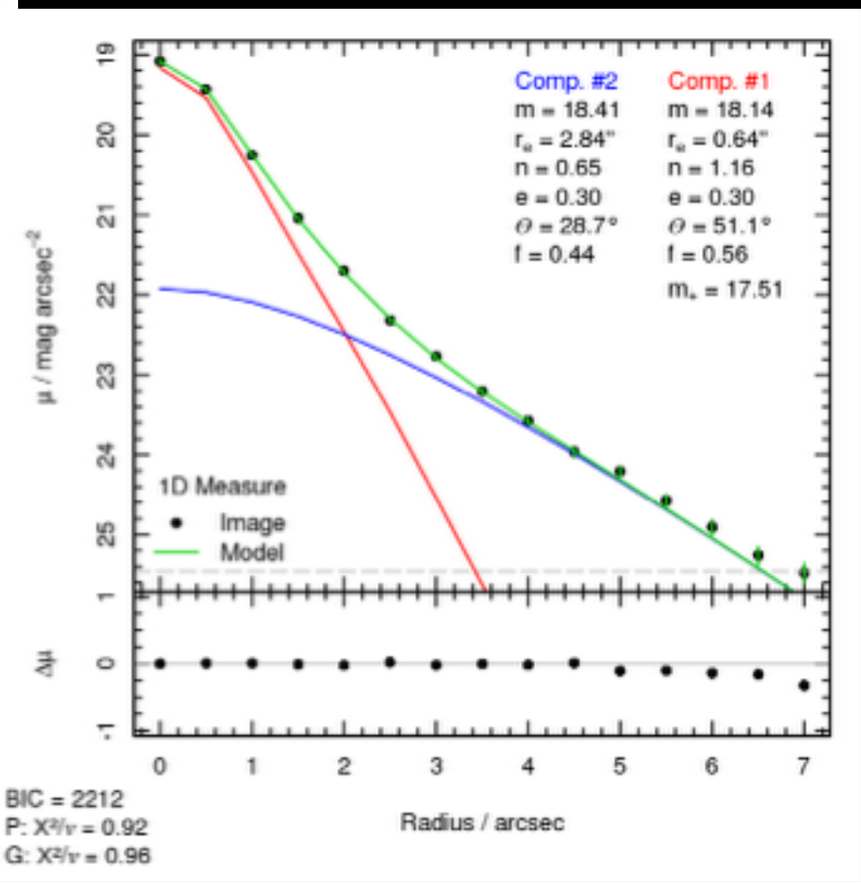
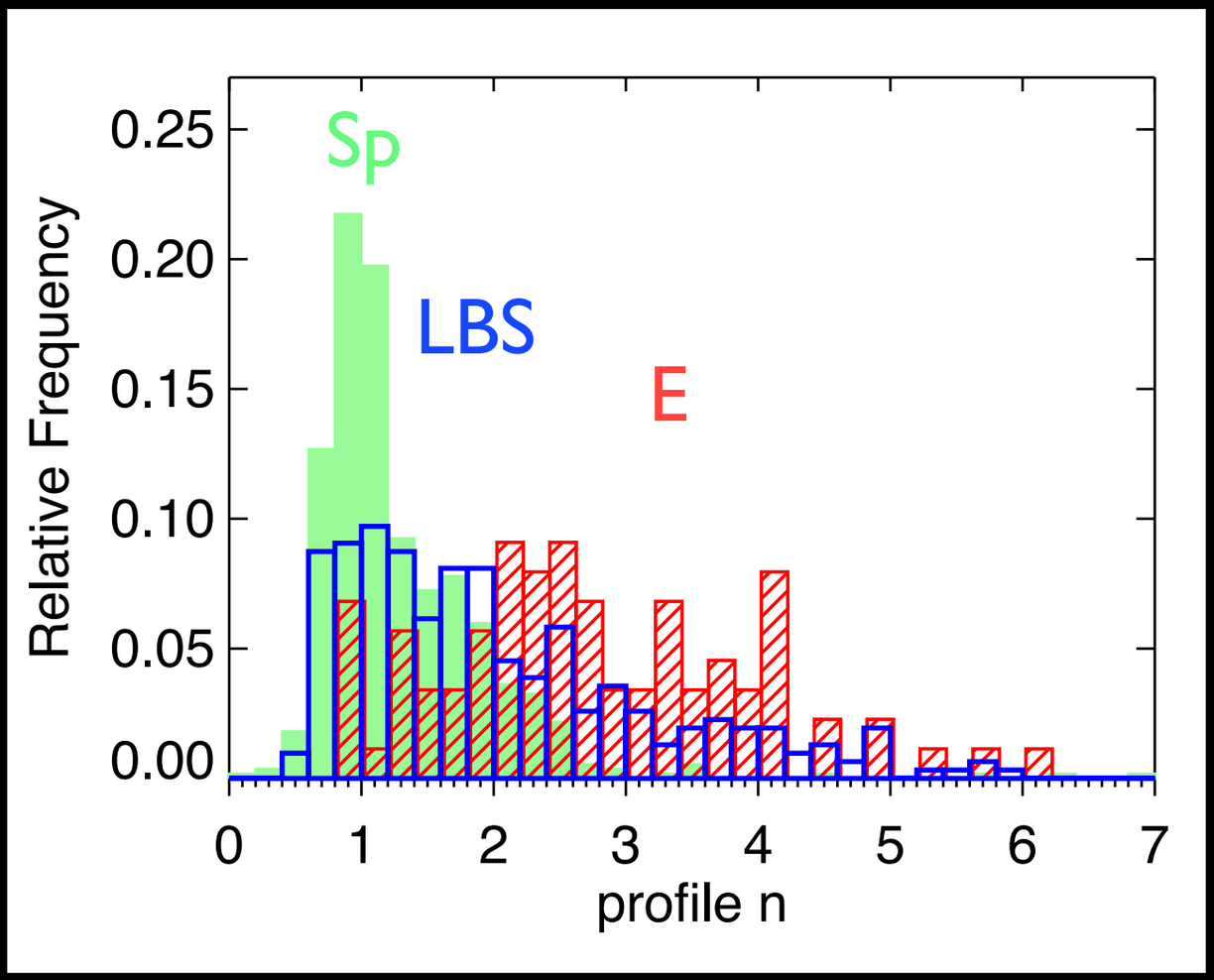
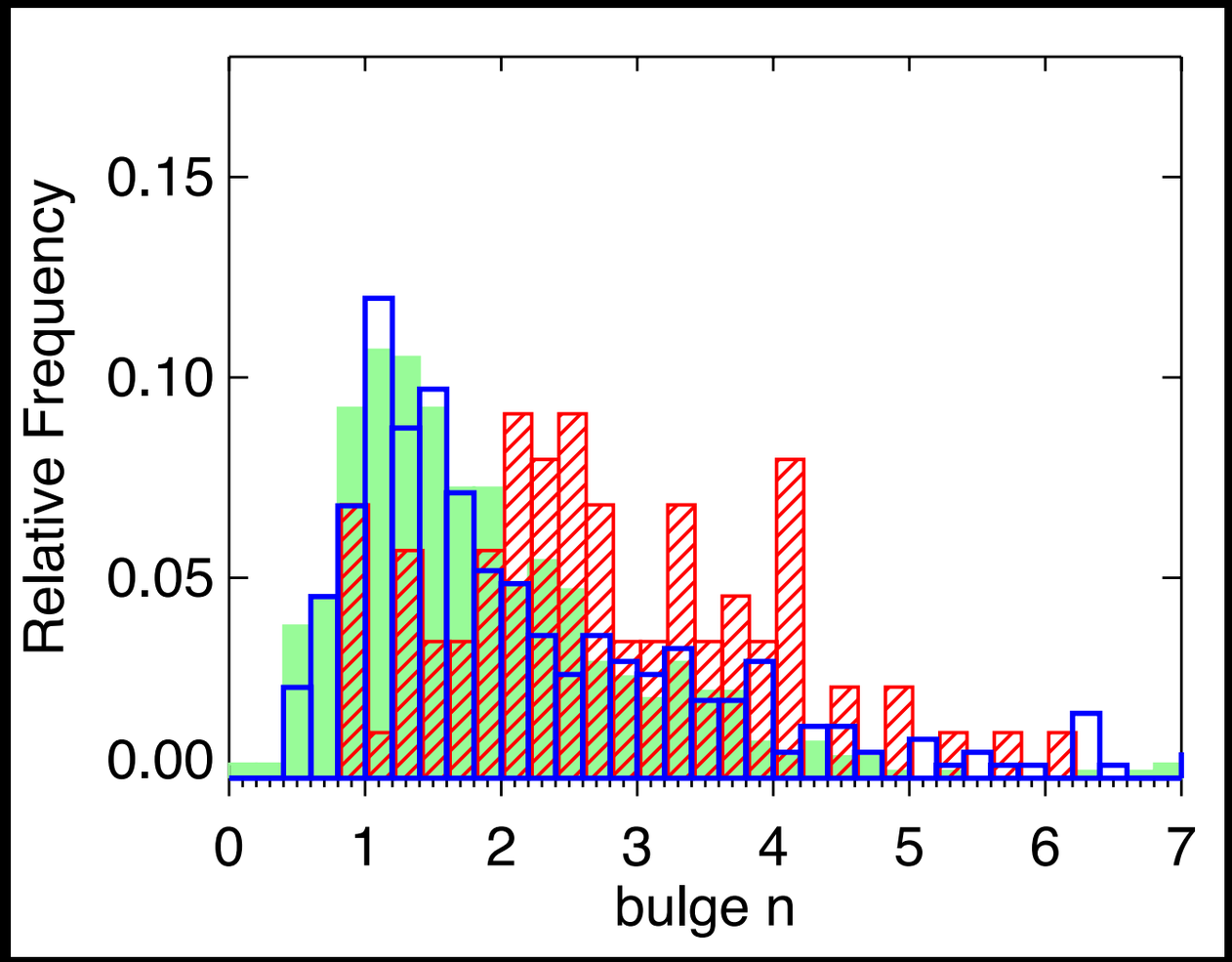


KiDS Model Fit Early Results



LBS bulge n similar to spirals, frequently pseudobulges
- no clear single formation mechanism (e.g., review Graham 2013)



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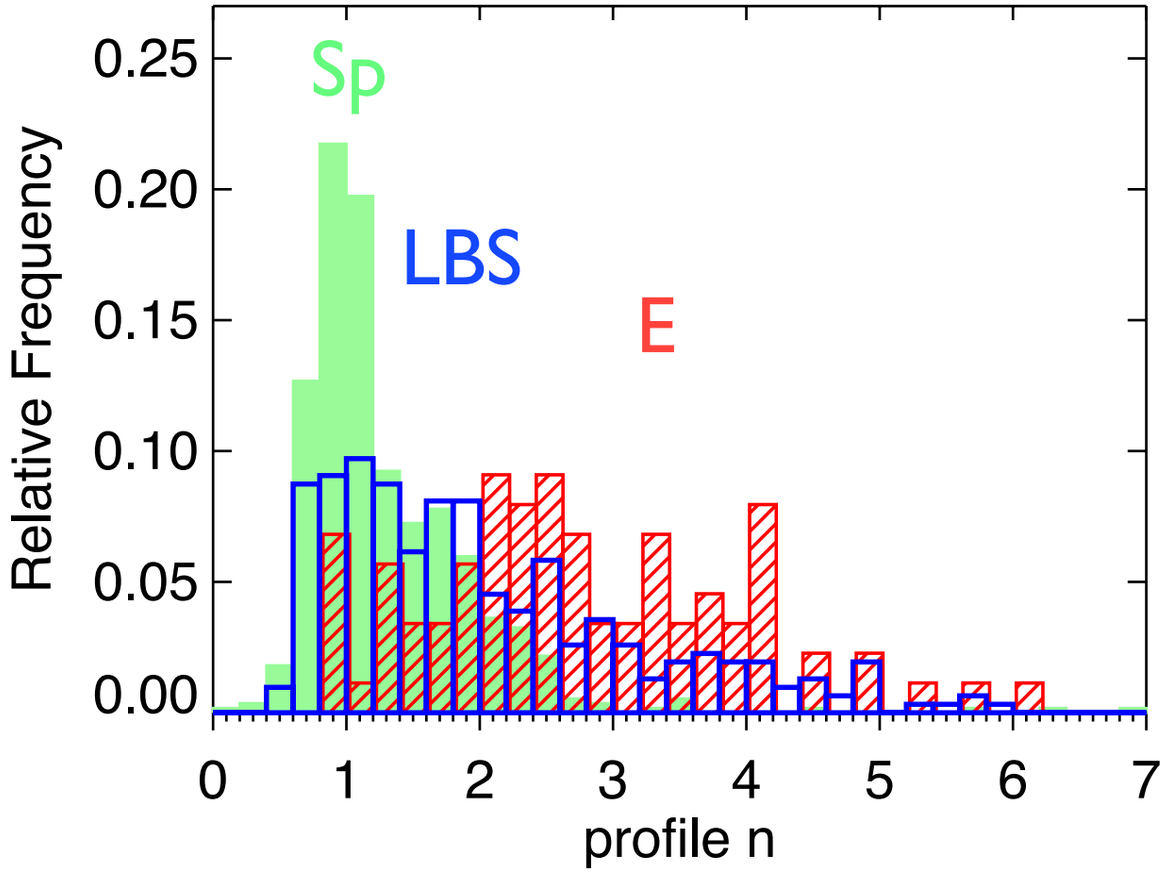
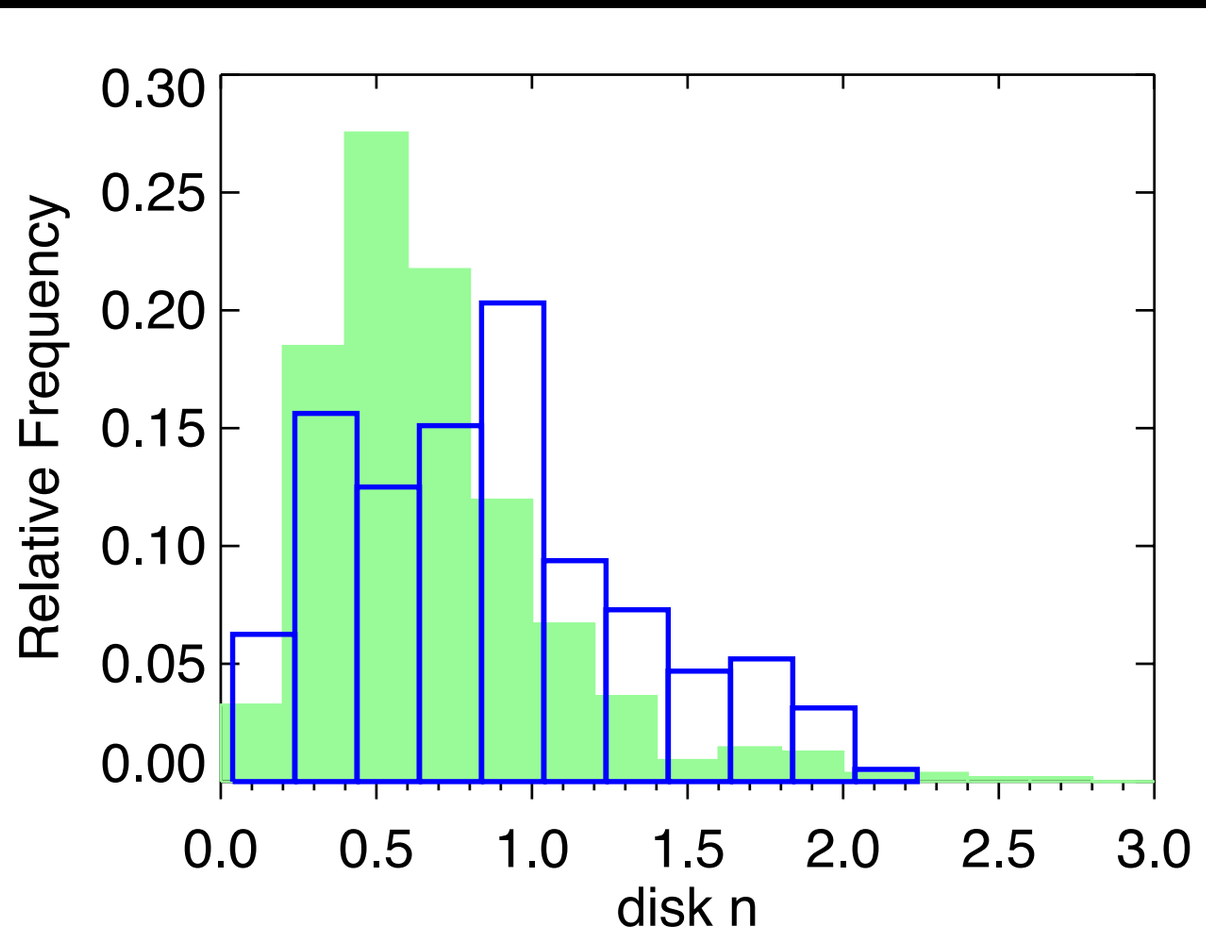


For two-component LBSs, disk n distribution differs from spiral distribution



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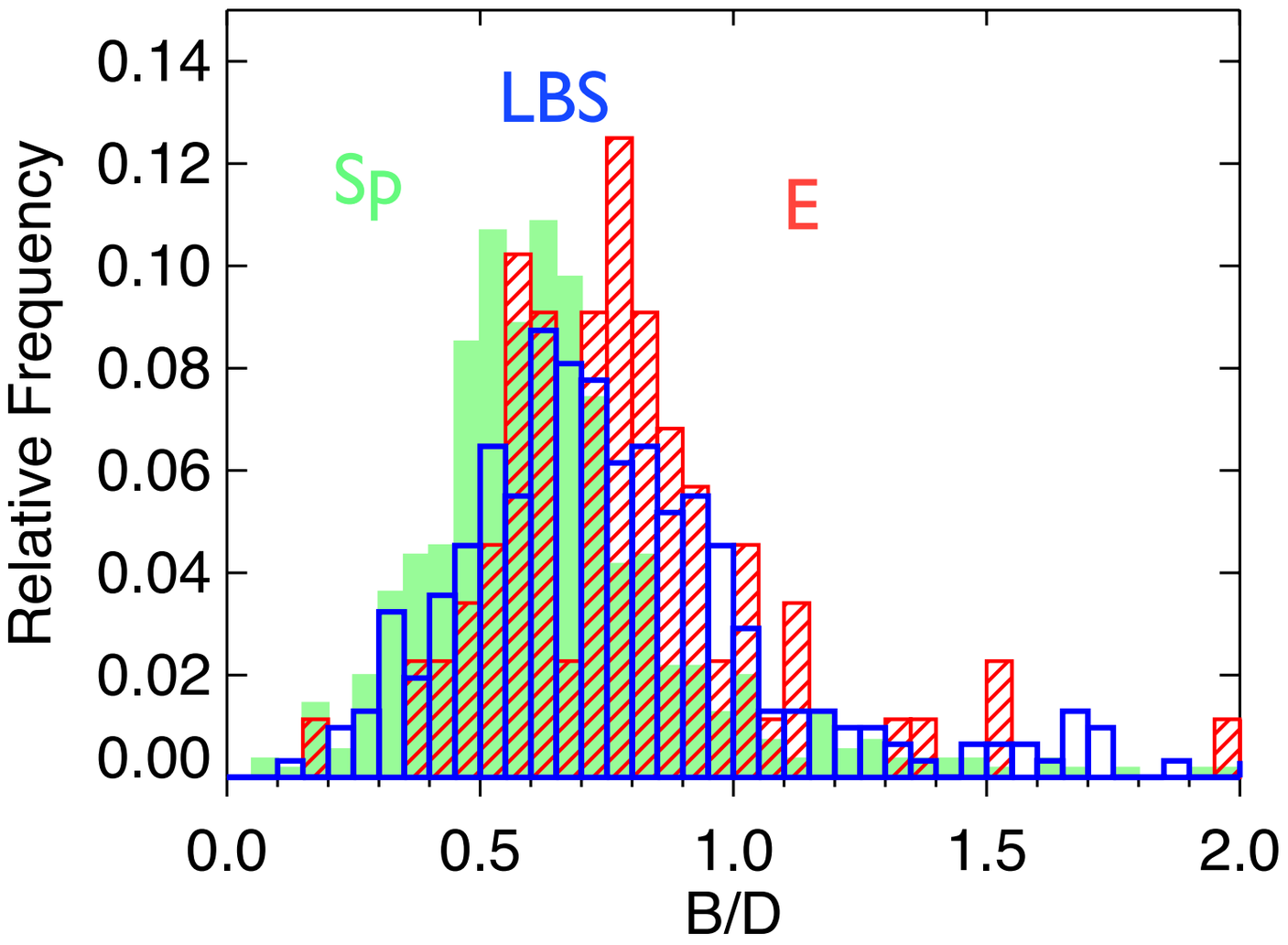

LBS B/D luminosity ratio distribution intermediate between E/Sp distributions

Summary

- GAMA's "Little Blue Spheroids" are typically low stellar mass & star-forming; many are likely multi-component systems
- LBSs largely inhabit environments outside densest galaxy concentrations, implying these conditions are important for their formation and persistence
- LBSs have transitional structural characteristics, with bulge n similar to typical spirals but with differing disk n and B/D ratios intermediate between E/Sp populations
- History and evolutionary future of LBSs unclear - fading or growing? -> examine stellar population diagnostics, interaction indicators, quantify typical gas reservoirs
- Beyond the LBSs - full KiDS imaging coverage will expand GAMA structural sample significantly, allowing B/D fits on deeper/higher-resolution data