

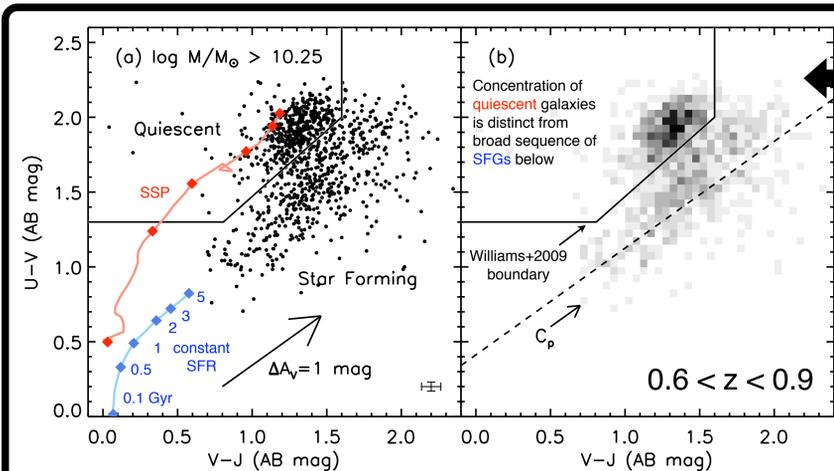
The UVJ Selection of Quiescent and Star Forming Galaxies: Separating Early and Late-Type Galaxies and Isolating Edge-on Spirals



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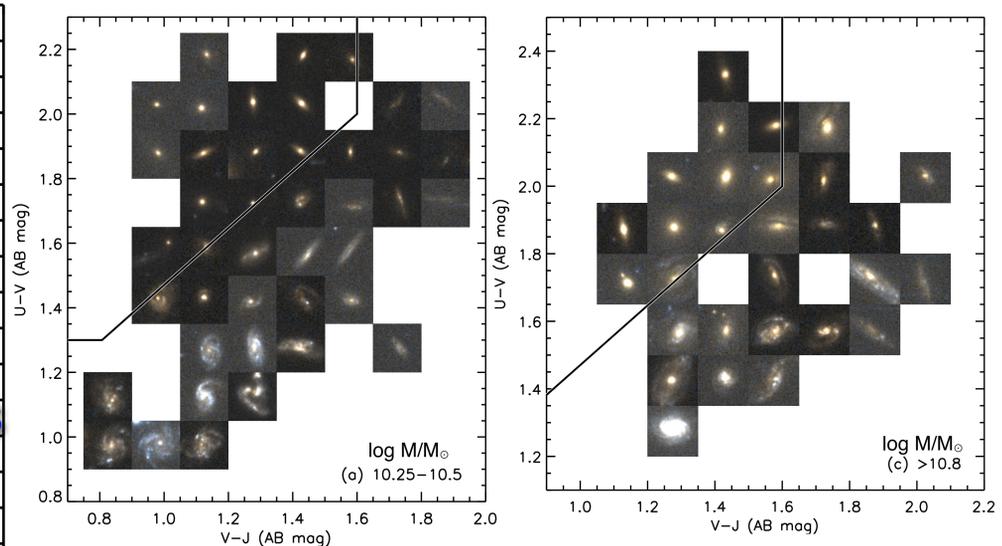
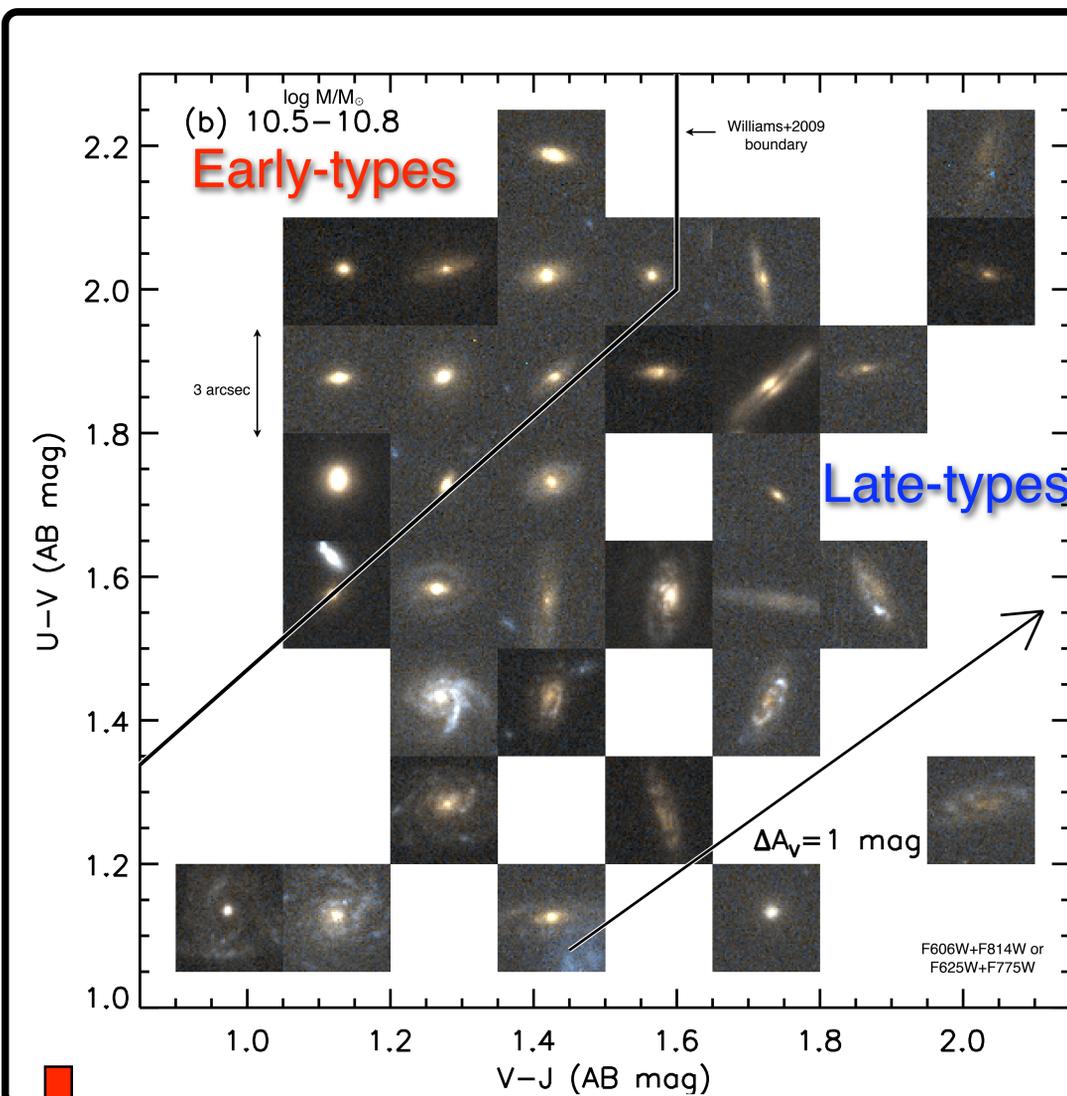


The UVJ diagram (i.e. U-V vs. V-J) can be used to distinguish **quiescent** galaxies from **star forming galaxies** (SFGs)^{1,2,3,4,5}, even reddened SFGs!

- How could two rest-frame colors be any more useful?
- What do galaxies look like in different regions of UVJ color space?
- Why are the UVJ colors of SFGs spread out into a sequence?
- What are the red SFGs?

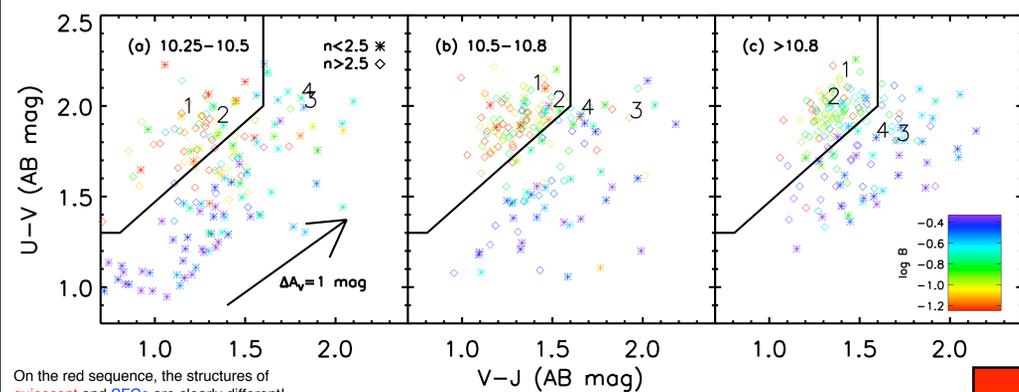


We used HST ACS imaging to examine the structural properties of galaxies in the UVJ Diagram



- UVJ-selected **quiescent** galaxies look like **early-types**.
- UVJ-selected **SFGs** look like **late-types**.
 - Bluer ones are face-on spirals, while redder ones are closer to edge-on.

A Quantitative View into Galaxy Structure in the UVJ Diagram



On the red sequence, the structures of quiescent and SFGs are clearly different!

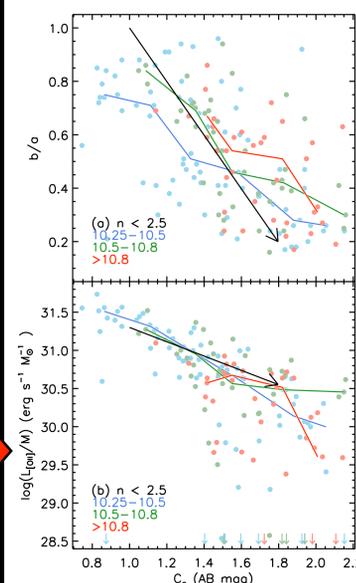


Quiescent galaxies have concentrated (high Sersic index, n) and featureless (low bumpiness^{**}, B) surface brightness profiles, characteristic of early-type galaxies.

SFGs have a mix of Sersic indices. However, most with concentrated profiles ($n > 2.5$) also have significant structure (high B) from dust and/or SF -- this is typical of late-type galaxies.

References
(1) Labbe+2005, ApJ, 624, L81, (2) Wuyts+2007, ApJ, 655, 51, (3) Williams+2009, ApJ, 691, 1879, (4) Patel+2011, ApJ, 735, 53, (5) Brammer+2011, arXiv:1104.2595, (6) Blakeslee+2006, ApJ, 644, 30

^{**} The bumpiness parameter, B , is defined as the ratio between the rms of the residual from the best-fitting Sersic model from GALFIT and the model mean⁶.



What is the source for the broad distribution of UVJ colors for SFGs?

Hypothesis: reddening is a major factor.

(a) The inclinations (or axis ratios, b/a) of SFGs are correlated with the UVJ colors along the reddening vector (C_p): blue SFGs are viewed face-on, while red ones are viewed edge-on.

(b) The $[OIII]\lambda 3727\text{\AA}$ luminosities decline along the reddening vector due to extinction from dust within highly inclined disks.

Disks viewed closer to edge-on having higher degrees of reddening. The models of Rocha+2008 can roughly explain the spread in UVJ colors and $L_{[OIII]}/M$ for SFGs when going from face-on to edge-on (black arrows).

^{**} See C_p vector in Figure 1 on top

Summary

- Two rest-frame colors can be used to classify the recent SFHs and morphologies of galaxies out to $z \sim 1$.
- The UVJ colors of SFGs are largely determined by mass and the viewing inclination.
 - Most SFGs on the red sequence are simply edge-on spirals.