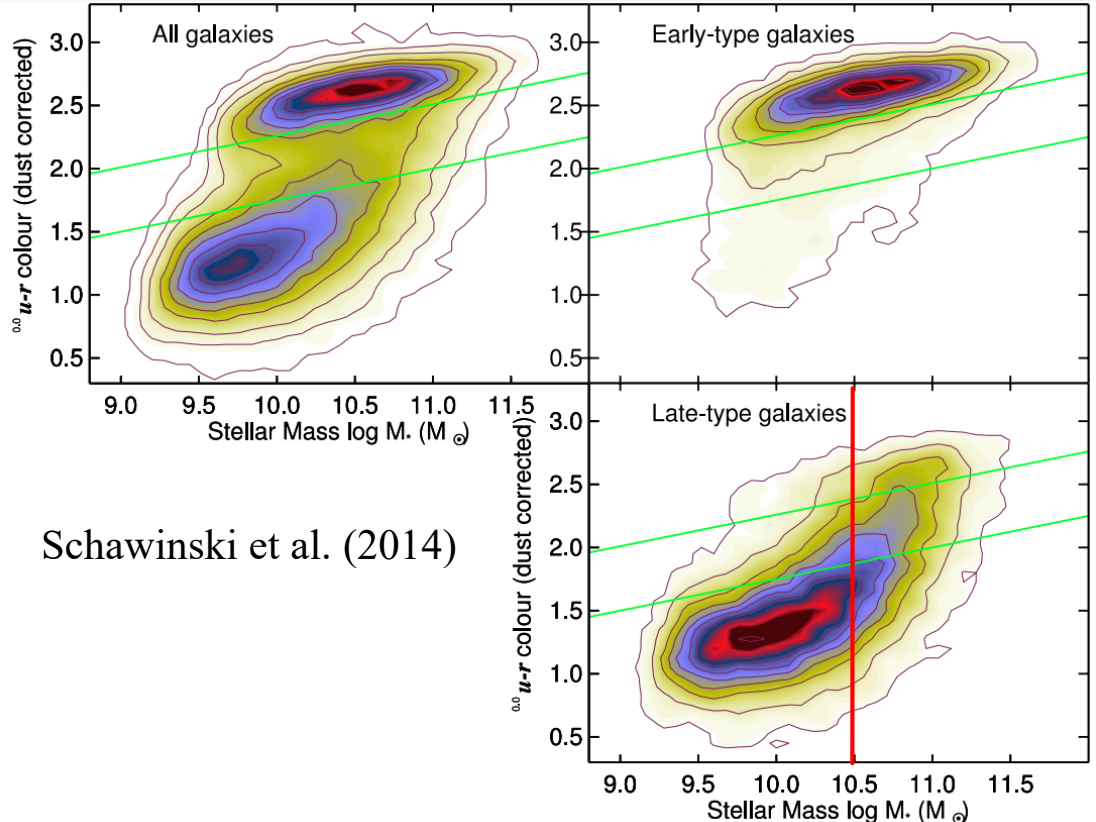


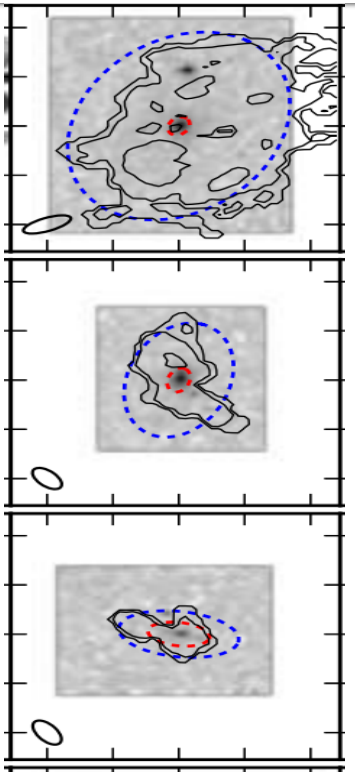
The role of environment in the formation of optically red spiral galaxies

GUO Rui (郭蕊), XIA Xiaoyang (夏晓阳), HAO Cai-Na (郝彩娜)
Tianjin Astrophysics Center, Tianjin Normal University

Optically red spirals

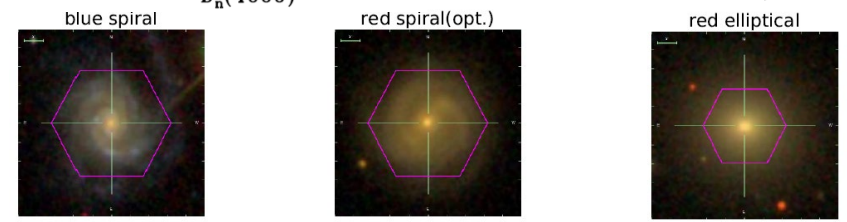
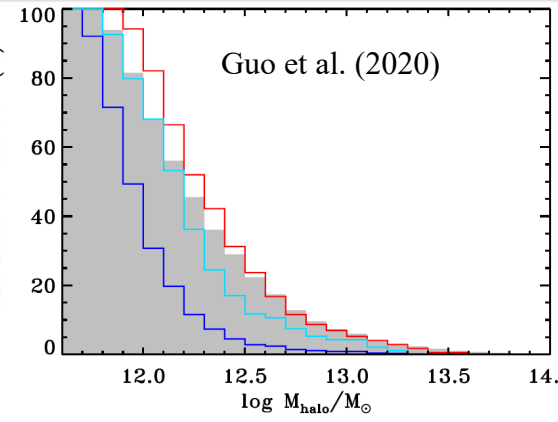
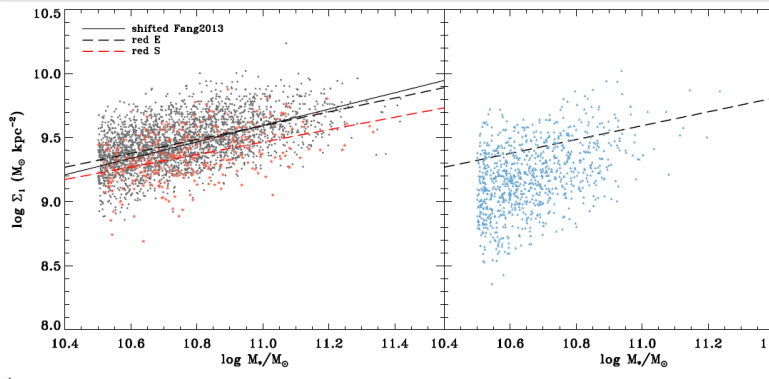
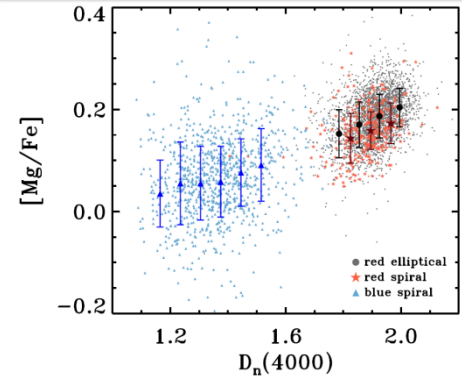


Schawinski et al. (2014)

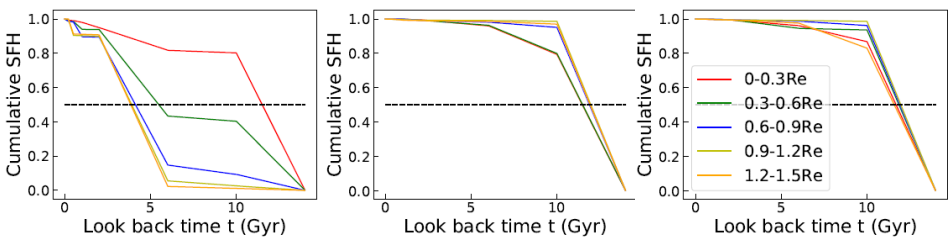


Lemonias et al. (2014)

Optically red spirals

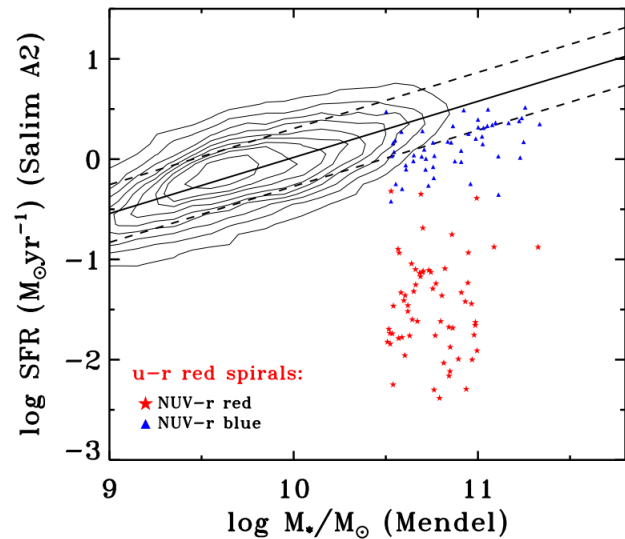
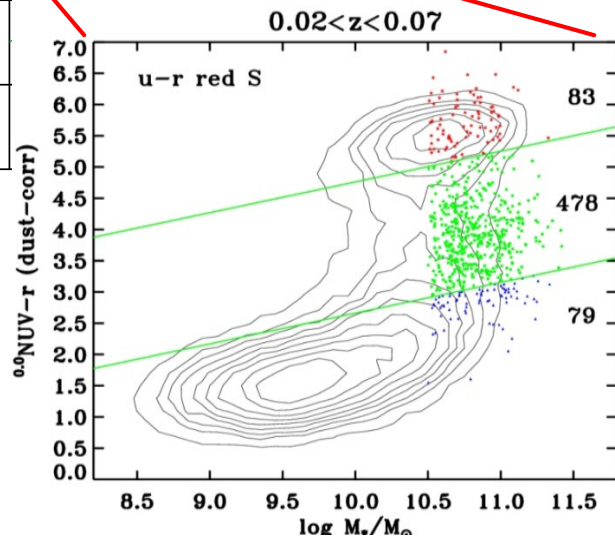
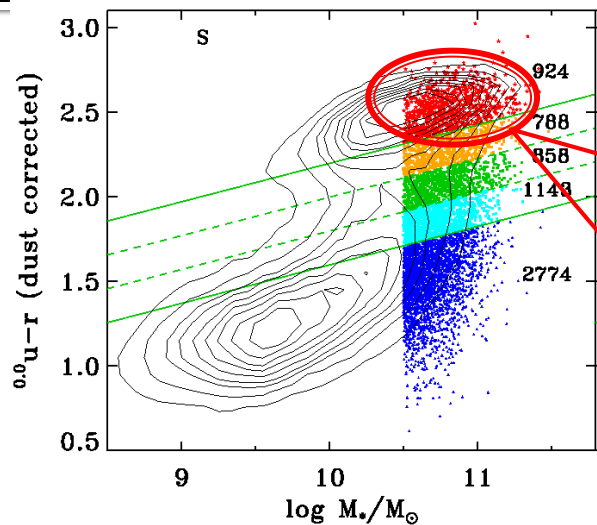


➤ red spirals are formed at $z \sim 2$, through major mergers between the extended disk galaxies with high angular momentum before most of the gas turned into stars.

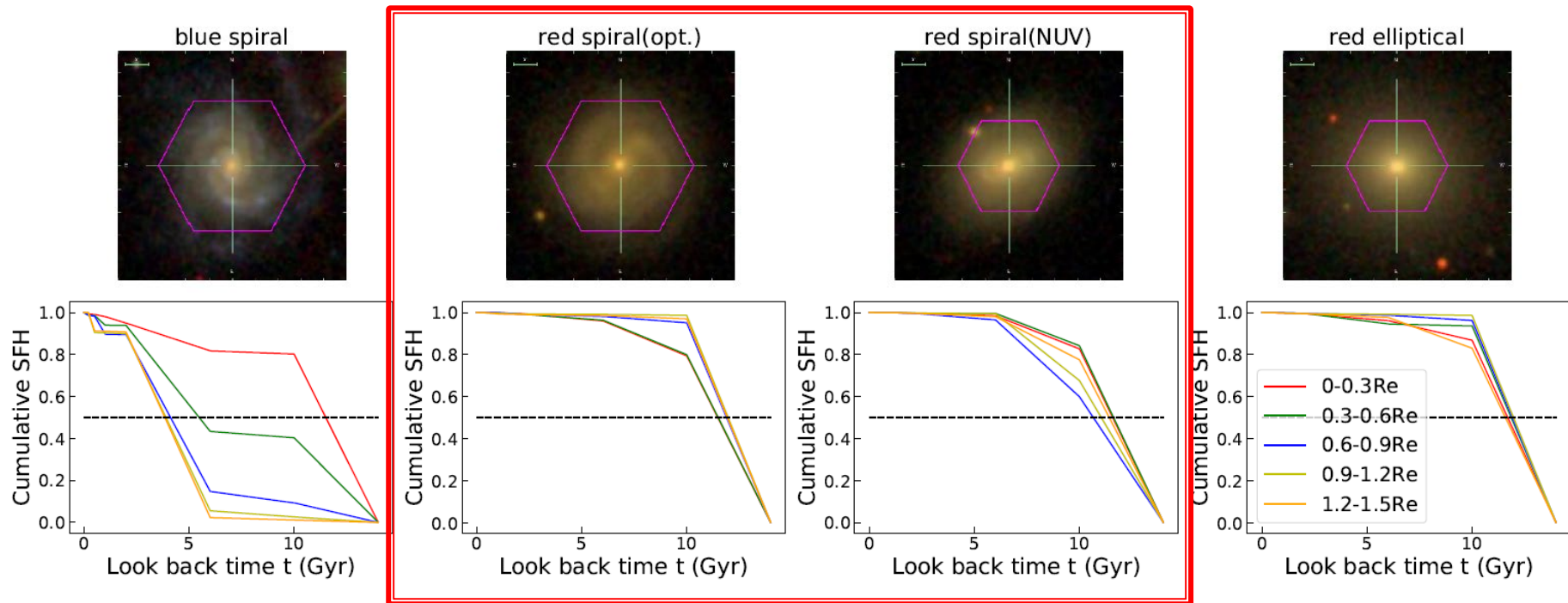


Zhou et al. (2020)

Why the NUV-r color different?

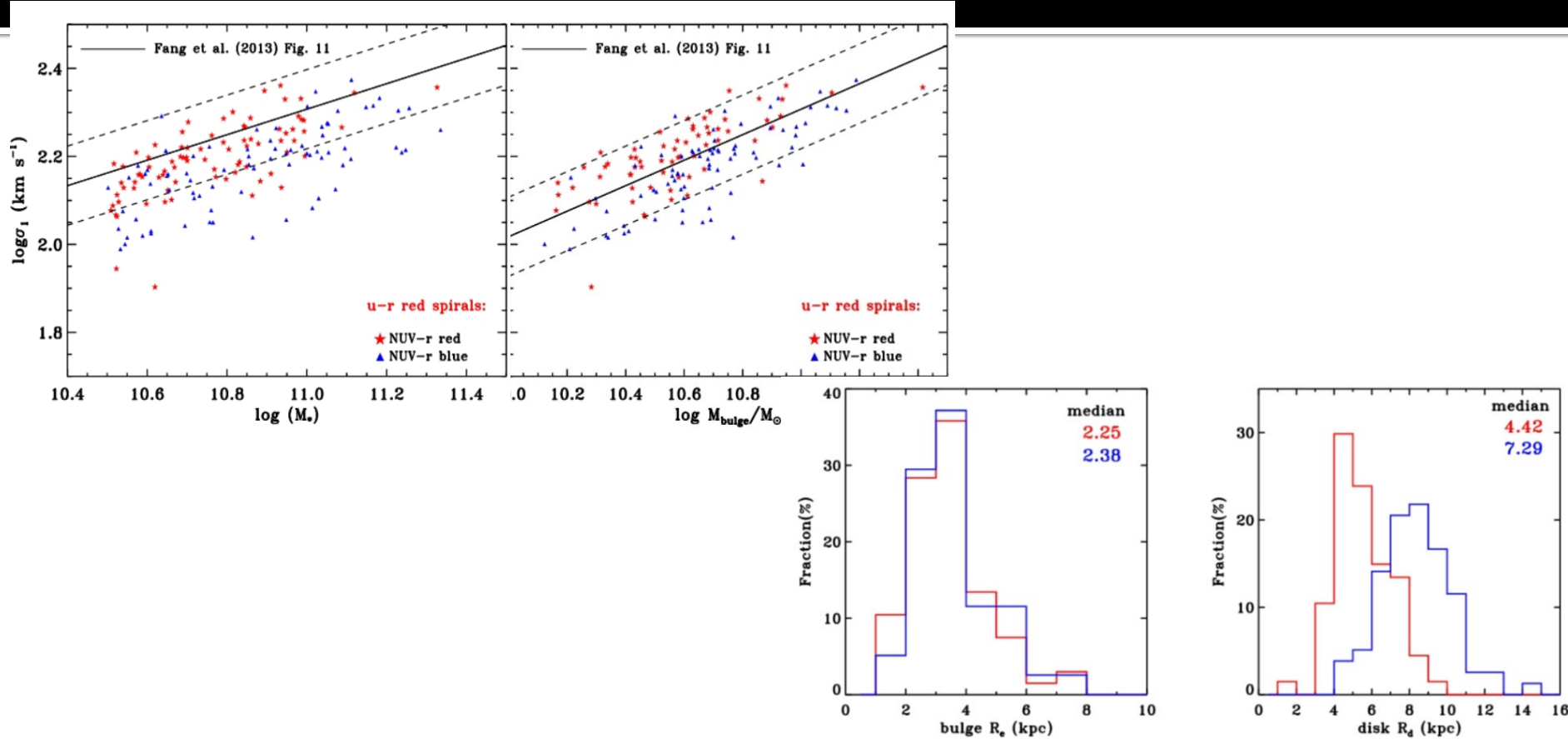


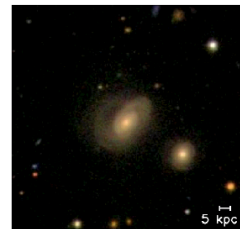
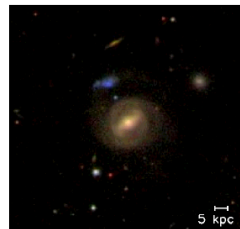
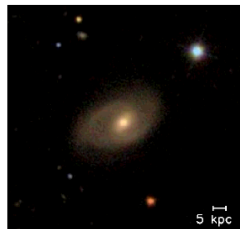
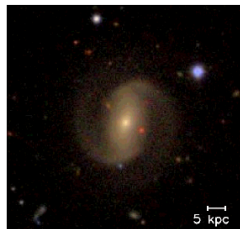
Similar central SFH for the optically red spirals



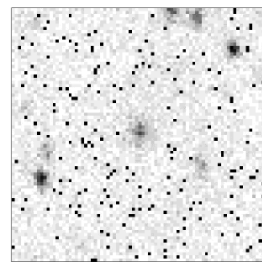
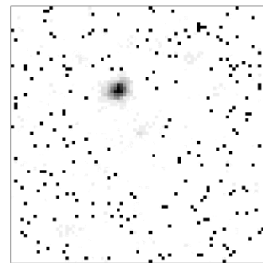
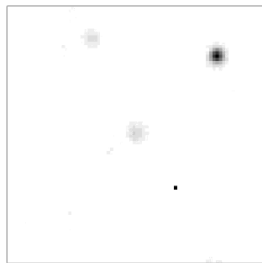
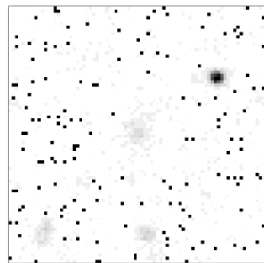
Zhou et al. (2020)

Similar central structure for the optically red spirals

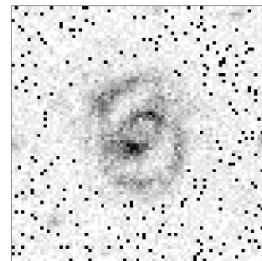
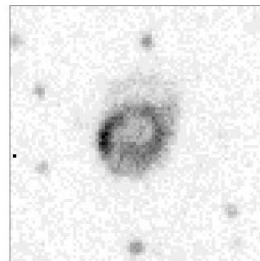
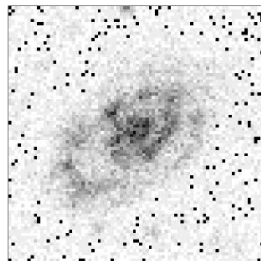
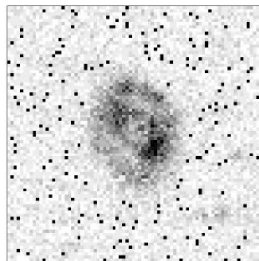
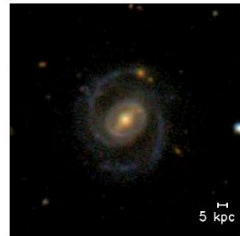
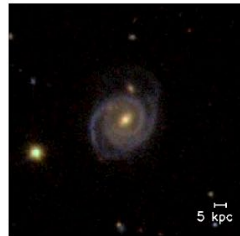
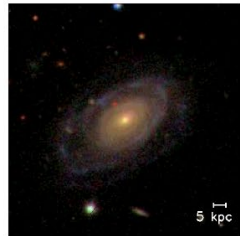
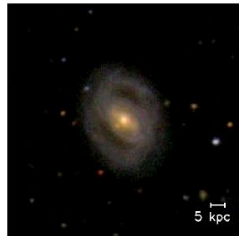




NUV-r red

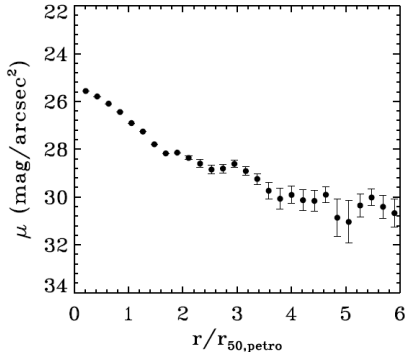
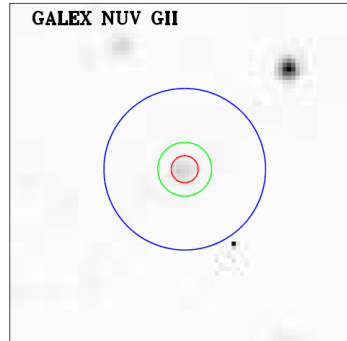
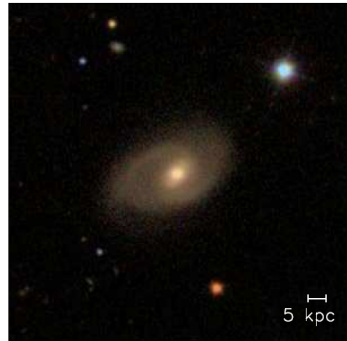


NUV-r blue

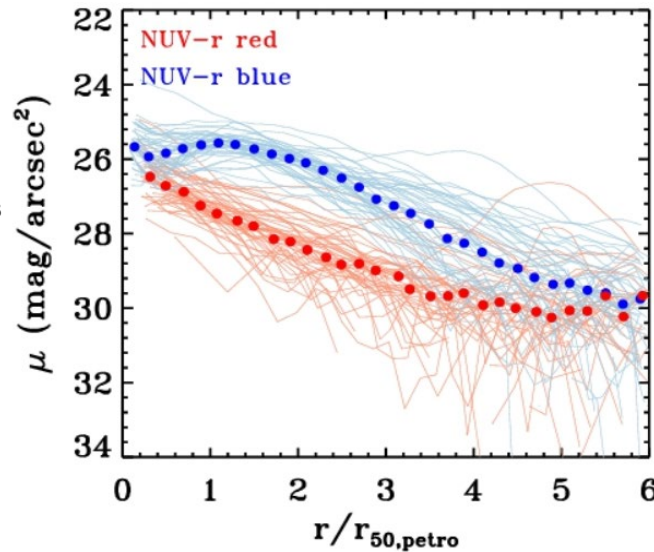
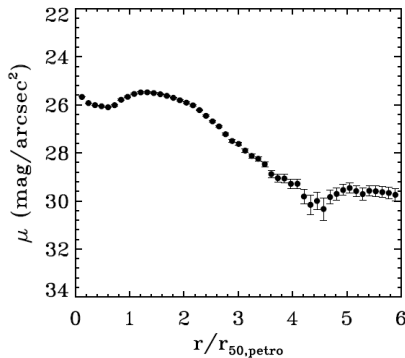
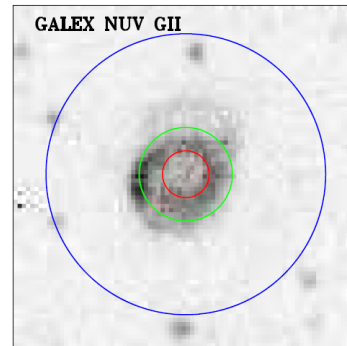
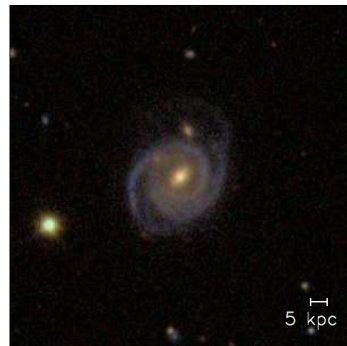


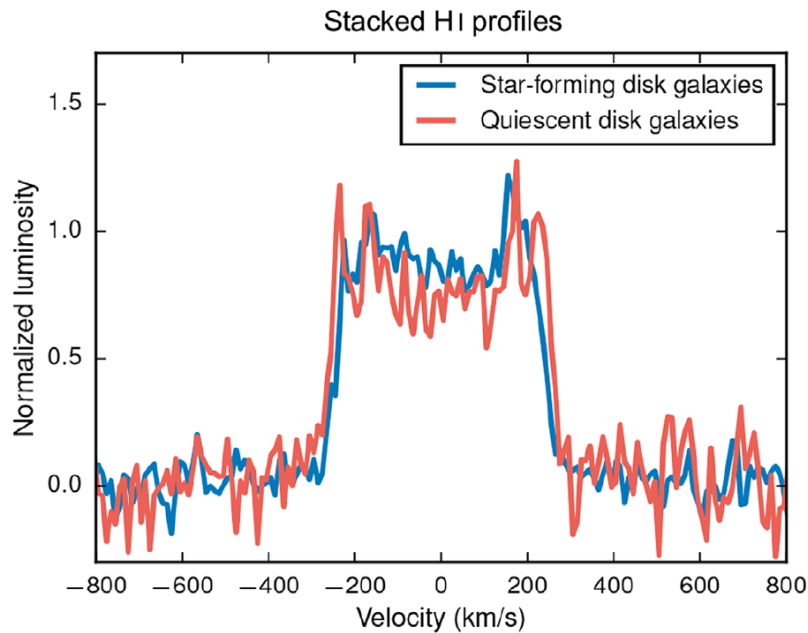
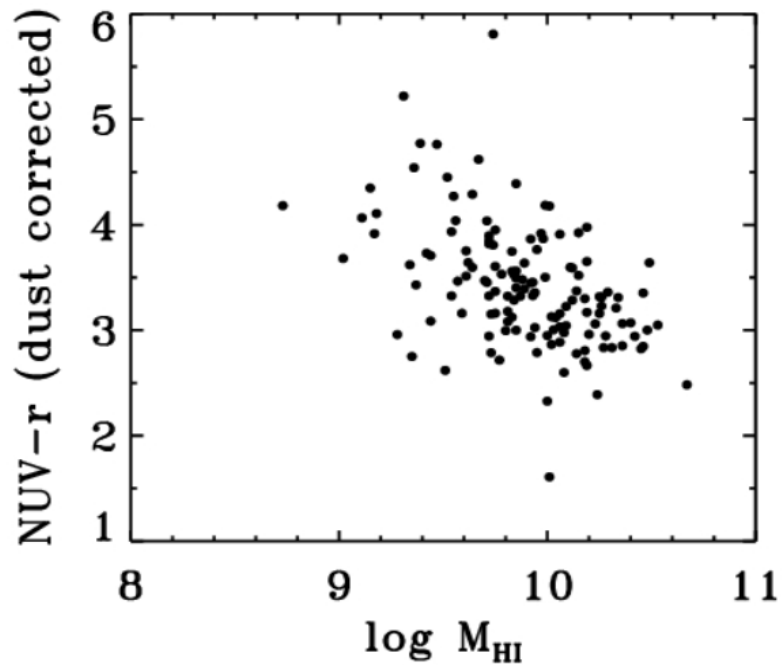
NUV profile

NUV-r red:



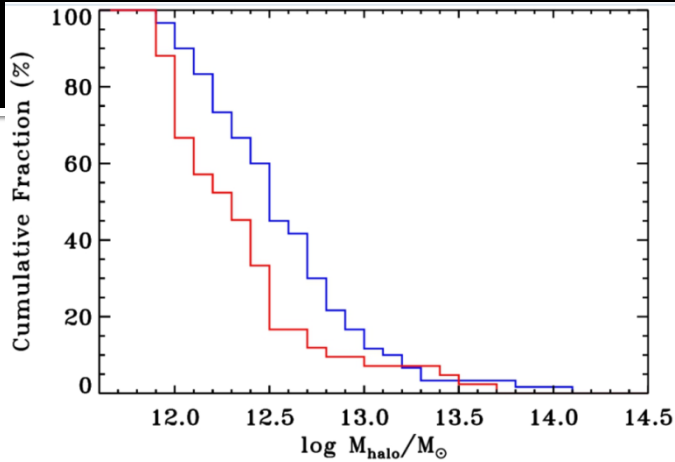
NUV-r blue:



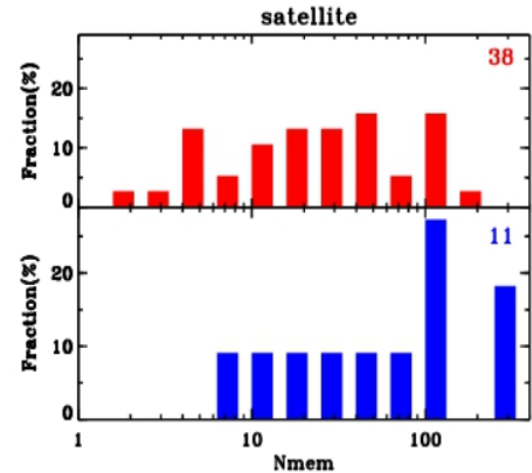
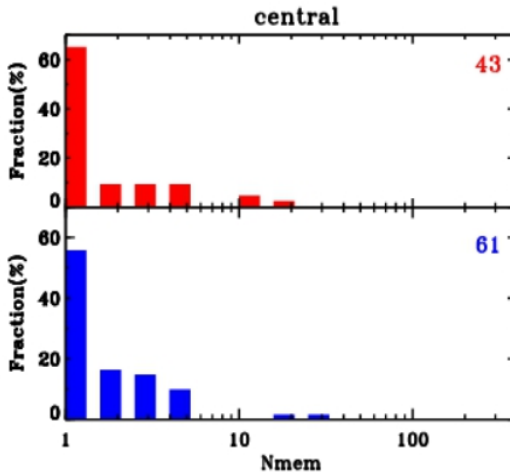
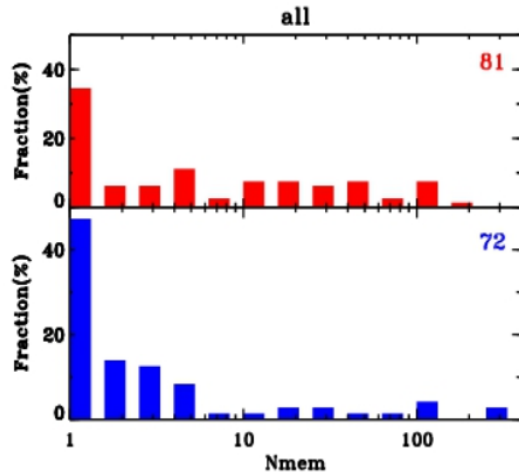


Zhang et al. (2019)

Environment

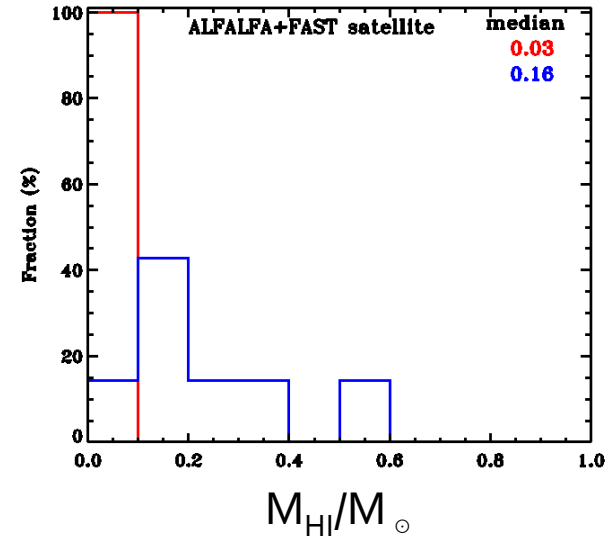
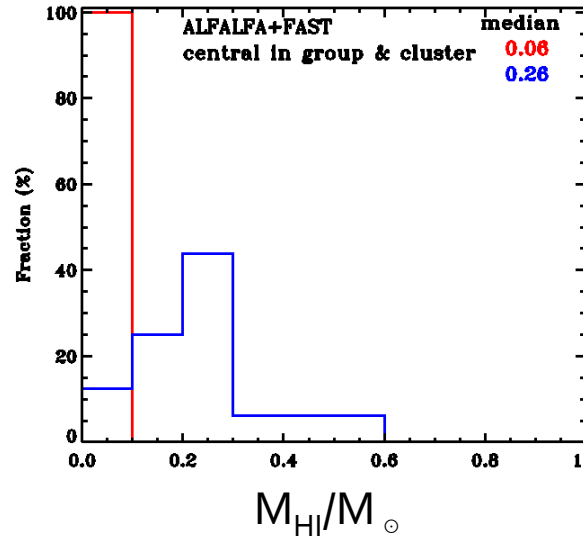
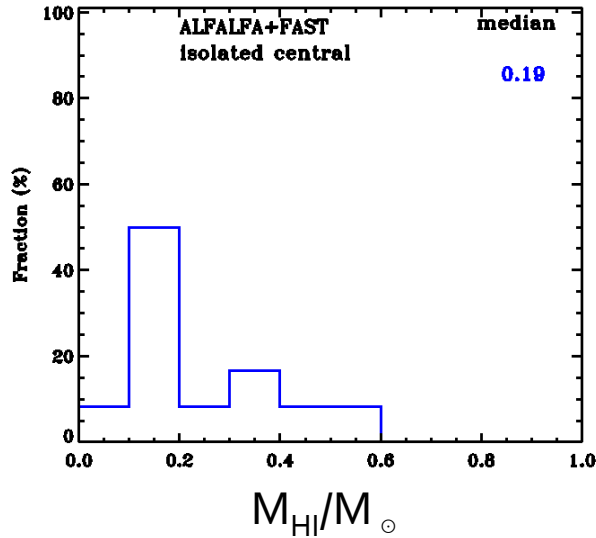


- $\sim 50\%$ NUV-r red spirals are satellites
- $\sim 85\%$ NUV-r blue galaxies are central or isolated galaxies.



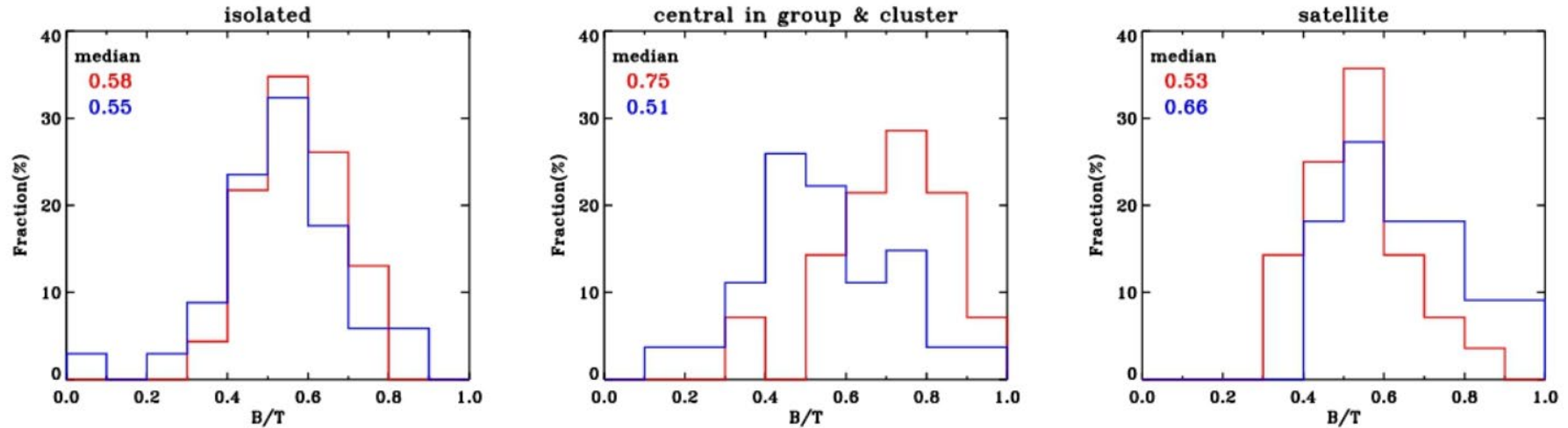
HI detection

- Only 2 NUV-r red spirals vs. 100% NUV-r blue spirals



- NUV-r blue galaxies may have more gas with large angular momentum and be triggered star formation in the outskirts due to disruption or interaction.

B/T



- **More than 90% central red spirals have B/T larger than 0.5 \rightarrow they may be quenched due to a large bulge providing a large gravitational potential to stabilizing the disk and prevent star formation.**

summary

- **Optically red spirals distribute widely on the NUV-r color-mass diagram.**
- **NUV-r blue spirals have larger disks and more HI content than NUV-r red spirals.**
- **NUV-r blue spirals are brighter than NUV-r red spirals at $\sim 1-4 R_e$ in NUV-band, ~ 2 mag in average.**
- **$\sim 50\%$ NUV-r red spirals are satellites, while $\sim 85\%$ NUV-r blue galaxies are central or isolated galaxies.**
- **NUV-r red spirals may be more susceptible to the environment to lose their gas and quenched.**
- **NUV-r blue galaxies may have more gas and be triggered star formation in the outskirts due to disruption or interaction.**

