A large, detailed image of the Triangulum Galaxy (M33) occupies the left side of the slide. It shows a dense field of stars in various colors (red, orange, yellow, white, blue) and a prominent reddish-brown dust lane running through the center.

The Structure of the Triangulum Galaxy in Surveyed Stellar Populations

Adam Smercina

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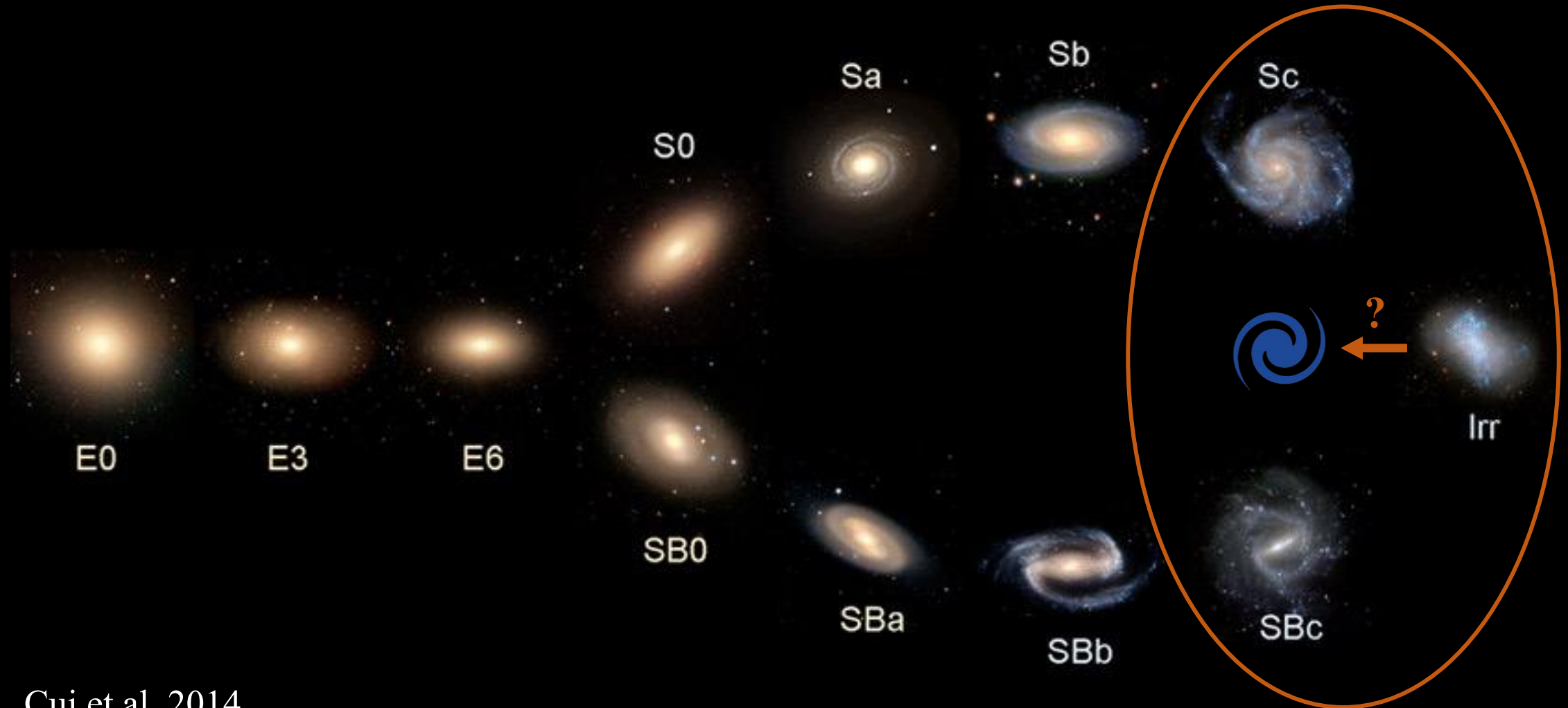
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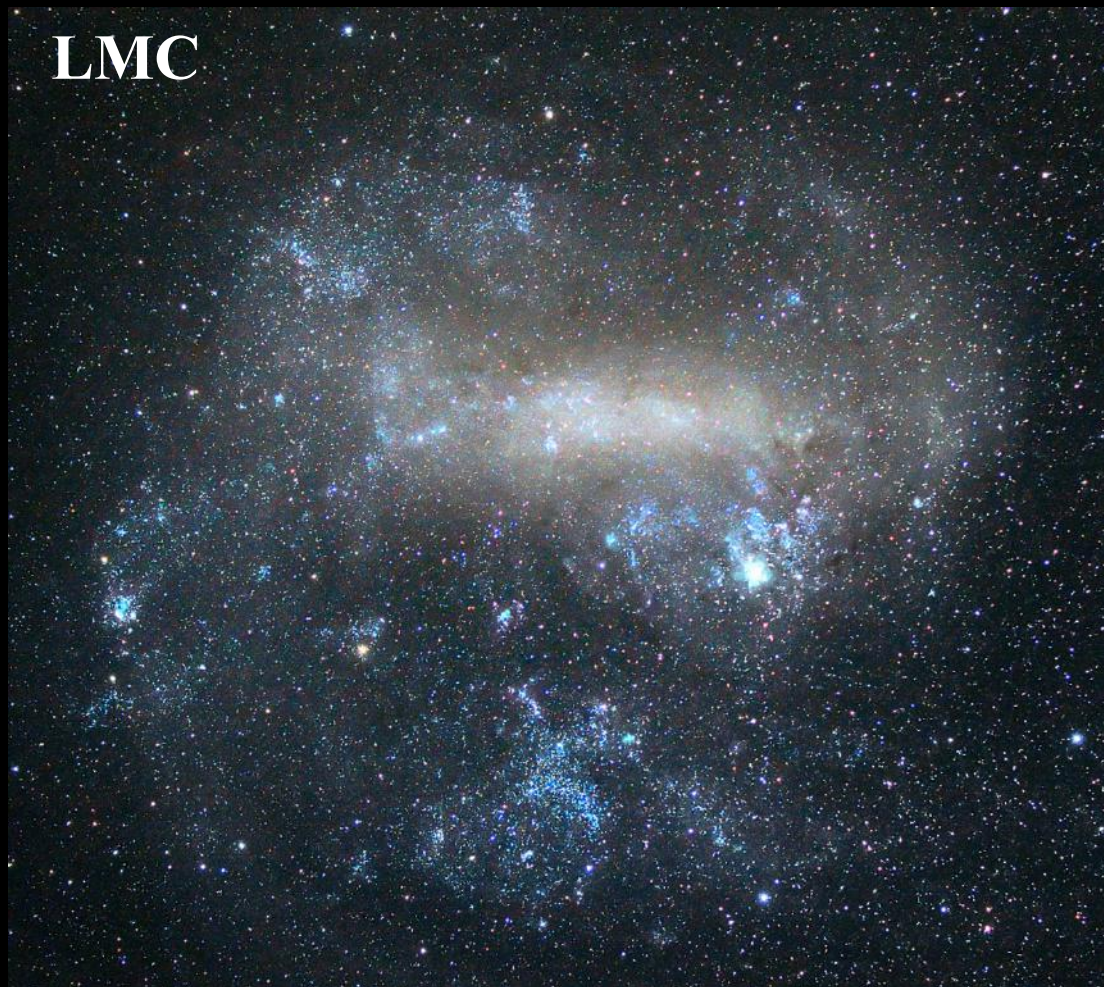
With: Julianne Dalcanton
(Center for Computational Astrophysics),
Ben Williams (U. of Washington),
and the PHATTER Team

Galaxies Come in all Shapes & Sizes

Spiral Structure in Low-mass Galaxies is Poorly Understood



Nearest examples are... a mess



Interaction with Milky Way is the dominant process!

Messier 33: A More Well-Behaved Example

- Andromeda(M31)'s largest satellite
 - Discovered centuries ago (1654 earliest documentation)!
- Visually a prototypical “flocculent” spiral
- Used the resolving power of Hubble to study individual stars in M33, revealing its structure in never-before-seen detail.



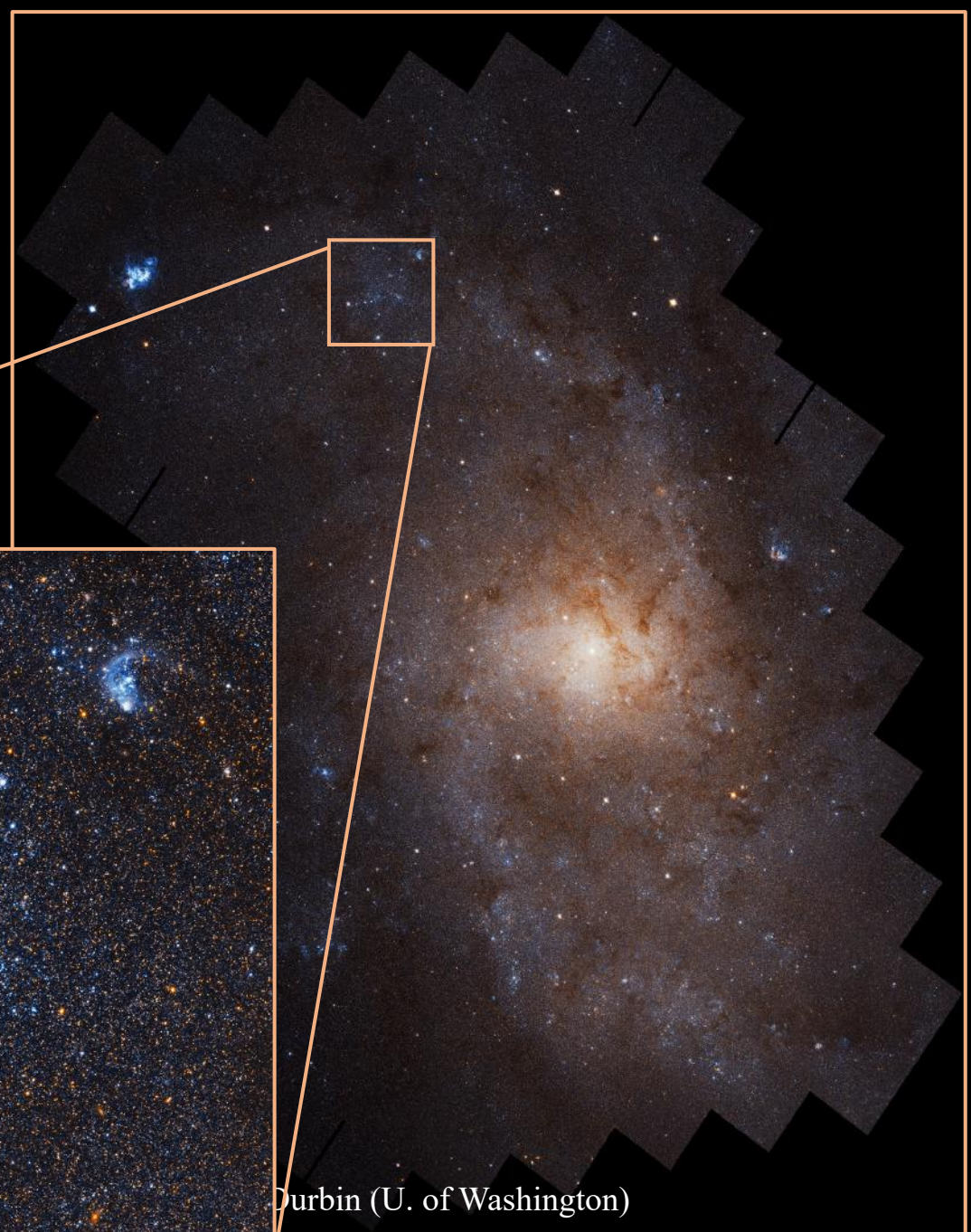
Credit: ESO/VLT

The Panchromatic Hubble Andromeda Treasury Triangulum Extended Region (PHATTER)

108 orbits of HST
in 54 individual
pointings.

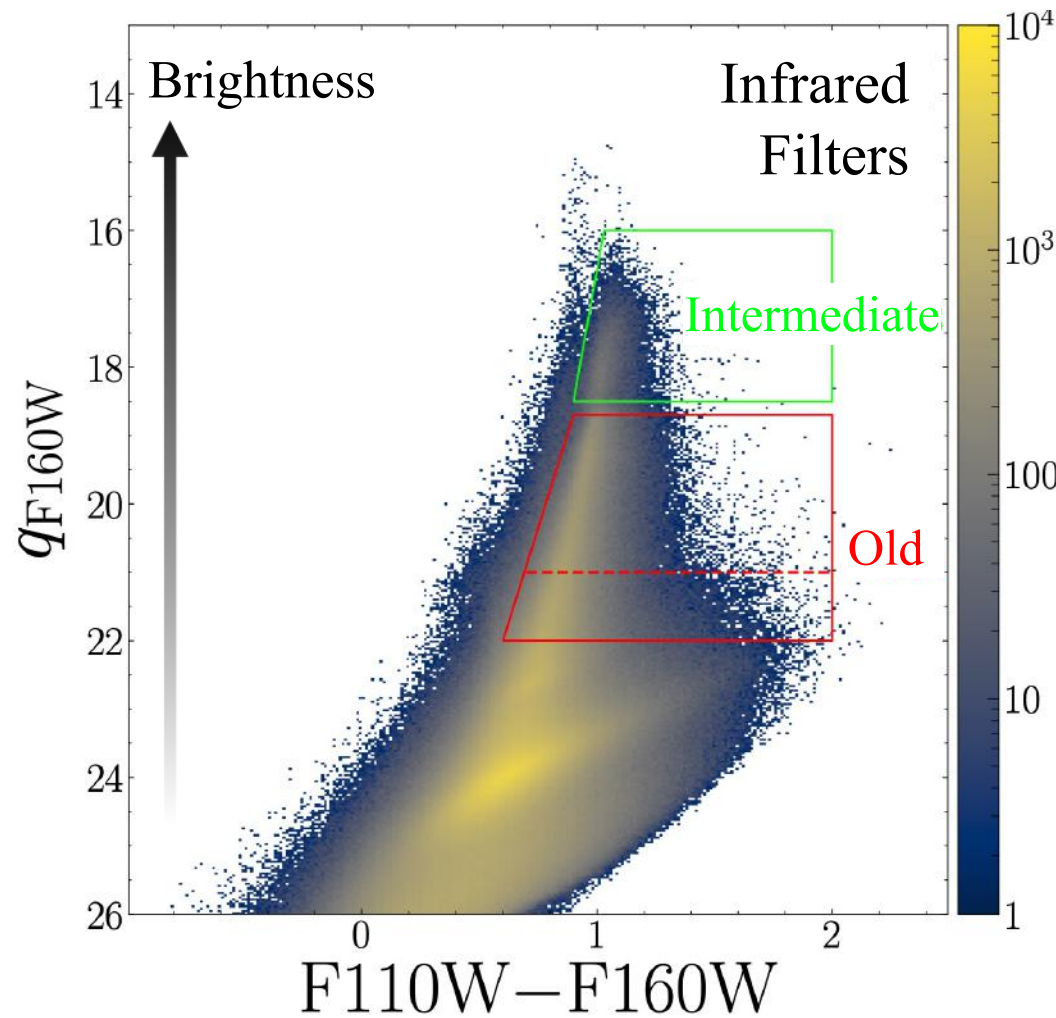
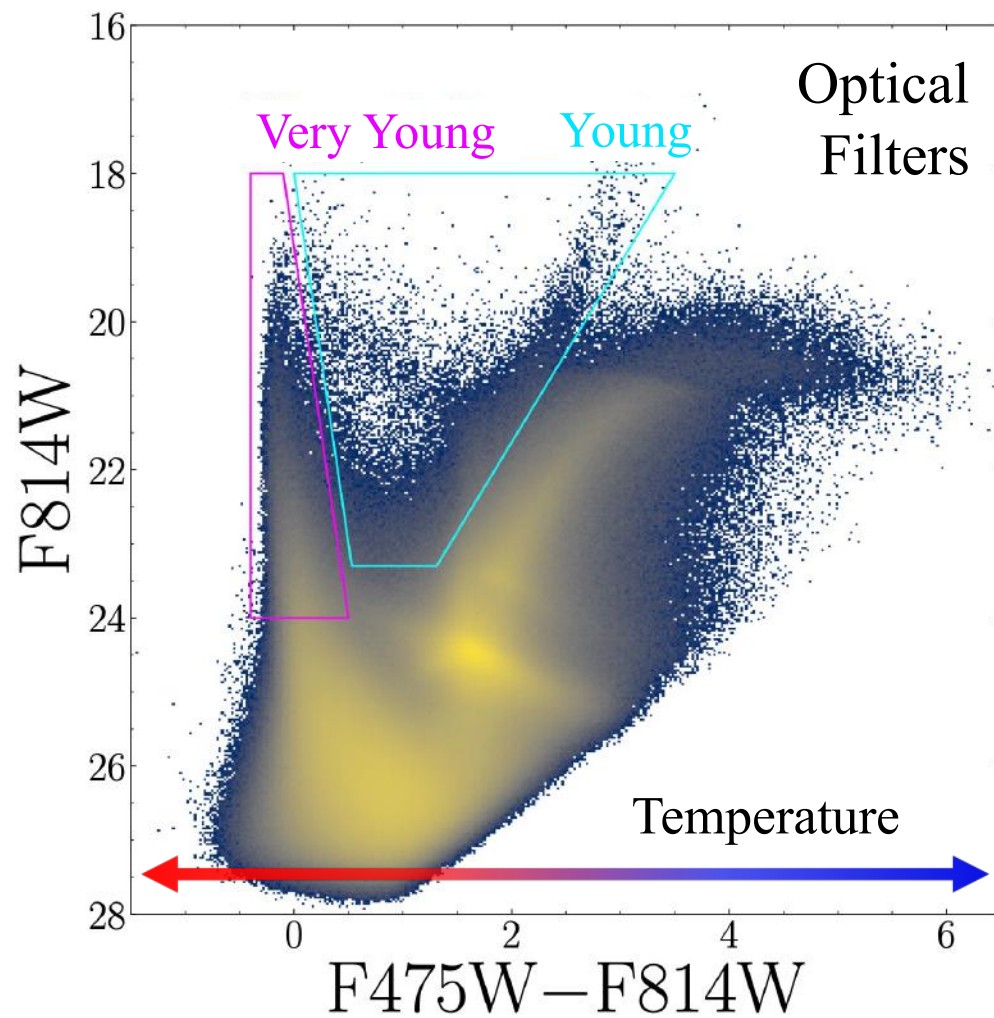
(PI: Dalcanton)

22 million
individually
resolved stars in
M33's center.



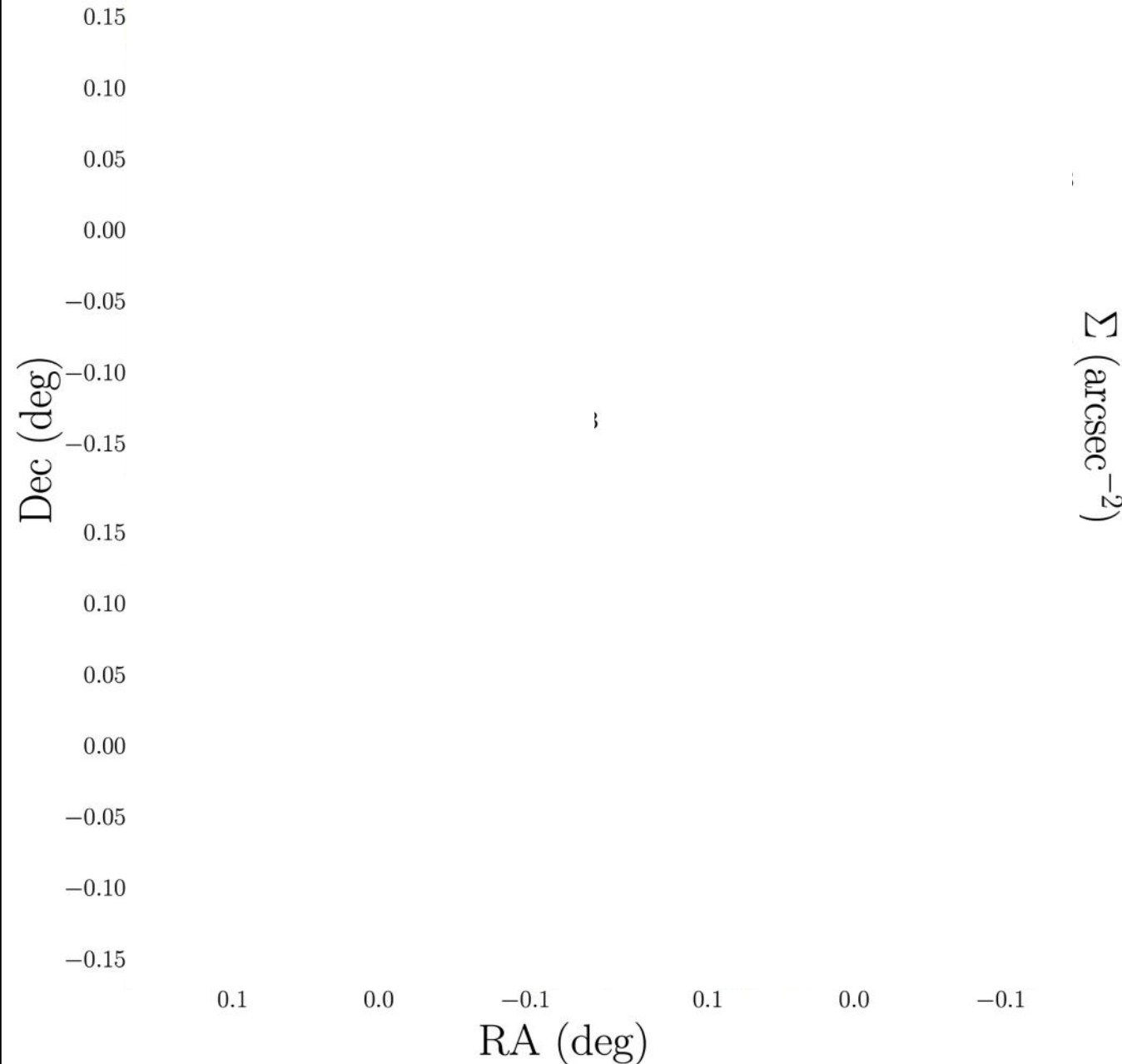
Durbin (U. of Washington)

We Can Select Broad Populations of Stars Using the “Color–Magnitude Diagram”



M33's Structure is “Age-Dependent”

- Very Young stars show typical flocculent structure
- Young stars look similar, but with 2 dominant arms and a bar?
 - M33 not considered a “barred galaxy”
- Old and Intermediate-age stars organized in much smoother disk with only **2 spiral arms + a bar**



Summary

1. Using HST, the PHATTER Survey has resolved 22 million stars in M33 – revealing its structure in never-before-seen detail.
2. M33's structure shows large differences in its young vs. ancient populations
3. Primary structure is a 2-arm spiral with a bar, rather than the flocculent structure it's known for
 - Flocculent structure is only visible in youngest stars
4. Hidden structure such as this may be relevant for many low-mass spiral and irregular galaxies.