

# Eridanus IV: an Ultra-Faint Dwarf Galaxy Candidate Discovered in the DELVE Survey

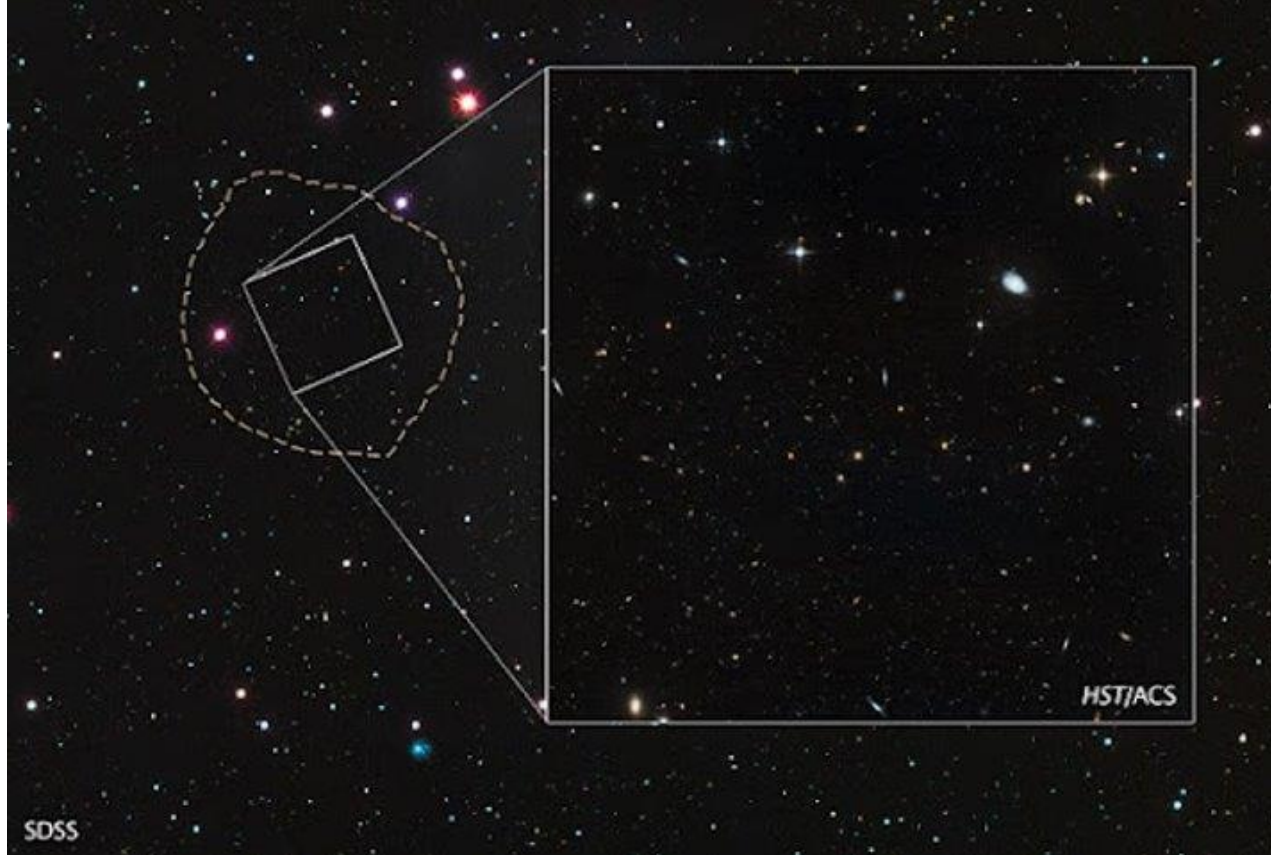
William Cerny (on behalf of the DELVE collaboration)

New Perspectives 2021

8/16/2021



# The Universe's Least Luminous Galaxies



Ultra-faint dwarf galaxies are the:

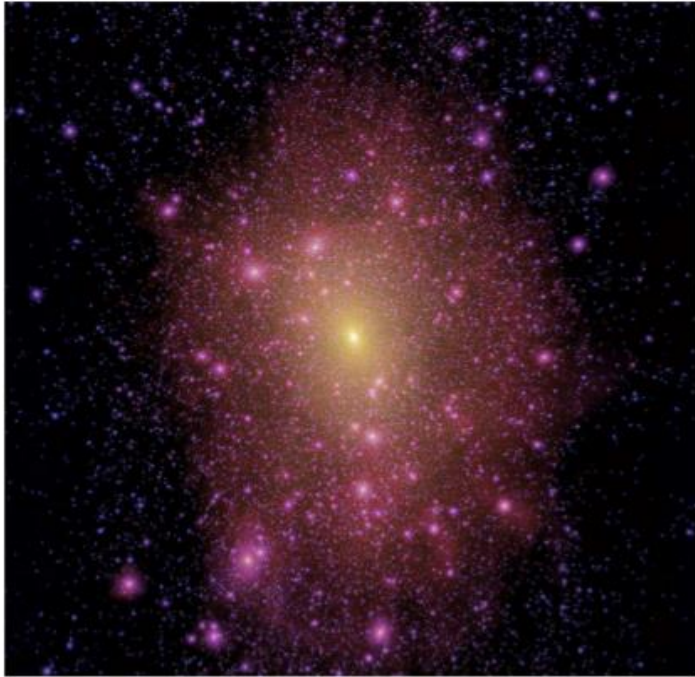
- Least luminous
- Most metal-poor
- Most dark-matter-dominated

galaxies in the universe!

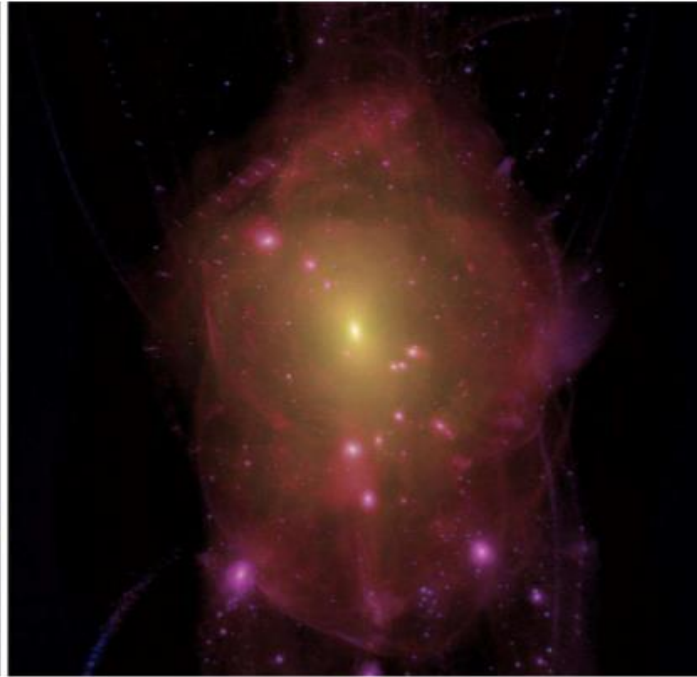
Image Credit: NASA, ESA, and T. Brown (STScI)

# Dwarf Galaxies are Excellent Laboratories for Studying...

## Properties of Dark Matter



**Cold Dark Matter Simulation**



**Warm Dark Matter Simulation**

Image credit: Lovell et al. (2012)

## Galaxy Formation

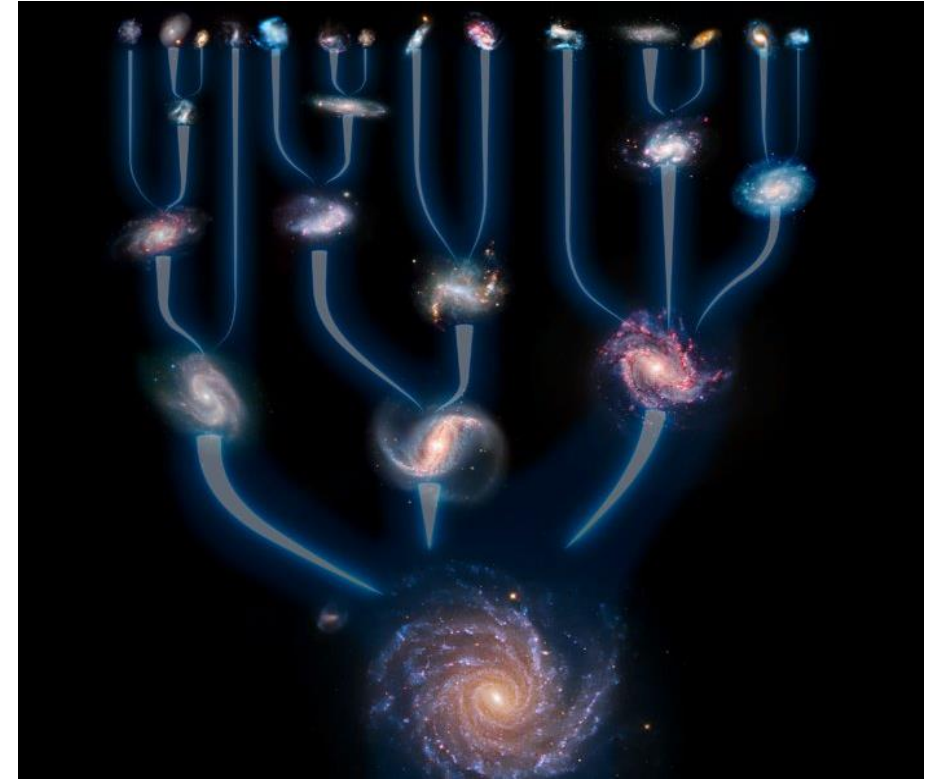


Image credit: ESO

# The Dwarf Galaxy Discovery Renaissance

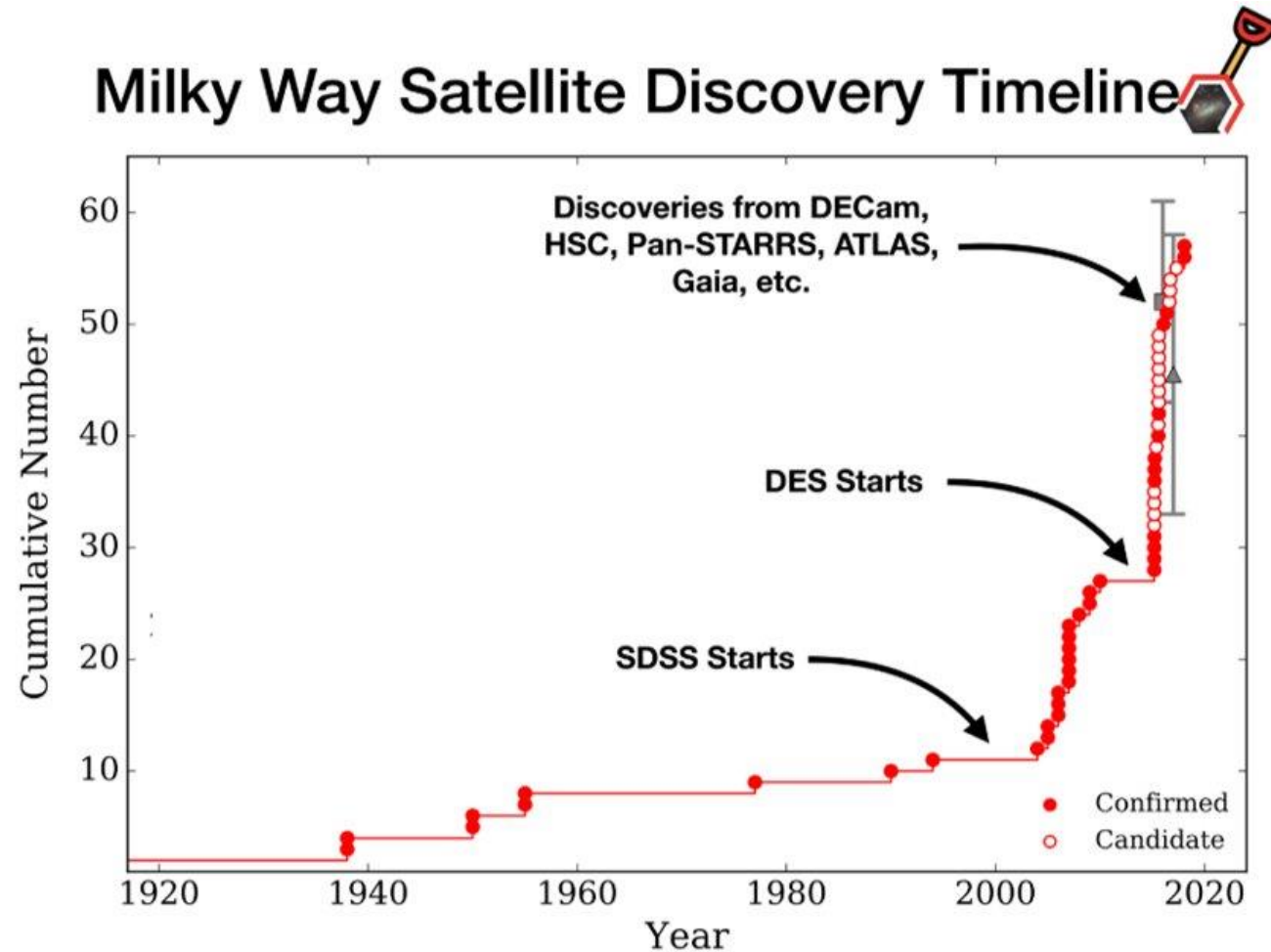


Image credit: Alex Drlica-Wagner



# How to find an ultra-faint dwarf galaxy (part 1 of 2)

Sensitive, Wide-Field Imager --> Survey Large Area of Sky

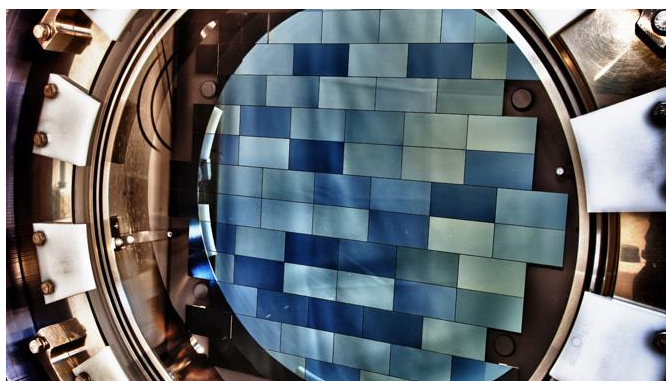
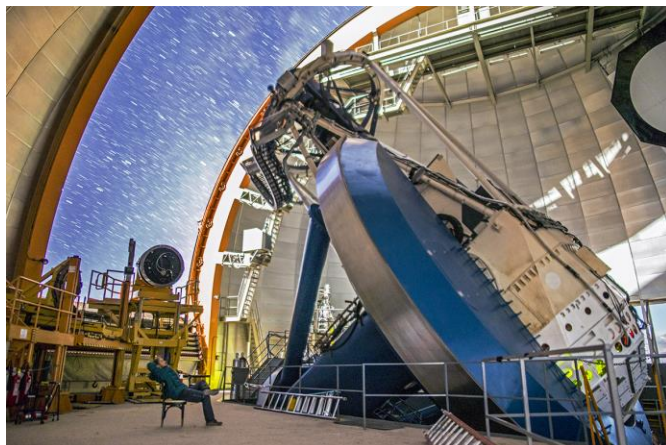


Image credits: Dark Energy  
Survey Collaboration

4-meter  
Telescope

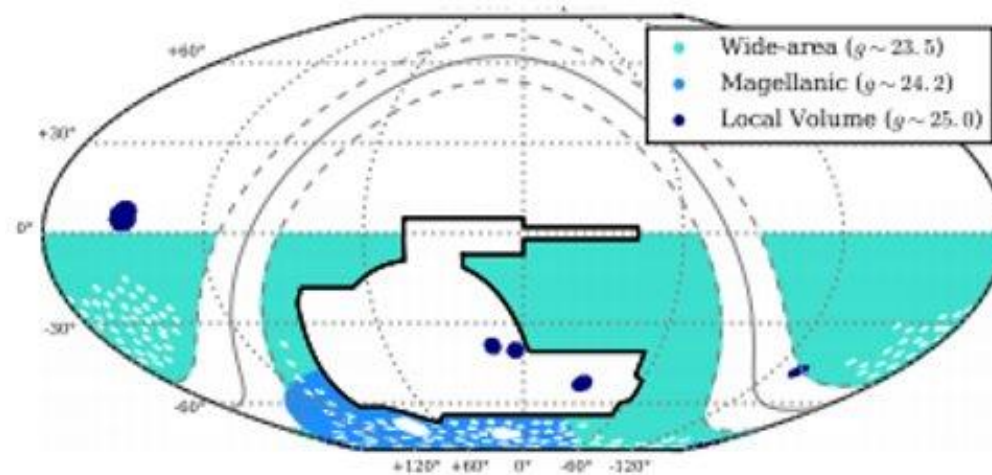
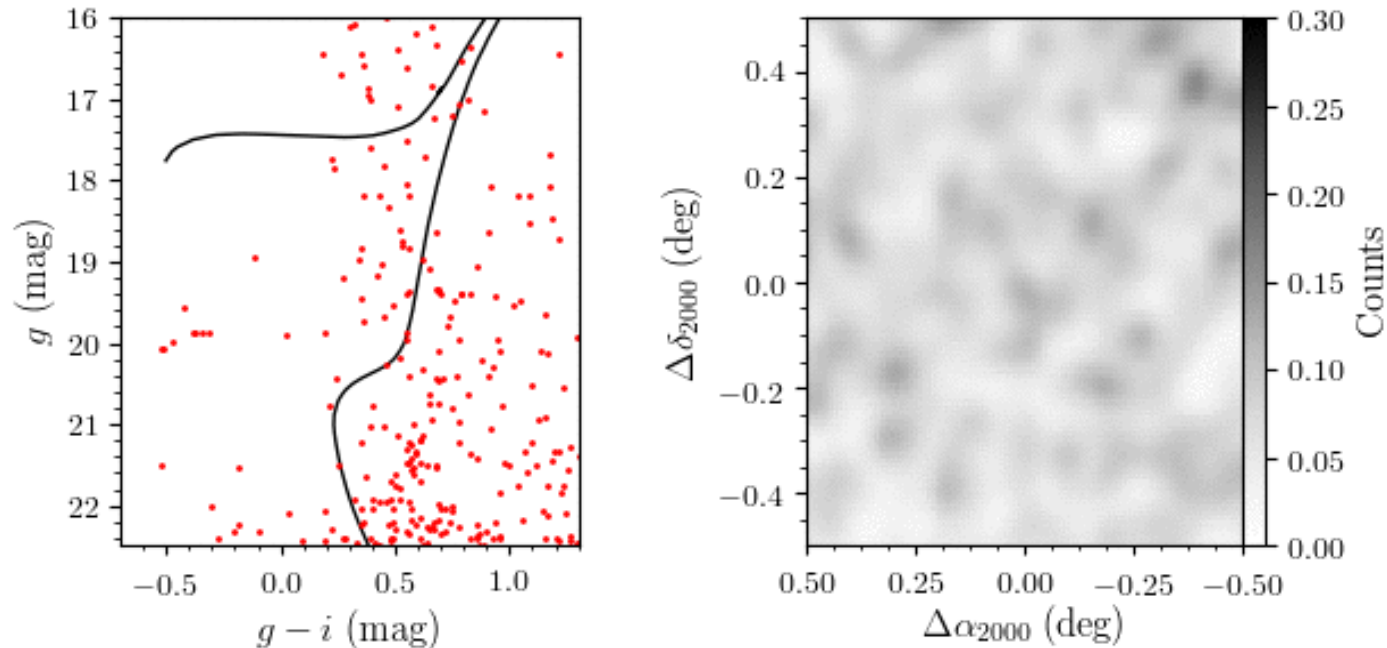


Image credit: DELVE  
Collaboration

570 Megapixel Camera

# How to find an ultra-faint dwarf galaxy (part 2 of 2)

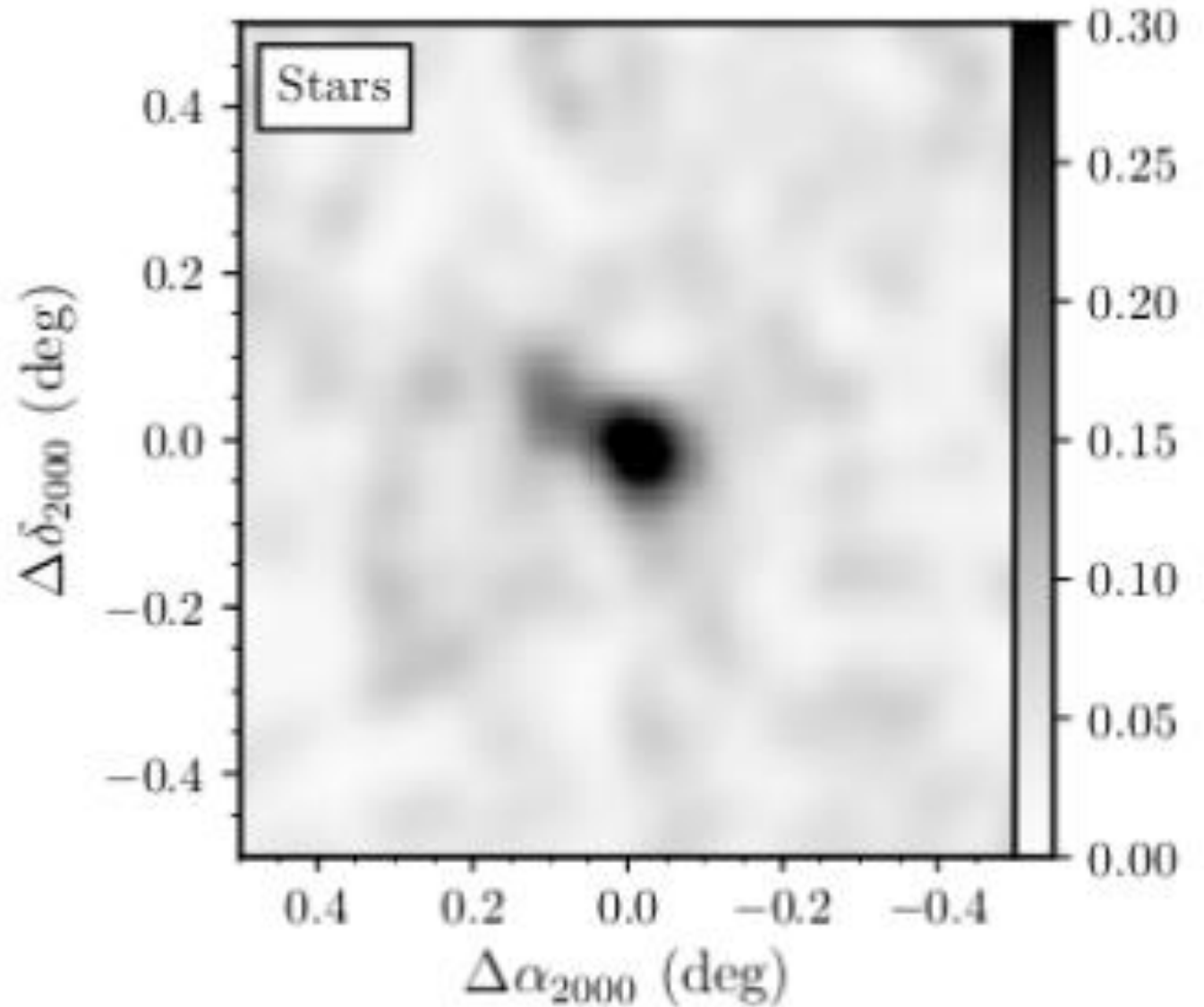
From (Star) Catalogs --> Candidates



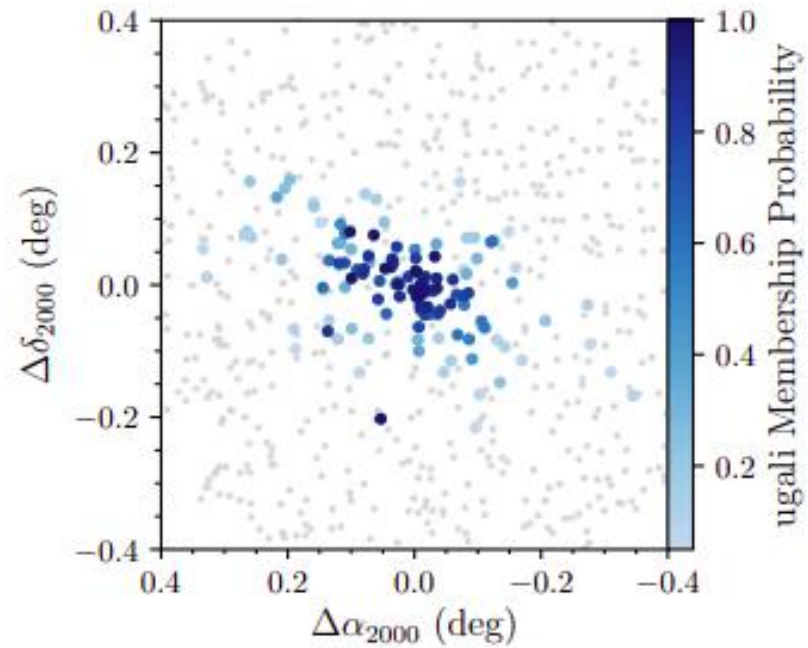
A new object appears when the "cookie cutter" filter is aligned...

# Eridanus IV: Our newly- discovered neighbor!

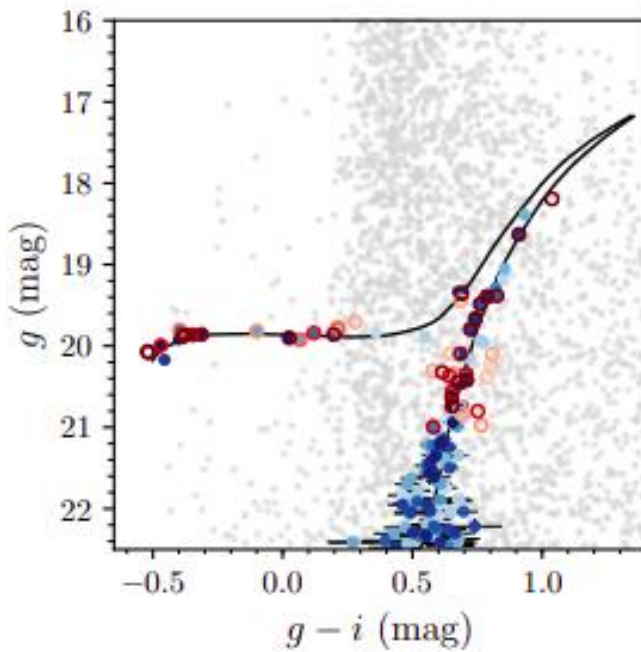
arxiv: 2107.09080



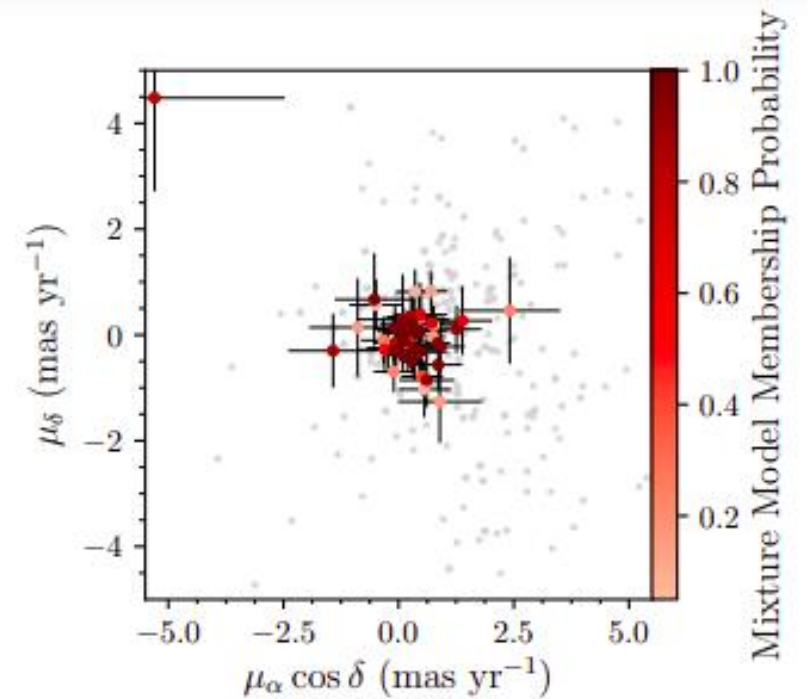
# Characterizing Eri IV's Stellar Population



Extended and Elliptical!



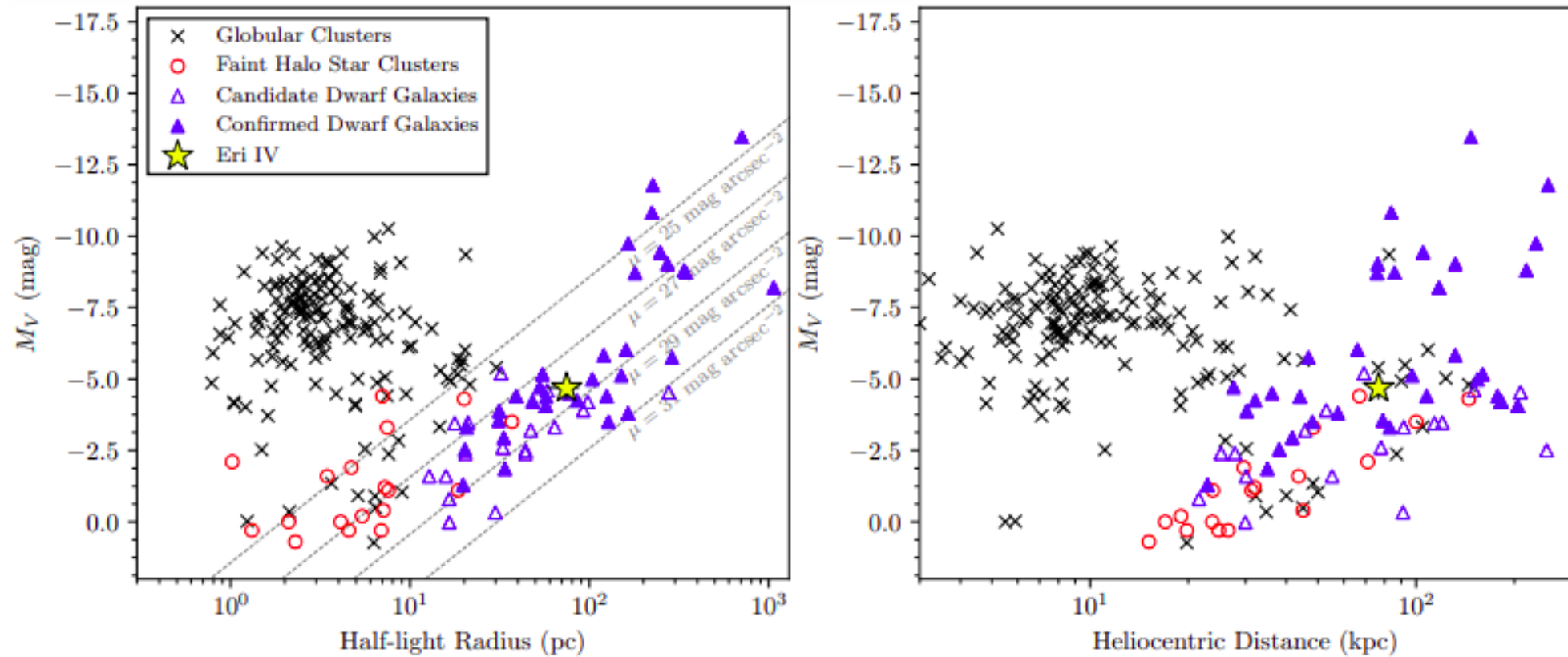
Old and Metal Poor!



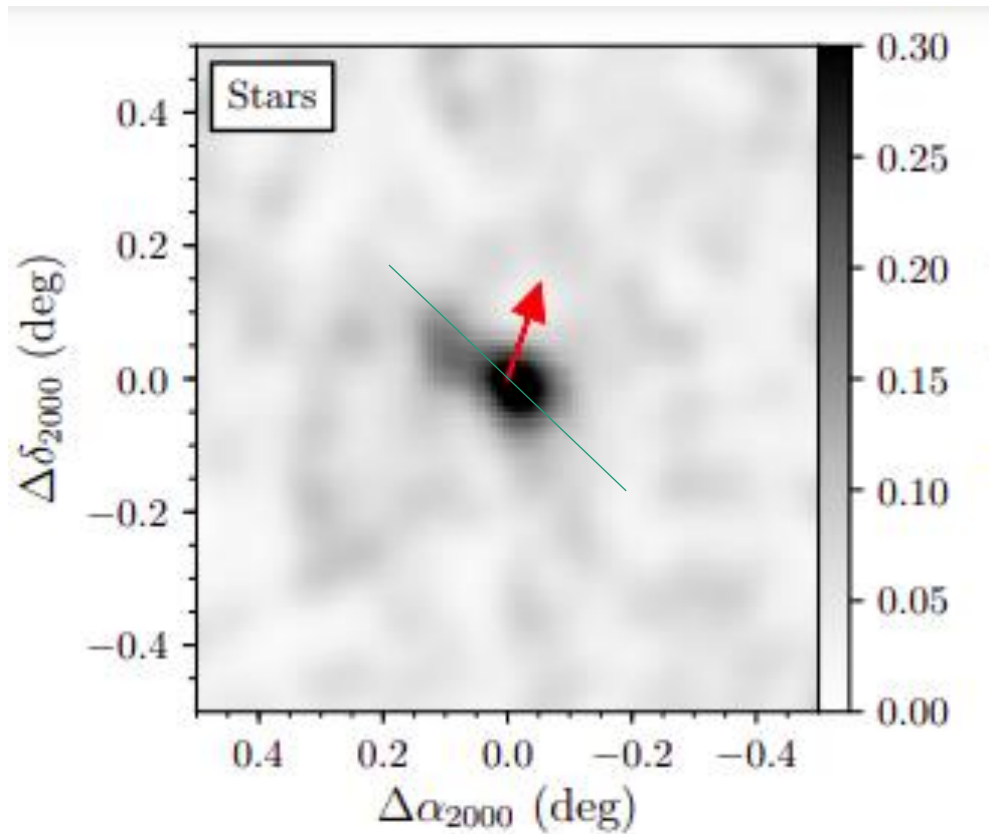
Bound and co-moving!



# Eridanus IV in Context



# Tidally Disrupting?



Tidal tail of a significantly more massive galaxy

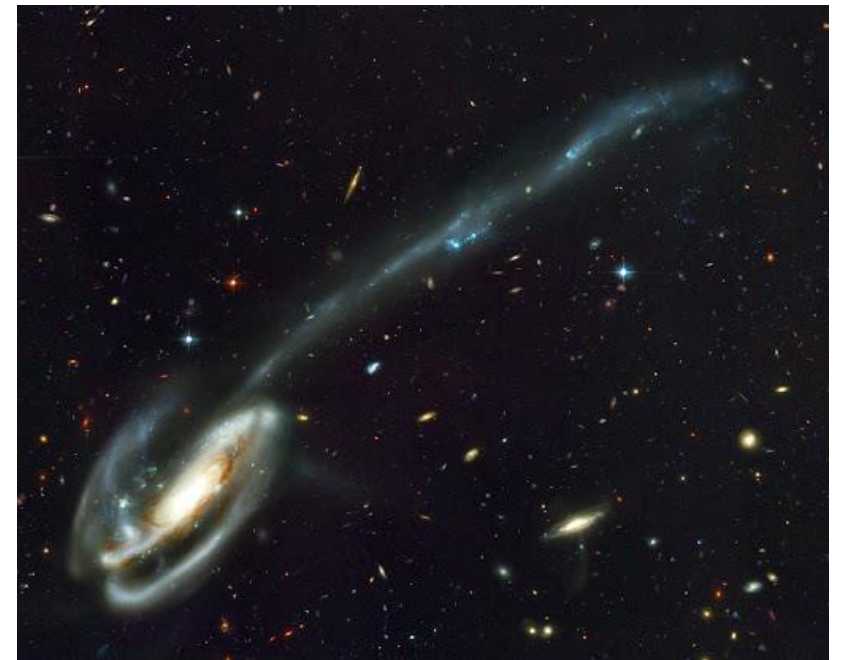


Image credit: H. Ford, JHU / M. Clampin, STScI / G. Hartig,  
STScI / G. Illingworth, UCO, Lick / ACS Science Team / ESA /  
NASA

# Looking to the Future

- Deeper photometric data will enable tighter constraints on Eri IV's morphological properties, including offering insight into whether its tidal feature is real
- Spectroscopic data will enable study of its dark matter content through its internal kinematics (motions of stars within the galaxy)
- Future large-scale imaging surveys including the Vera C. Rubin Observatory Legacy Survey of Space and Time (LSST) will allow for the discovery of many more new and exciting dwarf galaxies!