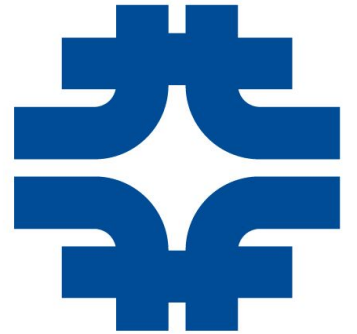


DES in 10 Minutes + Stellar Streams



Nora Shipp
Fermilab New Perspectives
June 10, 2019

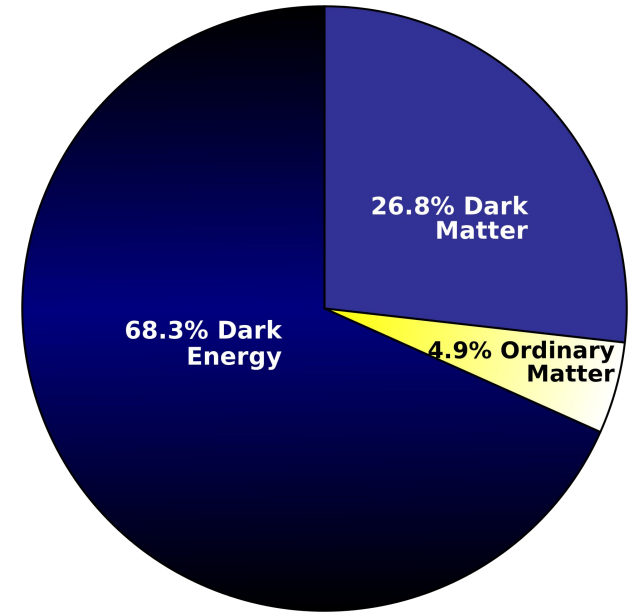
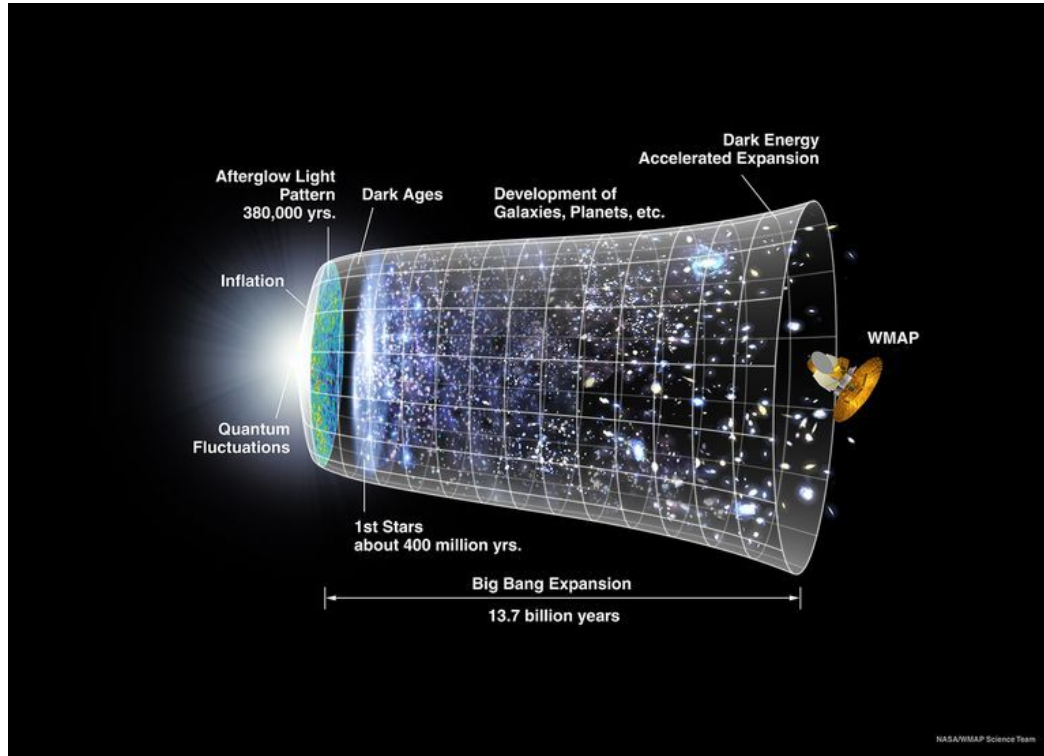


Dark Energy Survey (DES) Collaboration

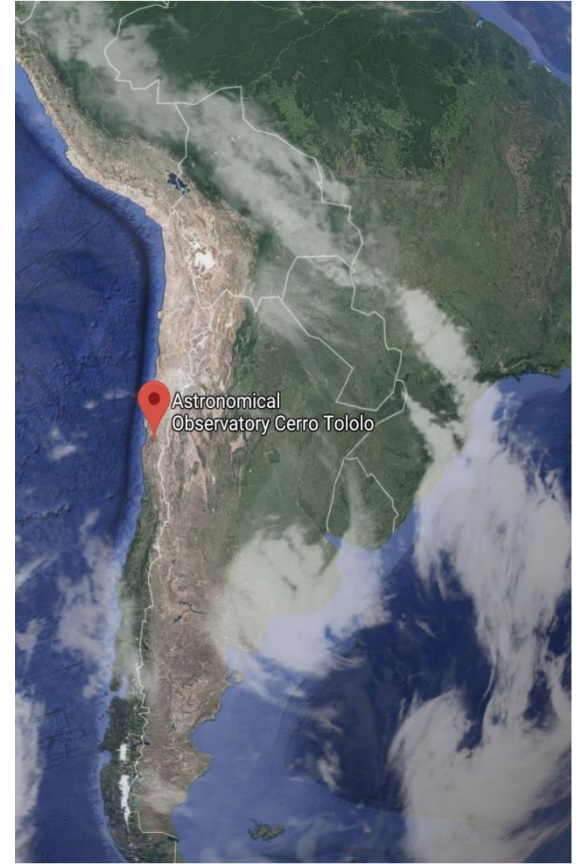
~400 collaborators, ~70% students and postdocs



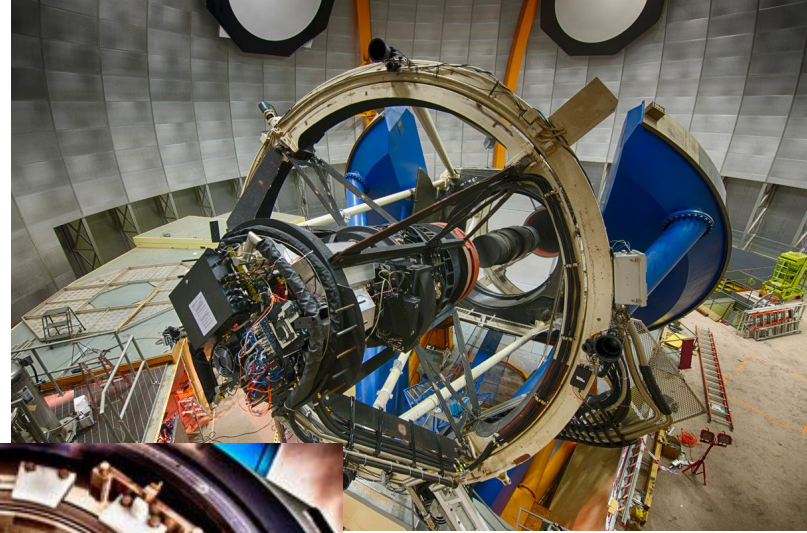
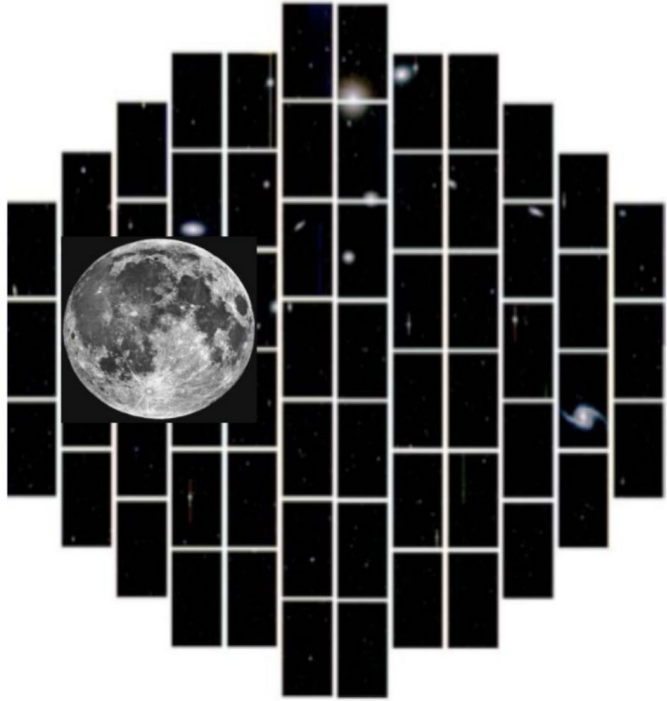
Dark Energy Survey Science Goals



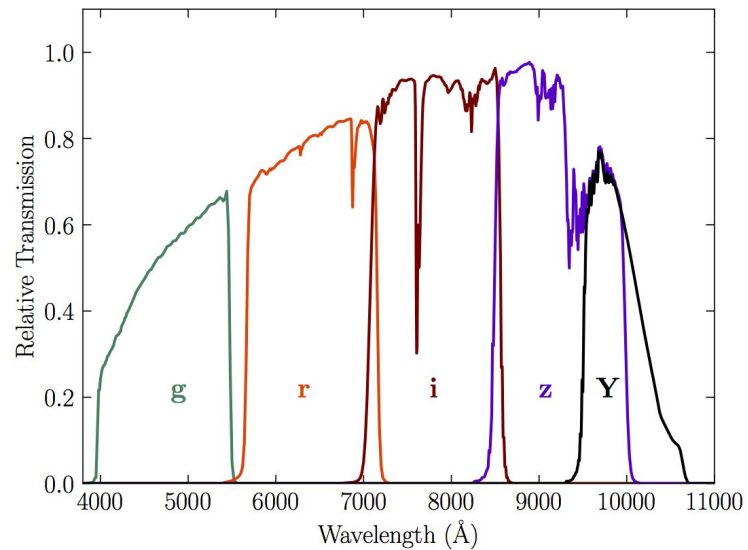
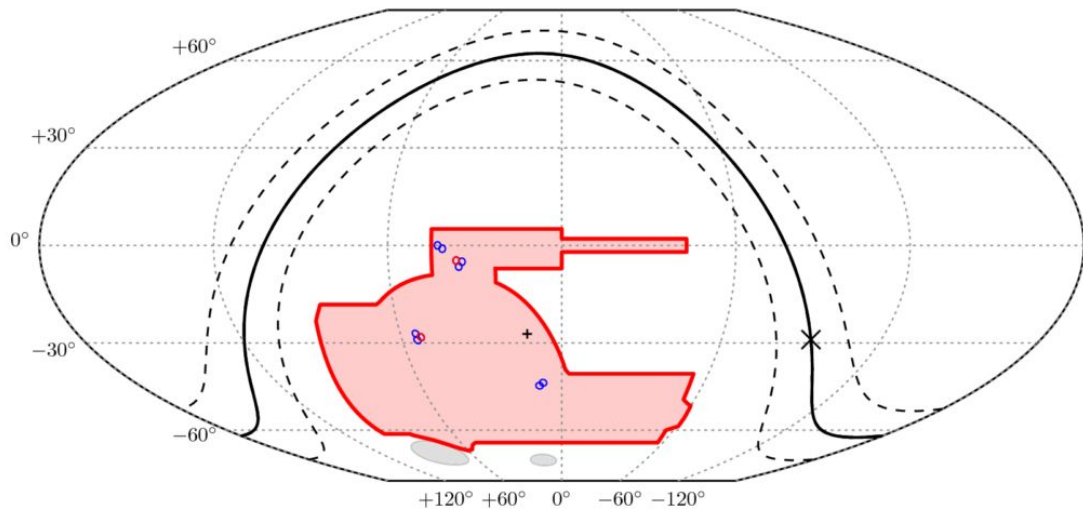
Blanco Telescope



Dark Energy Camera (DECam)



Dark Energy Survey

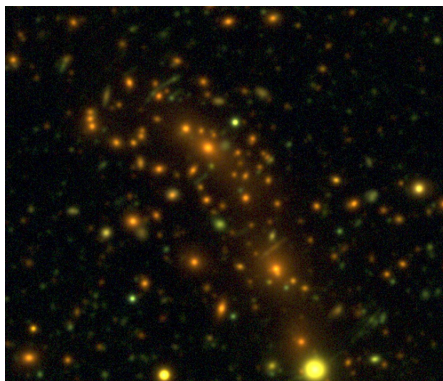


End of Observations Jan 2019

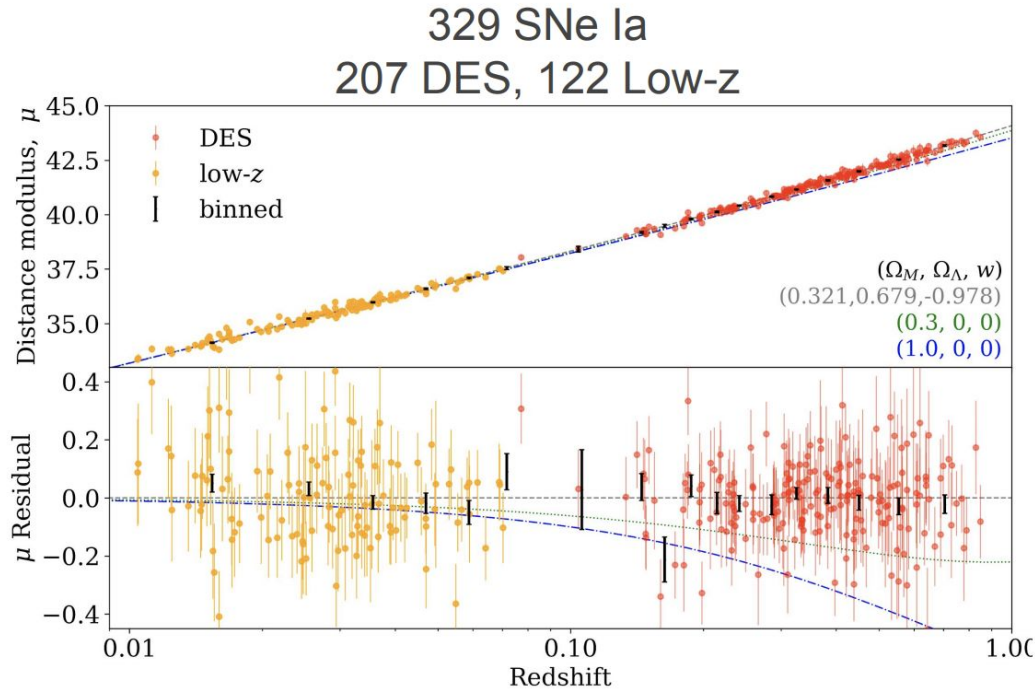


DES observations consisted of ~555 nights over nearly 6 years

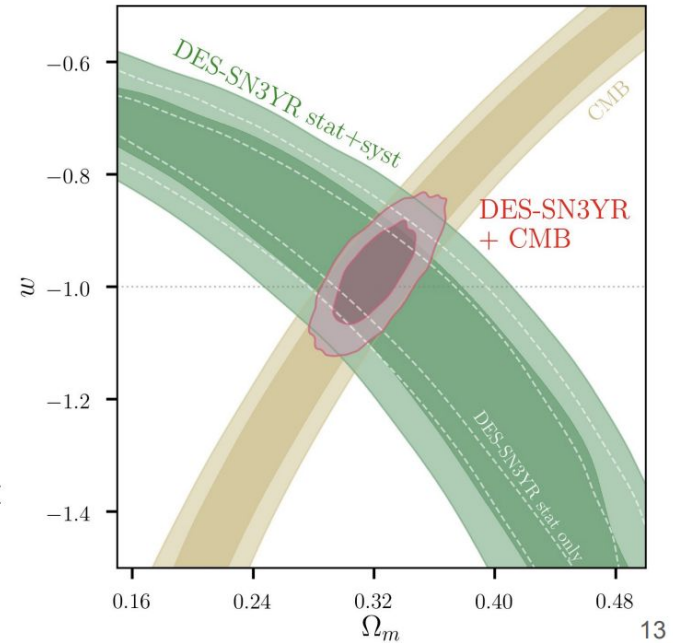
Final observations were taken on January 9, 2019



Supernova Cosmology Results



Combining with Planck16
Flat w CDM
 $w = -0.978 \pm 0.059$



Combined Cosmology

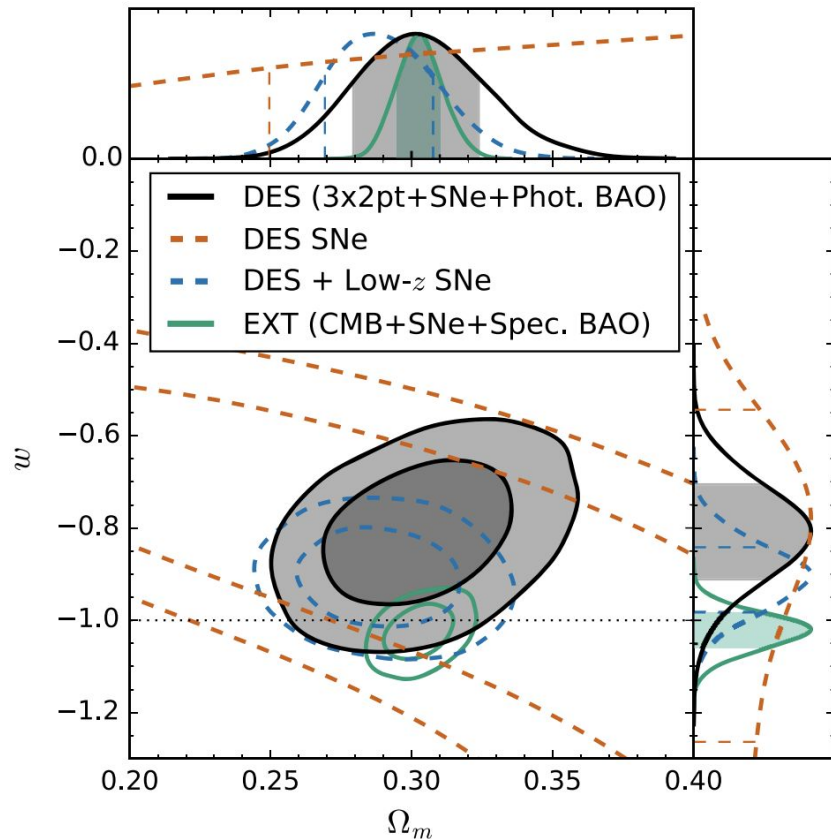
First single photometric probe to independently rule out a no dark energy universe.

DES: SN + 3x2pt + Phot. BAO

$$w = -0.80^{+0.09}_{-0.11}$$

DES-SN + Planck16

$$w = -0.911 \pm 0.087$$

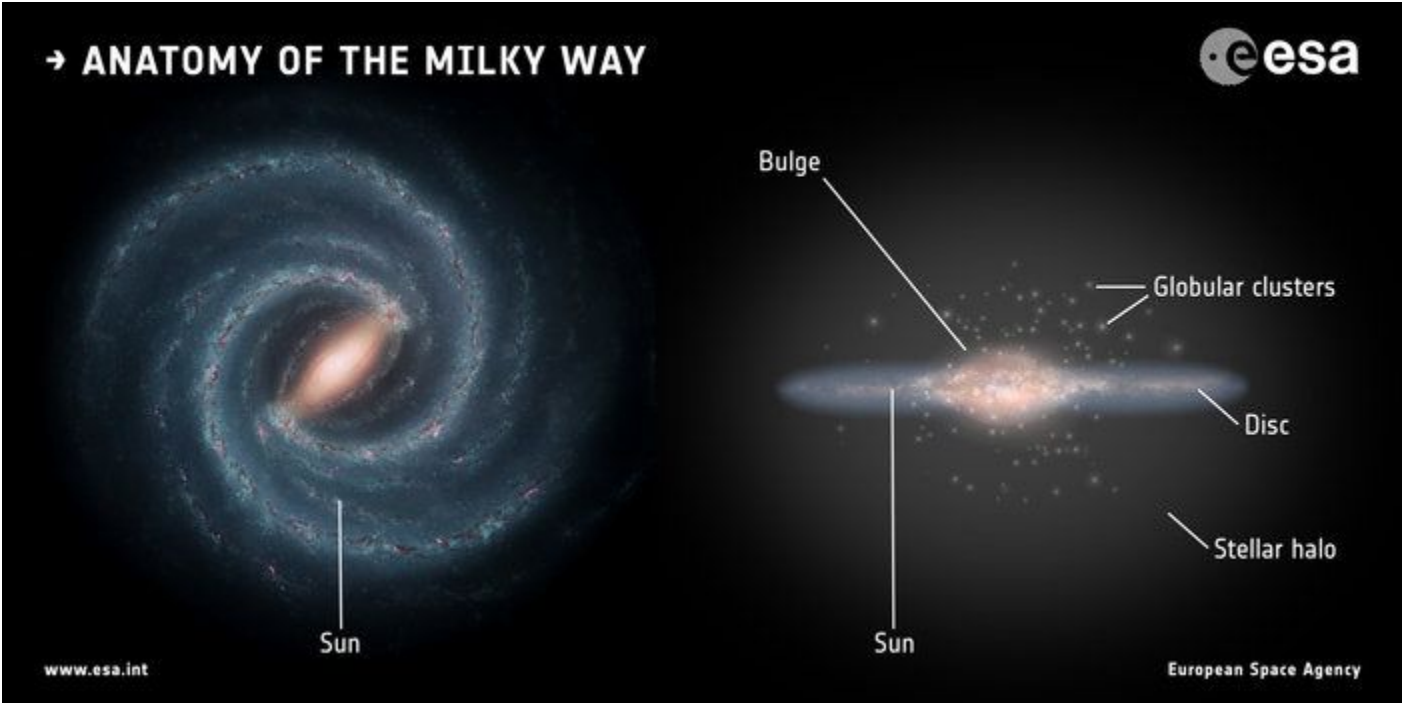


Stellar Streams

Stellar Streams



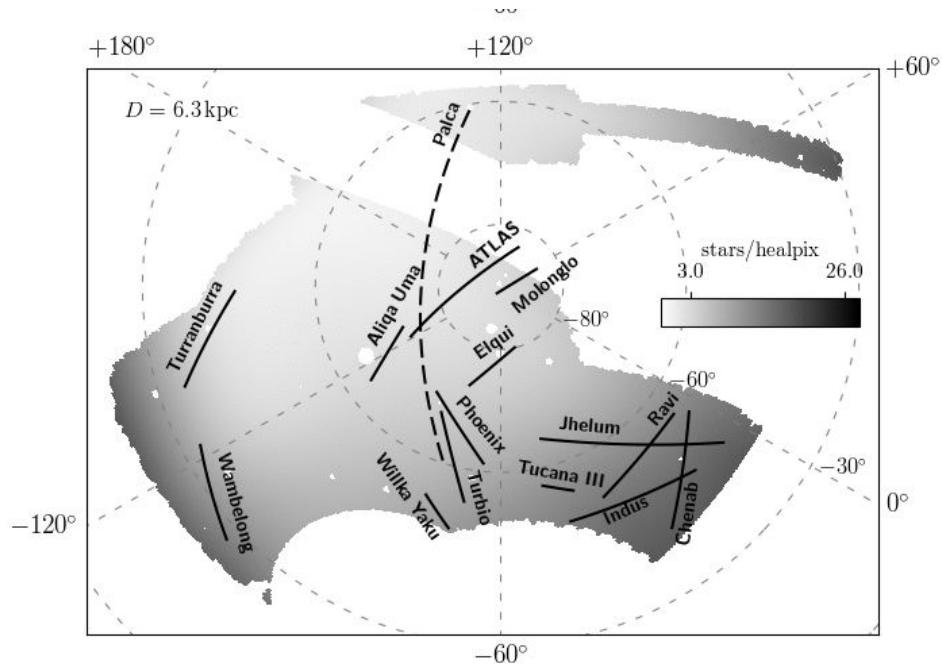
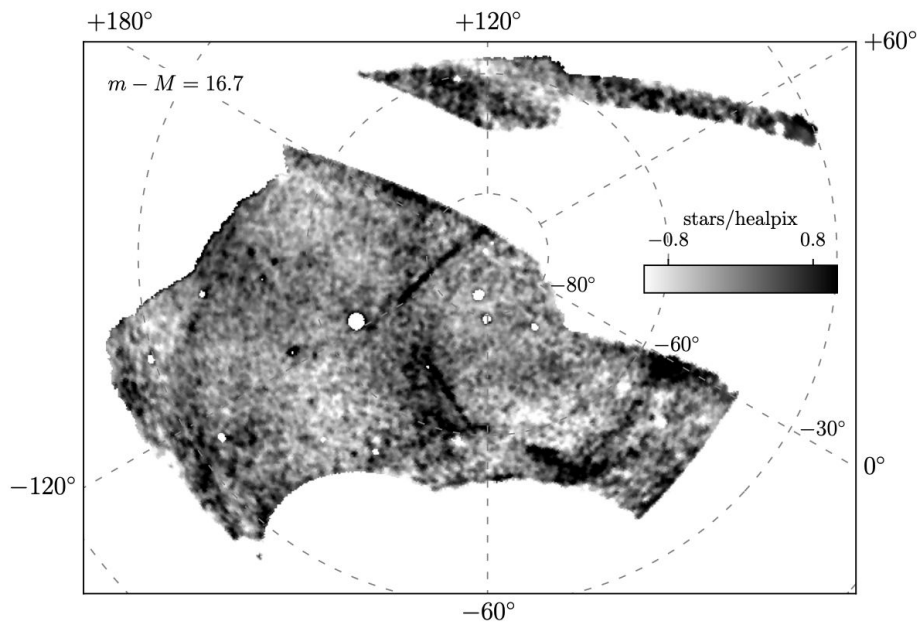
Stellar streams can tell us about galaxy formation and dark matter



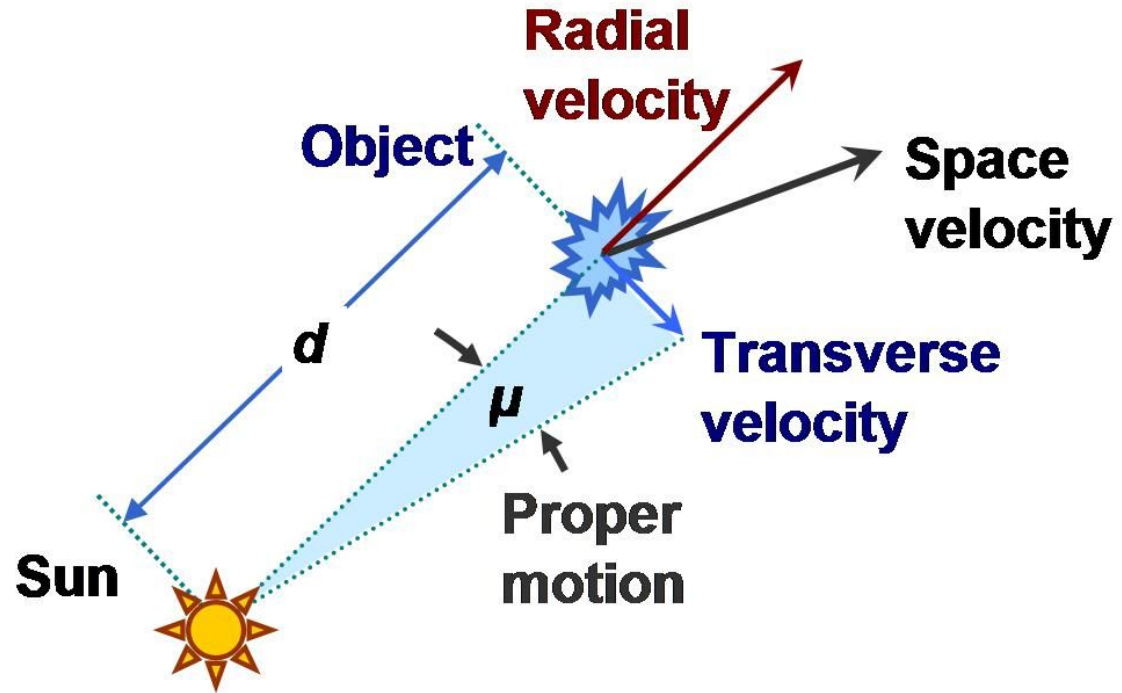
Stellar streams can tell us about galaxy formation and dark matter



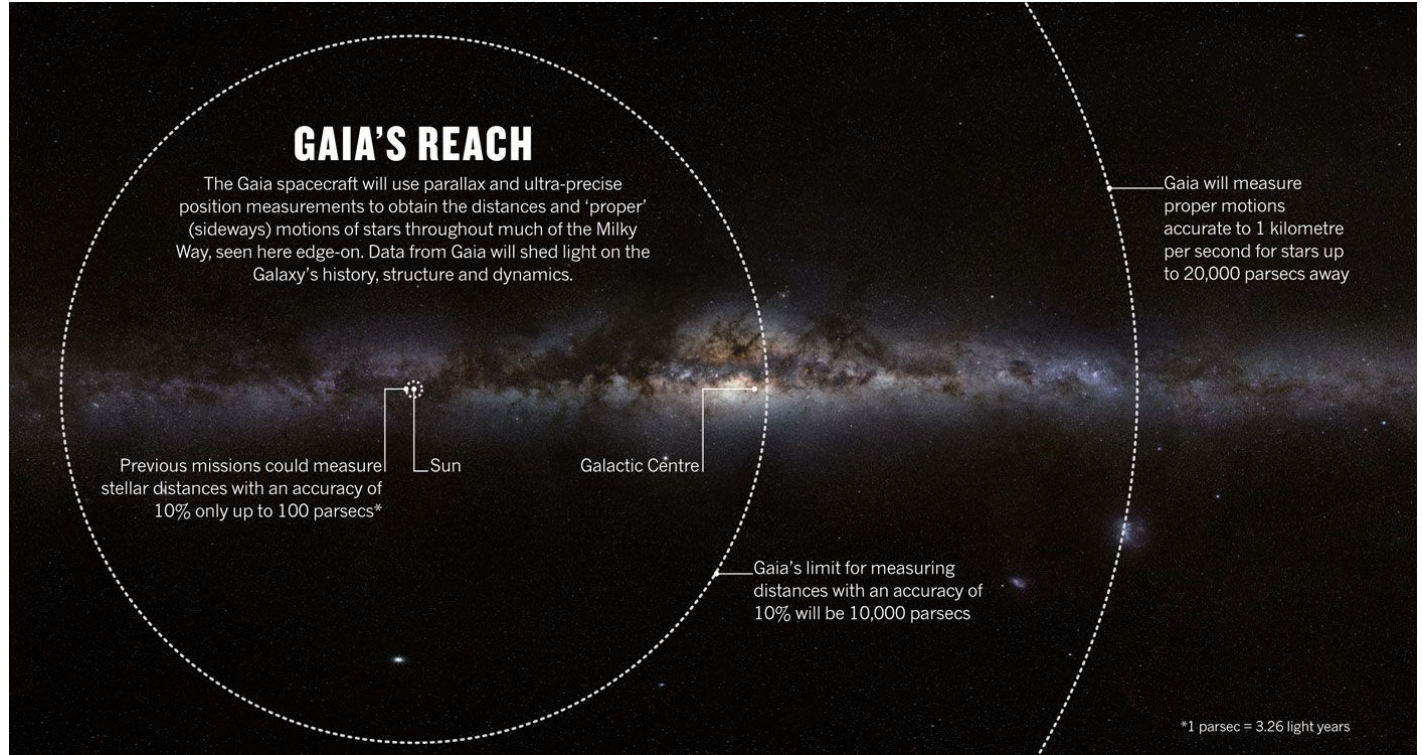
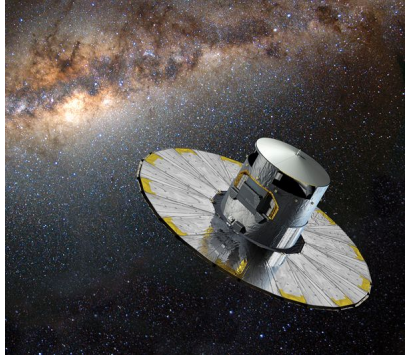
Discovered 11 new stellar streams in DES



Velocity measurements are needed to model stellar streams



Proper Motions - Gaia Satellite

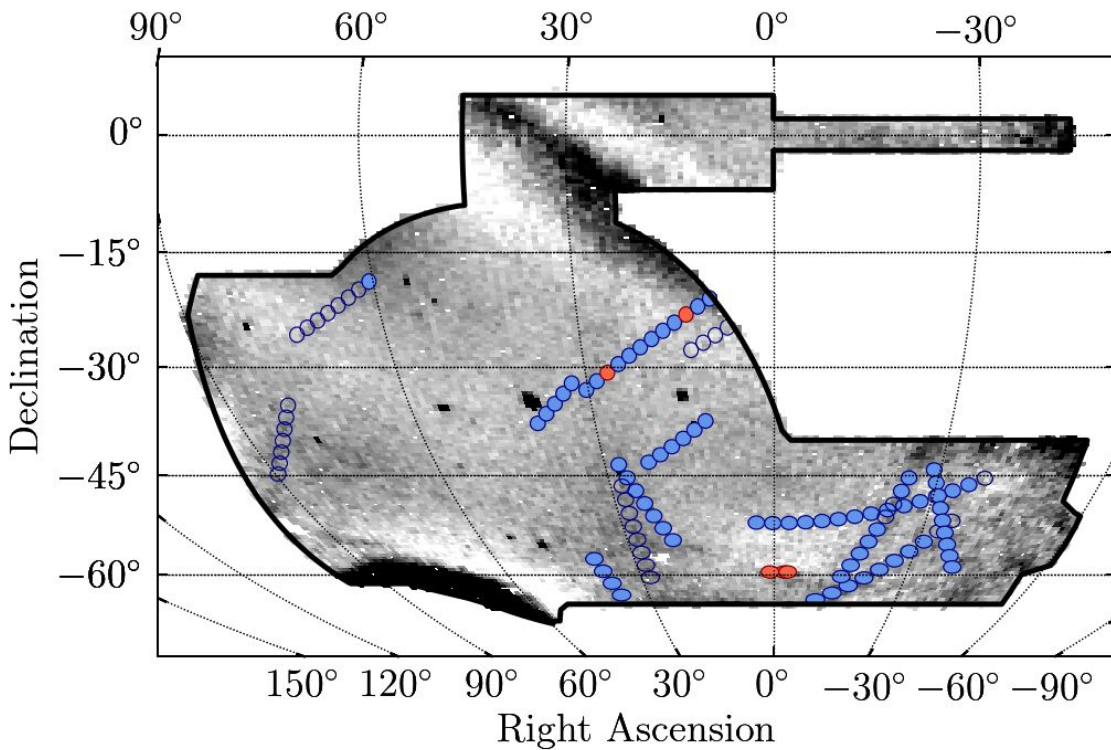


Radial Velocities - Southern Stellar Stream Spectroscopic Survey (S5)



Anglo-Australian Telescope

S⁵ Leadership: Ting Li (Fermilab),
Daniel Zucker, Geraint Lewis, Kyler
Khuen



Summary

- There are lots of exciting science result from the Dark Energy Survey, and more to come!
- Stellar streams are powerful tools for studying our Galaxy, especially when combining observations from the Dark Energy Survey, Gaia, and S⁵.

