WIDE-FIELD INFRARED SURVEY TELESCOPE
ASTROPHYSICS • DARK ENERGY • EXOPLANETS

Resolving the Milky Way Galaxy with WFIRST

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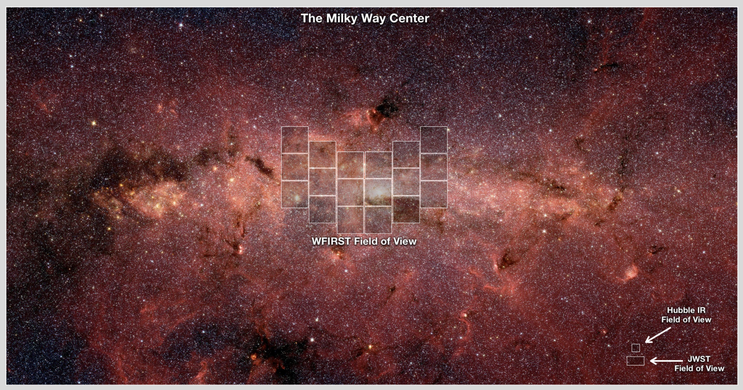
WFIRST and the Milky Way Galaxy

WFIRST will yield a transformative impact in measuring and characterizing resolved stellar populations in the Milky Way. The proximity and level of detail that such populations need to be studied at directly map to all three pillars of WFIRST capabilities - sensitivity from a 2.4 meter space based telescope, resolution from 0.1" pixels, and large 0.3 degree field of view from multiple detectors. Our Science Investigation Team (SIT) is developing notional observing programs related to the Galactic center, pockets of star formation in the disk, benchmark star clusters, and halo substructure and ultra faint dwarf satellites.

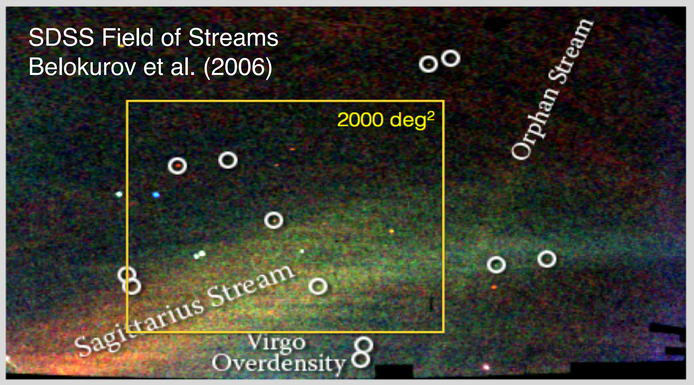
The Galactic Center

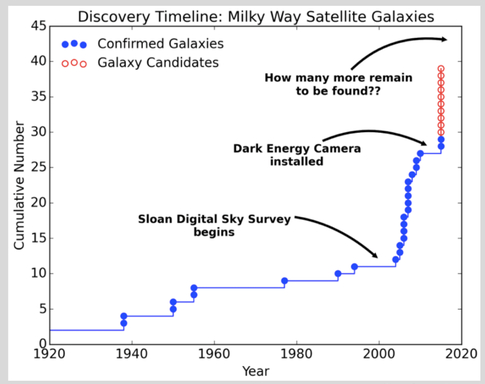


Motivating Questions that WFIRST can Answer

What is the global environment of the nuclear star cluster?
What is the distribution of faint old stars in this region?
Why is the Central Molecular Zone asymmetric about the SMBH?
How does the strong tidal field in this region effect cluster structure, dynamics, and evolution?
What are the tidal radii, orbits, and line of sight distances of massive young clusters?
What can we learn about the influence of extreme environments on star formation?

The Stellar Halo



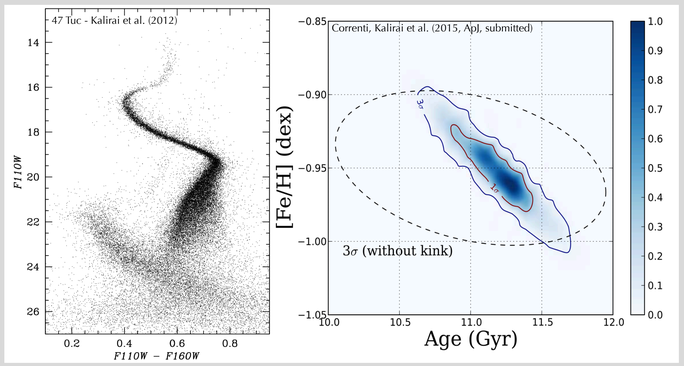


K. Bechtol

Motivating Questions that WFIRST can Answer

Is the census of small satellites consistent with cold dark matter predictions on small scales?
(SDSS only sees the faintest structure out to 1% of the halo, WFIRST will explore the full volume)
Is there a low luminosity threshold for galaxy formation?
Is the spatial distribution of dSphs (planar vs spherical) consistent with cold dark matter?
Do sub-Gyr age measurements reveal any cosmologically-driven synchronization in star formation histories?
What fraction of stellar halos are tied up in substructure?

Stellar Populations in the Gaia Era

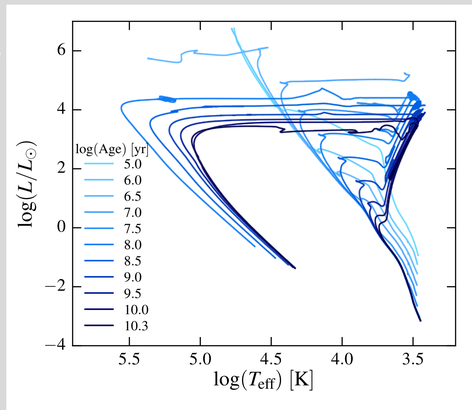


Motivating Questions that WFIRST can Answer

When did the earliest Milky Way systems form?
What is the shape of the sub-solar IMF and does it depend on environment?
What is the structure of the Milky Way disk in extincted regions?
What do the internal dynamics of co-spatial populations tell us about their formation process?

Team Activities and Deliverables

- Participation in all high-level WFIRST decisions to advocate for better community access.
- Participation in working groups to motivate software and hardware (e.g., filters) that expands Milky Way science opportunities.
- Development of optimized strategies and tools to maximize stellar population science with WFIRST.
- Generation of new grids of IR-optimized stellar evolution and synthetic spectroscopic models.
- Development of algorithms for optimal data reduction at the WFIRST sensitivity and pixel scale.
- Wide-field simulations of Milky Way environments including new astrometric studies.
- Strategies and algorithms to find substructure and dwarf galaxies in the Milky Way halo with the WFIRST High Latitude Survey.
- Develop WFIRST-specific photometric diagnostics for studying massive stars.



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