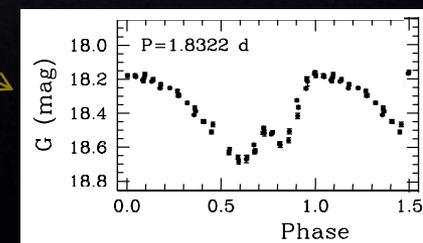
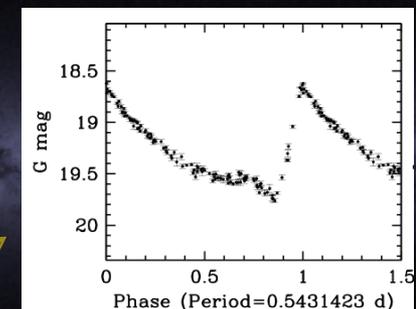
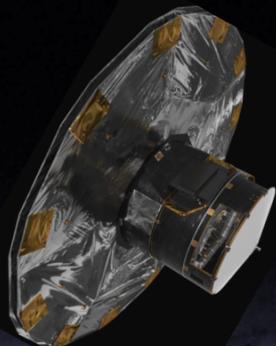




# Synergies Gaia-LSST

Gisella Clementini

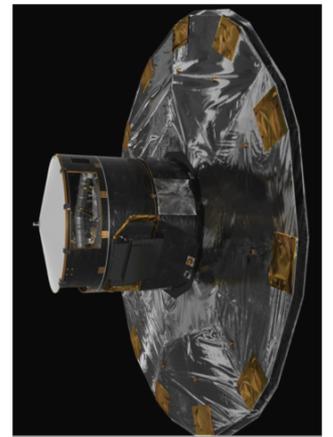
INAF - Osservatorio Astronomico, Bologna (OABO), Italy  
Coordination Unit 7 - Gaia Data Processing & Analysis Consortium (DPAC)



Partecipazione Italiana a LSST  
Roma, 14 Luglio 2016



# Synergies Gaia - LSST



## Gaia

- **all sky** (i.e.  $\sim 40,000 \text{ deg}^2$ ), unbiased survey down to  $G_{\text{lim}} = 20.7 \text{ mag}$   
70 measurements on average (from  $\sim 10$  to  $\sim 250$ , depending on position)
- high ( $\mu\text{as}$ ) accuracy **astrometry** (parallaxes, positions, proper motions)
- mmag optical **spectrophotometry** (luminosities, astrophysical parameters)
- **spectroscopy** (radial velocities, rotation, chemistry) for objects brighter than  $G = 15.3 - 16.2 \text{ mag}$  (and  $G > 2 \text{ mag}$ )

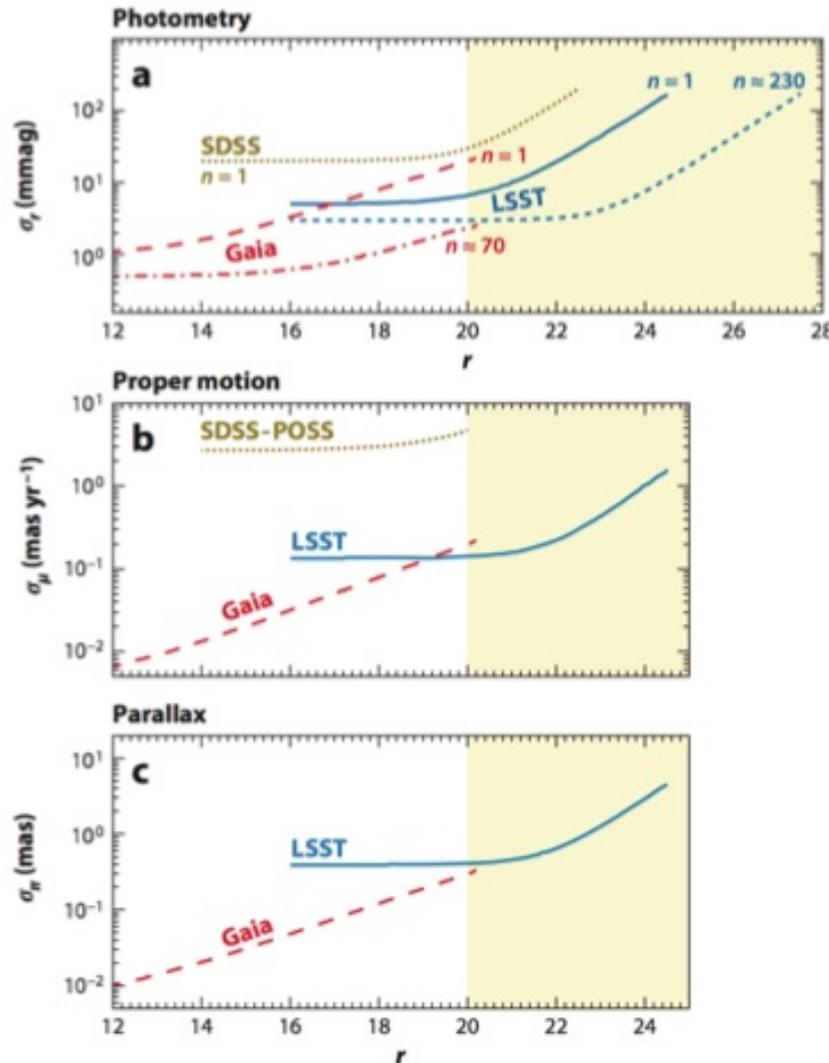
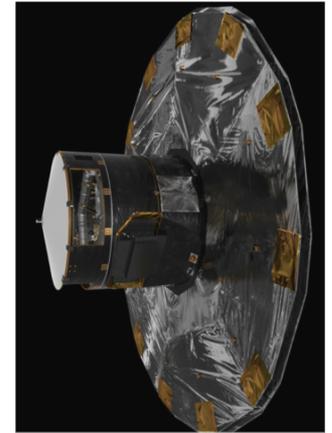
**Timeframe:** 2014 - 2019, intermediate data releases: GDR1: 14/09/2016, GDR2: Q4 2017, .... final catalogue 2022 .... possible 5-years(?) extension

## LSST

- **Southern sky** ( $\sim 18,000 \text{ deg}^2$ ), unbiased survey down to  $r \sim 24.5 \text{ mag}$  (single epoch), up to 2 measurements/week over 10 years

**Timeframe:** 2019+

# Synergies Gaia - LSST

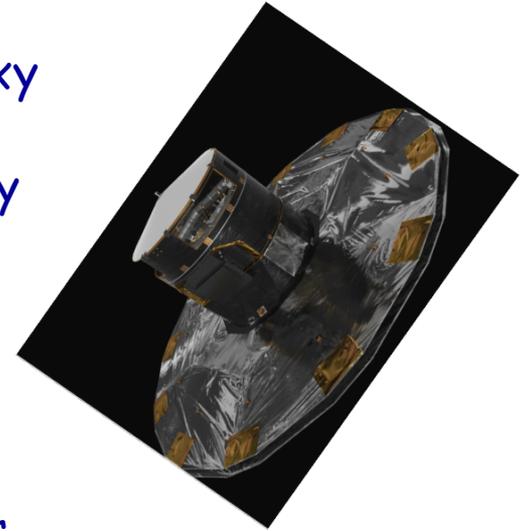


“LSST can be thought of as Gaia’s deep complement because the two surveys will deliver trigonometric parallax, proper-motion, and photometric measurements with similar uncertainties at Gaia’s faint end at  $r=20$ , and LSST will extend these measurements to a limit about five magnitudes fainter.”

# Gaia & LSST common science topics



- Structure and dynamics of the Galaxy
- Star formation history of the Galaxy
- Stellar astrophysics
- Binaries and multiple stars
- Brown dwarfs and planetary systems
- Solar system
- Galaxies, Quasars and the Reference Frame
- Fundamental physics: General relativity



**Multi-epoch surveys: discovery of thousands of new variable sources →**

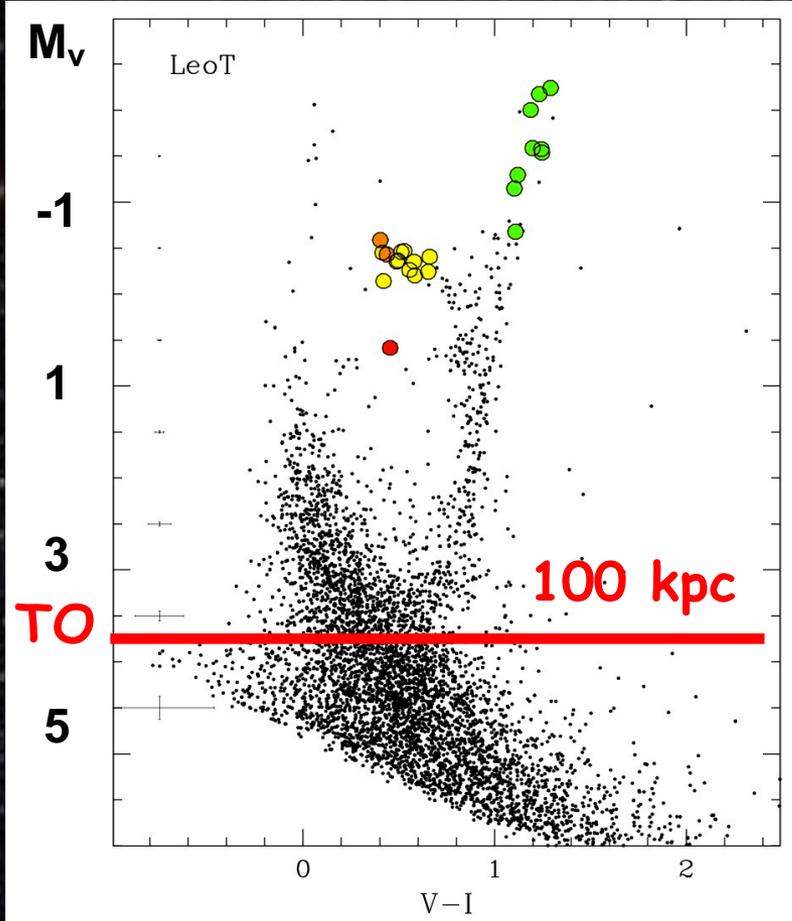
**Fundamental standard candles of the Cosmic Distance Ladder →  
Cepheids & RR Lyrae stars**

# What we plan to do with Gaia & LSST

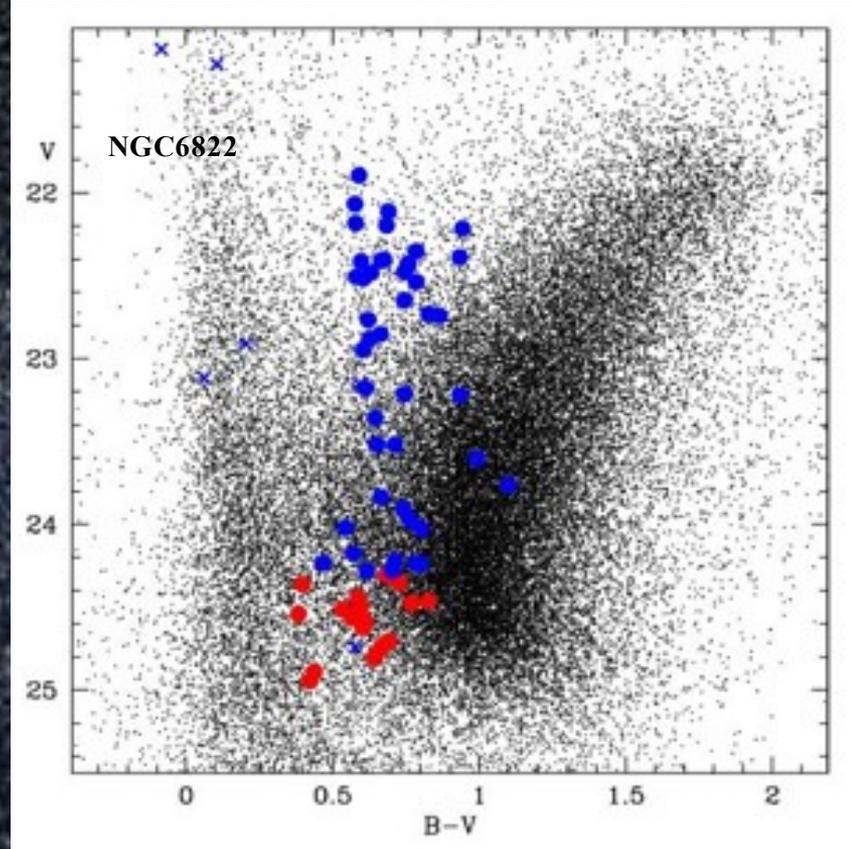
Use RR Lyrae & Cepheids and the CMD of resolved stellar populations to:

- trace the different stellar generations in galaxies
- measure distances
- map 3D structures, radial trends, halos & streams
- discover new galaxies and UFDs
- derive hints on how galaxies have formed
- study the star formation history

➤ trace the different stellar generations in galaxies



Clementini et al. 2012



Clementini et al. 2003

# Our team ... for LSST

**G. Clementini:** staff OABO, Gaia DPAC, CU7 (variability), responsible for the CU7 Cep&RRL WP

**M. Cignoni:** TD UniPi (star formation)

**F. Cusano:** TD OABO (variable stars & resolved stellar populations - LBT)

**T. Muraveva:** Postdoc OABO (variable stars, PL relations in NIR, VMC survey, Gaia DPAC CU7)

**A. Garofalo:** PhD DIFA-UniBO (variable stars PL relations in MIR, CRRP@Spitzer & CCHP2@HST surveys, Gaia DPAC CU7)

+ strong links with the following researchers:

M. Marconi, V. Ripepi, I. Musella, M.R. Cioni and many more ...

Thank you !

