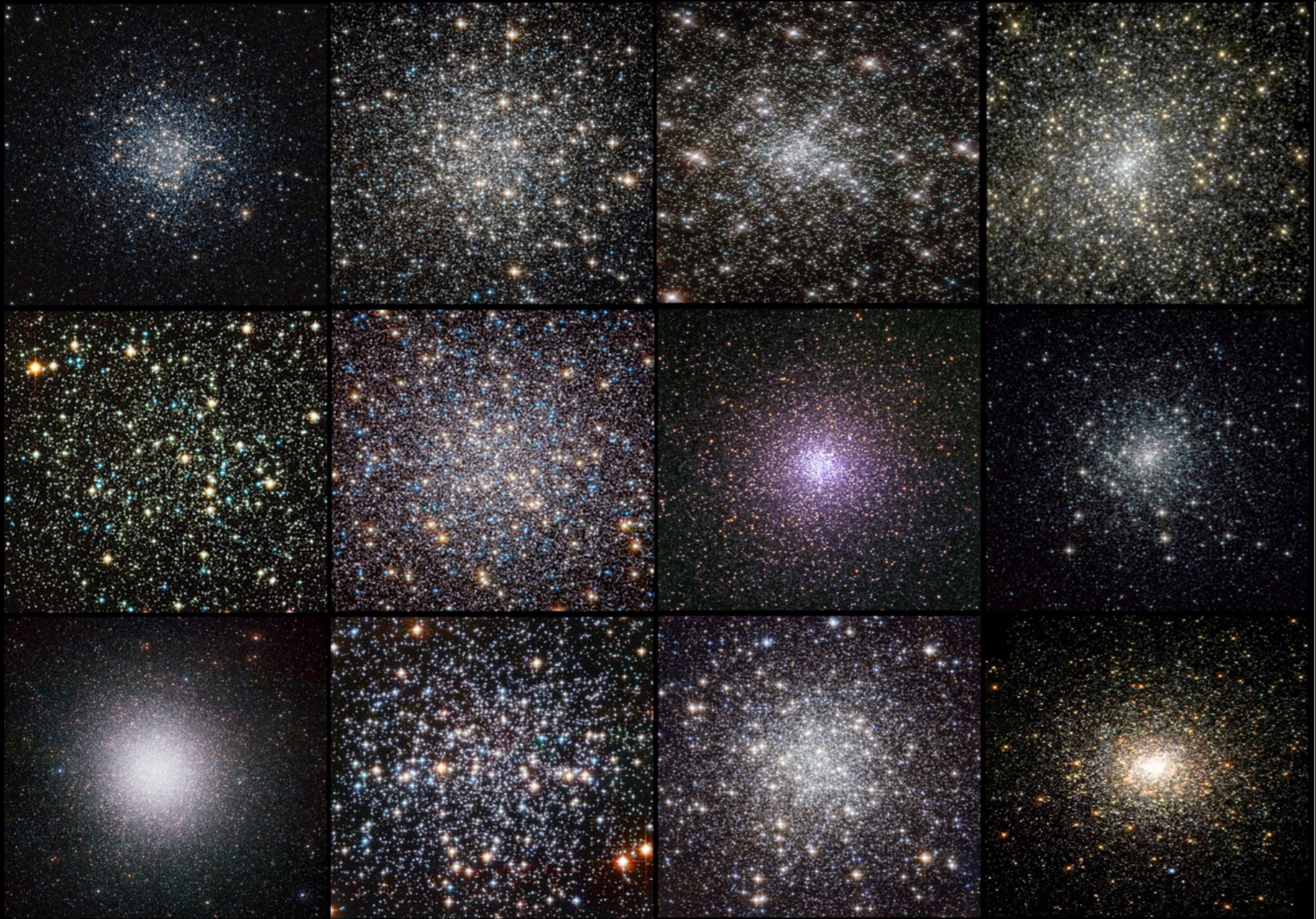


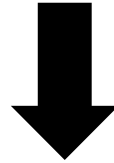
RESOLVED STELLAR POPULATIONS

Barbara Lanzoni A.A. 2023/2024



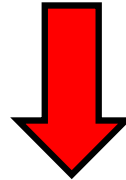
STELLAR ASTROPHYSICS

structure and physics of stars



STELLAR EVOLUTION

time variations of stellar structure



RESOLVED STELLAR POPULATIONS

observational properties of star clusters
and comparison with theory

RESOLVED STELLAR POPULATIONS

stars are *individually* resolved

for **every single** star:

- magnitude (colour)
- chemical composition
- radial velocity
- rotational velocity

from the ensemble of these individual stars:

- distance
- age
- kinematics
-

globular clusters



local dwarf galaxies



open clusters



Globular clusters



SSP
(simple stellar populations)



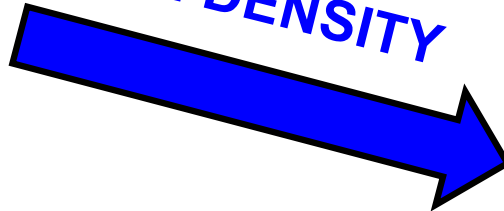
check of
Stellar Evolution theory
and
interpretation of
non-resolved galaxies

OLD (12 Gyr)



tracers of the
formation history
of the Milky Way
(=> of galaxies)

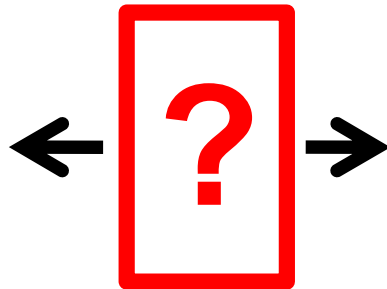
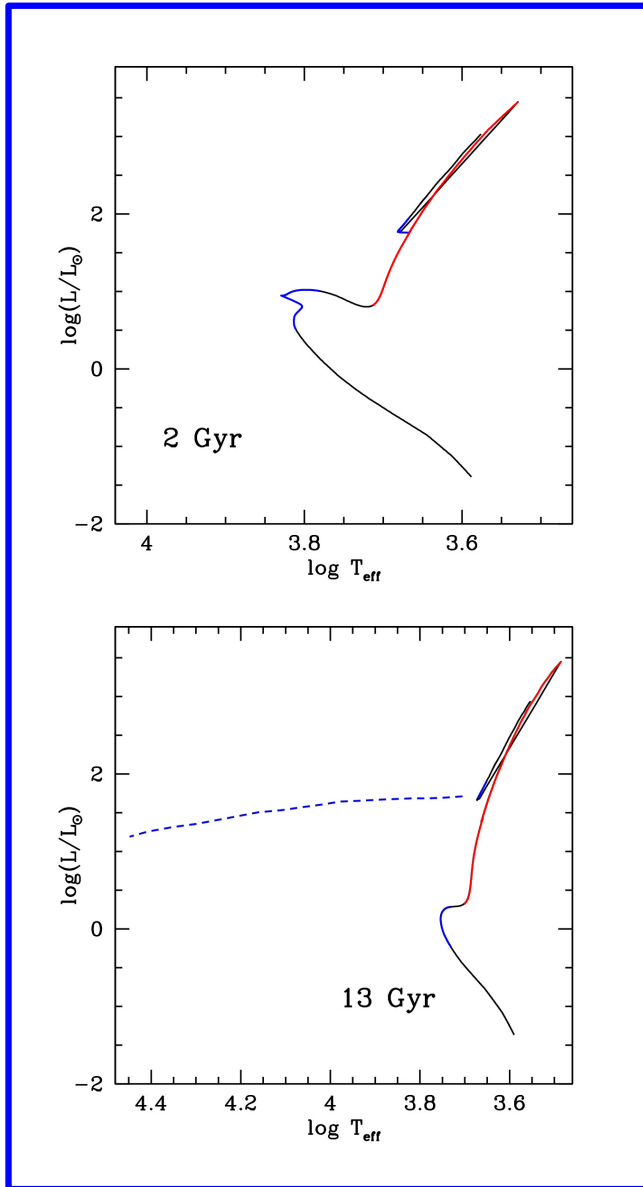
HIGH DENSITY



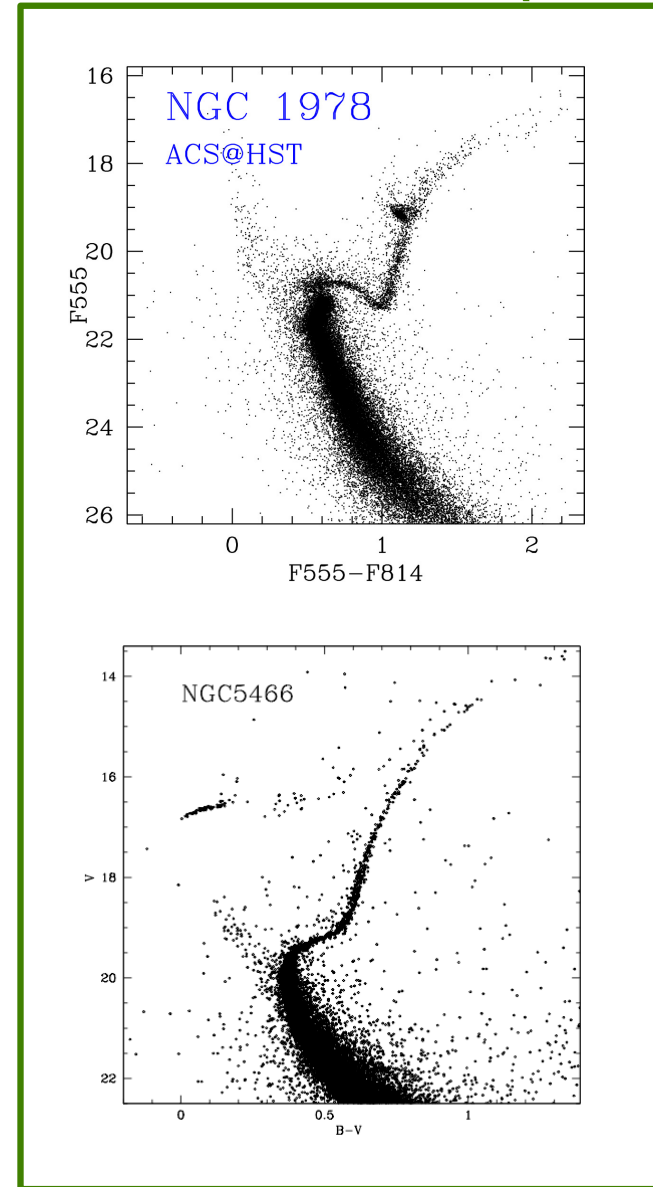
study of
multi-body dynamics
and its effects on
stellar evolution

check of Stellar Evolution theory and interpretation of non-resolved galaxies

THEORY (HR diagram)



OBSERVATIONS (CMD)



2 Gyr

13 Gyr

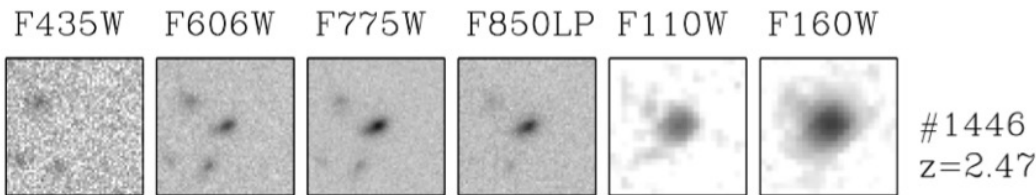
and **ALSO**:

- estimate of **age, distance, metallicity** (from photometry)
- determination of the **Spectral Energy Distribution (SED)**

=> interpretation of distant (non-resolved) galaxies

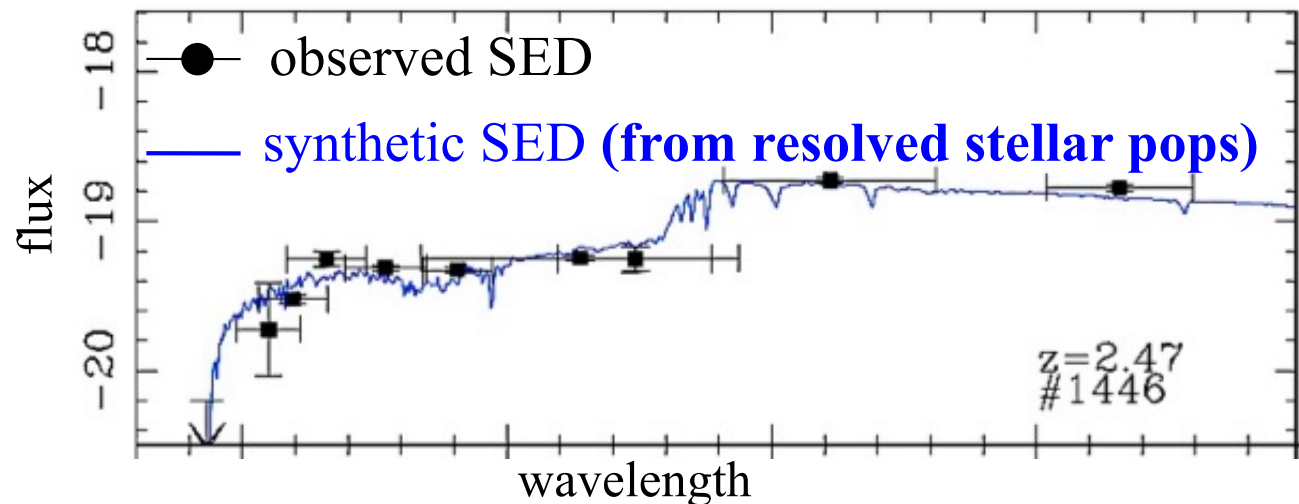
Example:

information available for high-z galaxies:



How can we get estimates of:

- age
- total stellar mass
- metallicity
-



**tracers of the Milky Way formation history
(=> of galaxies, in general)**

ω Centauri in the MW halo

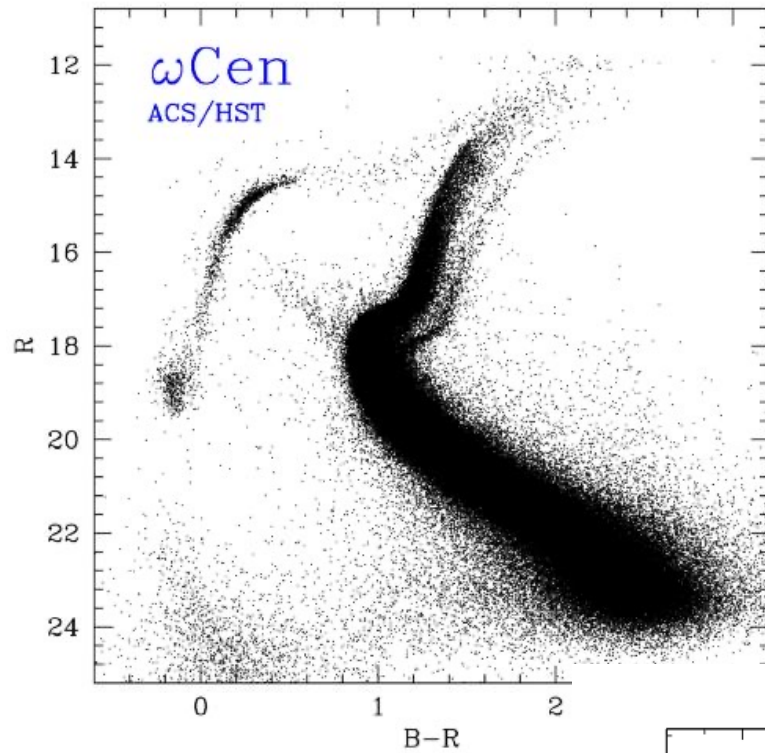


Terzan 5 in the MW bulge



ω Centauri

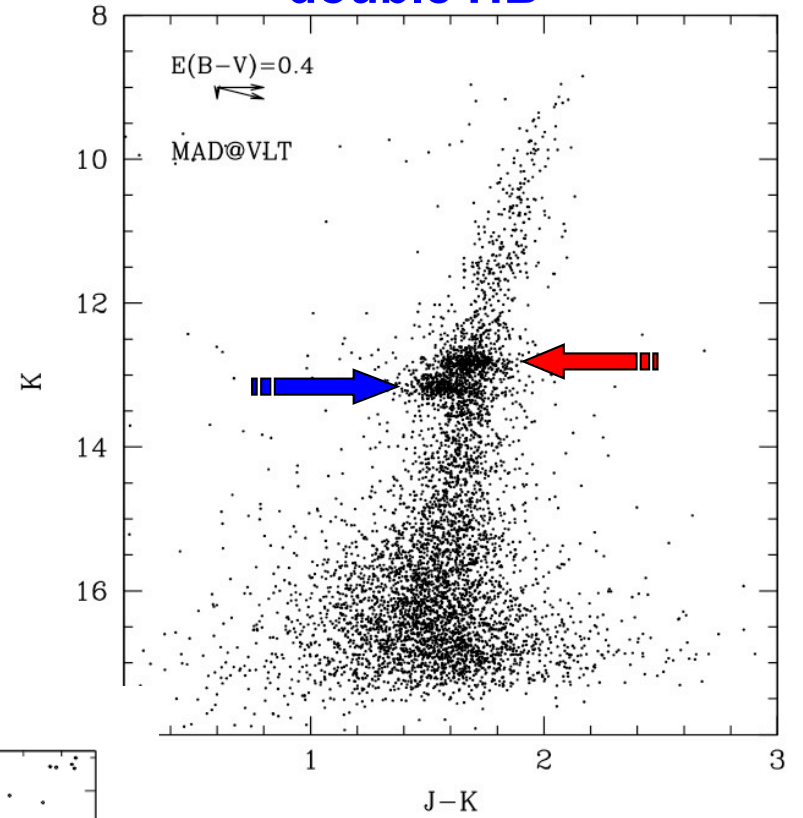
multiple RGB and SGB



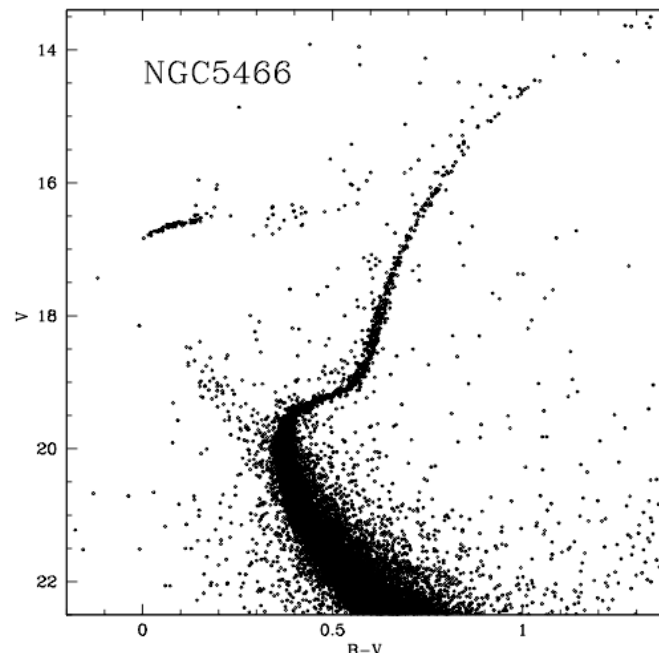
GC

Terzan 5

double HB

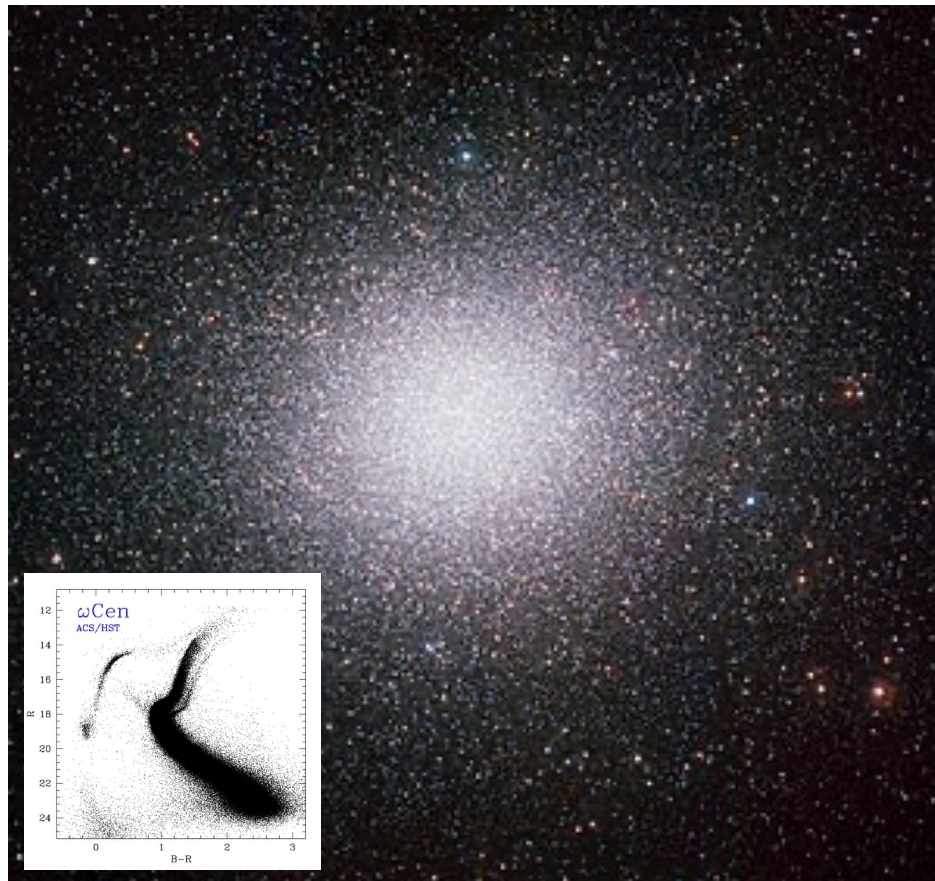


single & narrow RGB
single HB



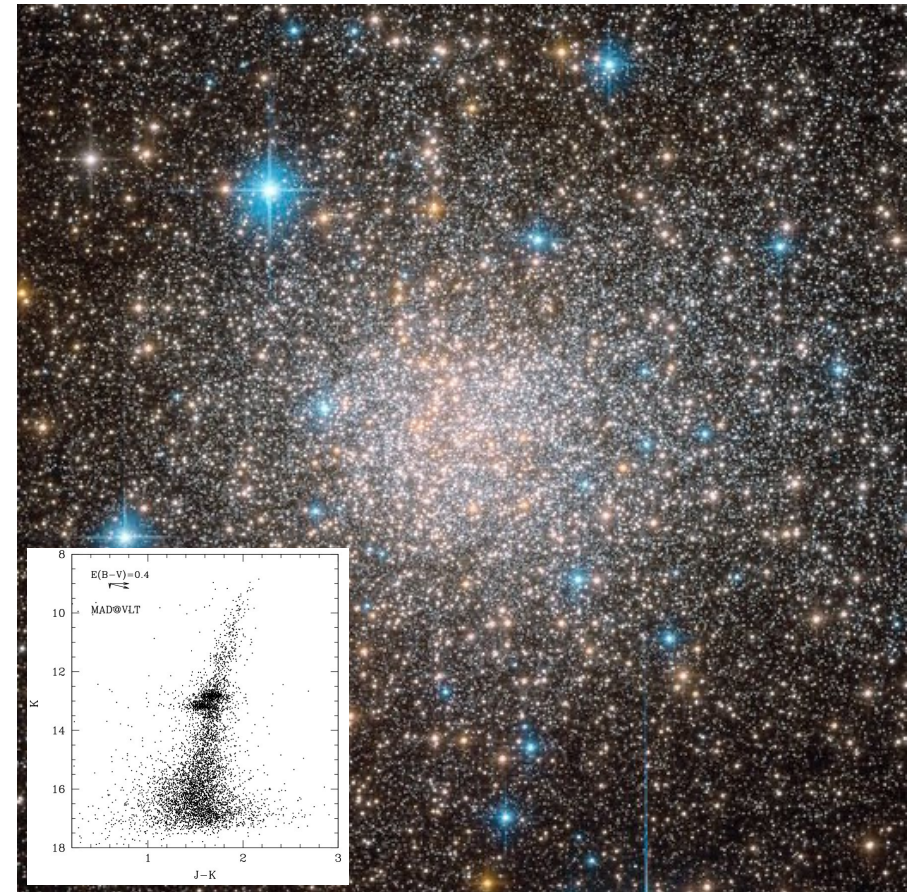
tracers of the Milky Way formation history (=> of galaxies, in general)

ω Centauri in the MW halo



remnant of a dwarf galaxy
accreted by the MW?

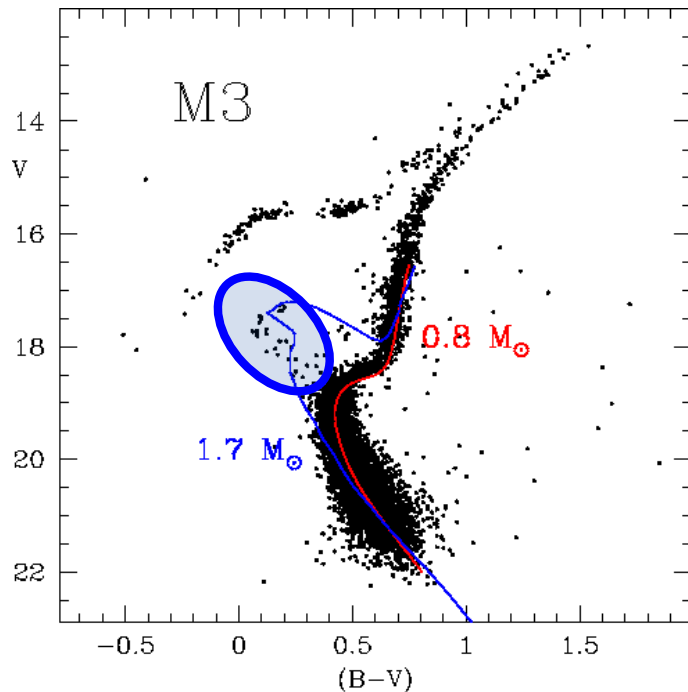
Terzan 5 in the MW bulge



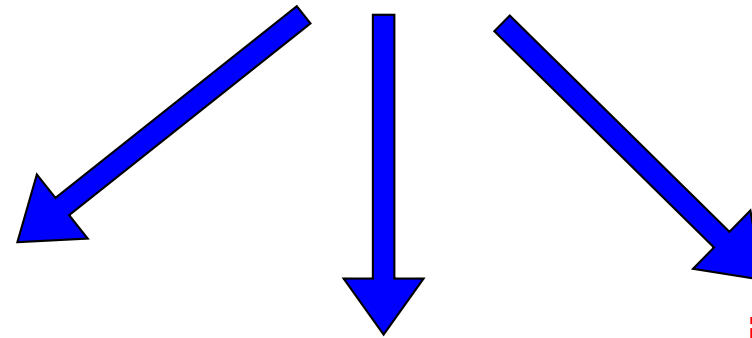
remnant of a structure
that contributed to build the
Galactic bulge?

study of multi-body dynamics and its effects on stellar evolution

Blue Straggler Stars



- stellar collisions
- evolution of binaries
- probes of dynamical evolution and core collapse



companion stars to Millisecond Pulsars



- evolution of binaries
- exchange interactions
- tidal captures

intermediate-mass black holes



- runaway collisions of massive MS stars?
- impact on internal kinematics

RESOLVED STELLAR POPULATIONS

Barbara Lanzoni A.A. 2023/2024



- ✦ discussion of both consolidated results, and ongoing research projects
- ✦ material: copy of the slides, scientific papers
- ✦ oral exam
- ✦ Master Degree theses within the "stellar group" of DIFA (BL, Ferraro, Mucciarelli, Pallanca, Cadelano, Lardo; <http://www.cosmic-lab.eu>), and/or with INAF researchers (Origlia, Dalessandro, Bellazzini, Annibali, Romano,...)