History (CMDs)

First CMDs with photographic plates, wide field but not very sensitive - pioneering wor e.g. Sculptor

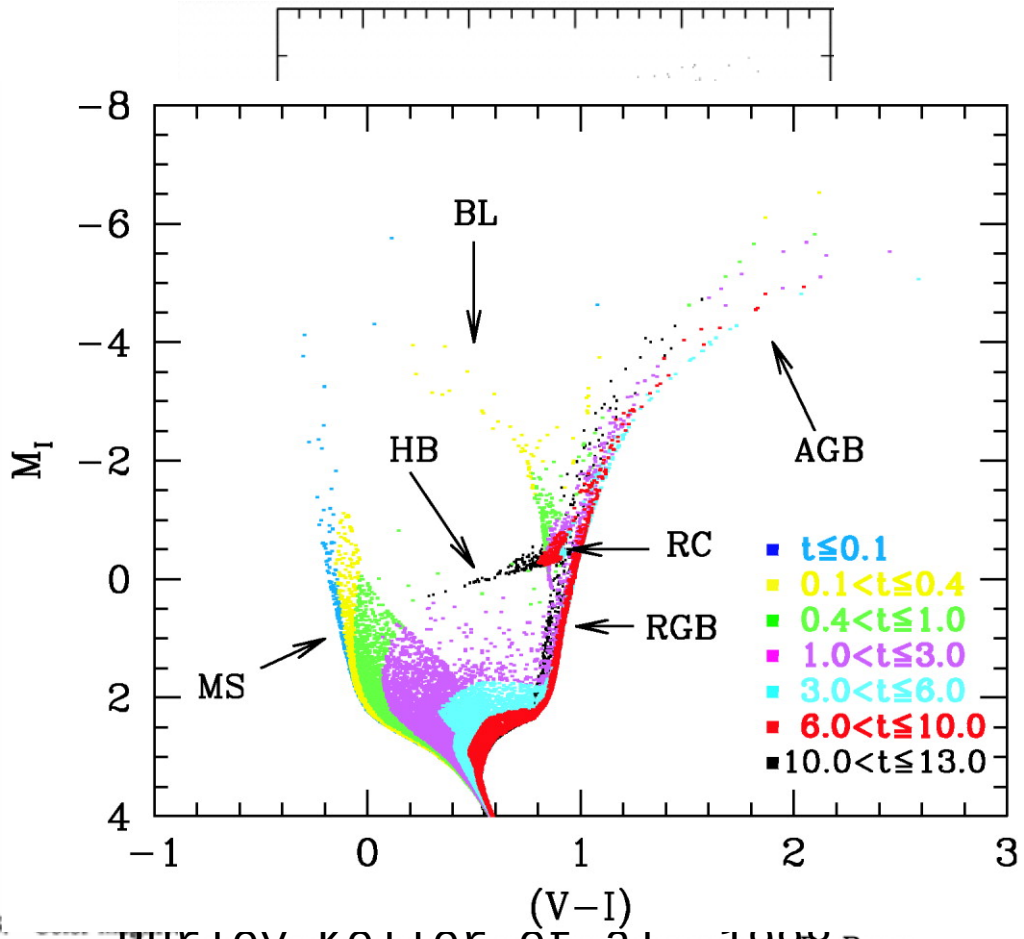
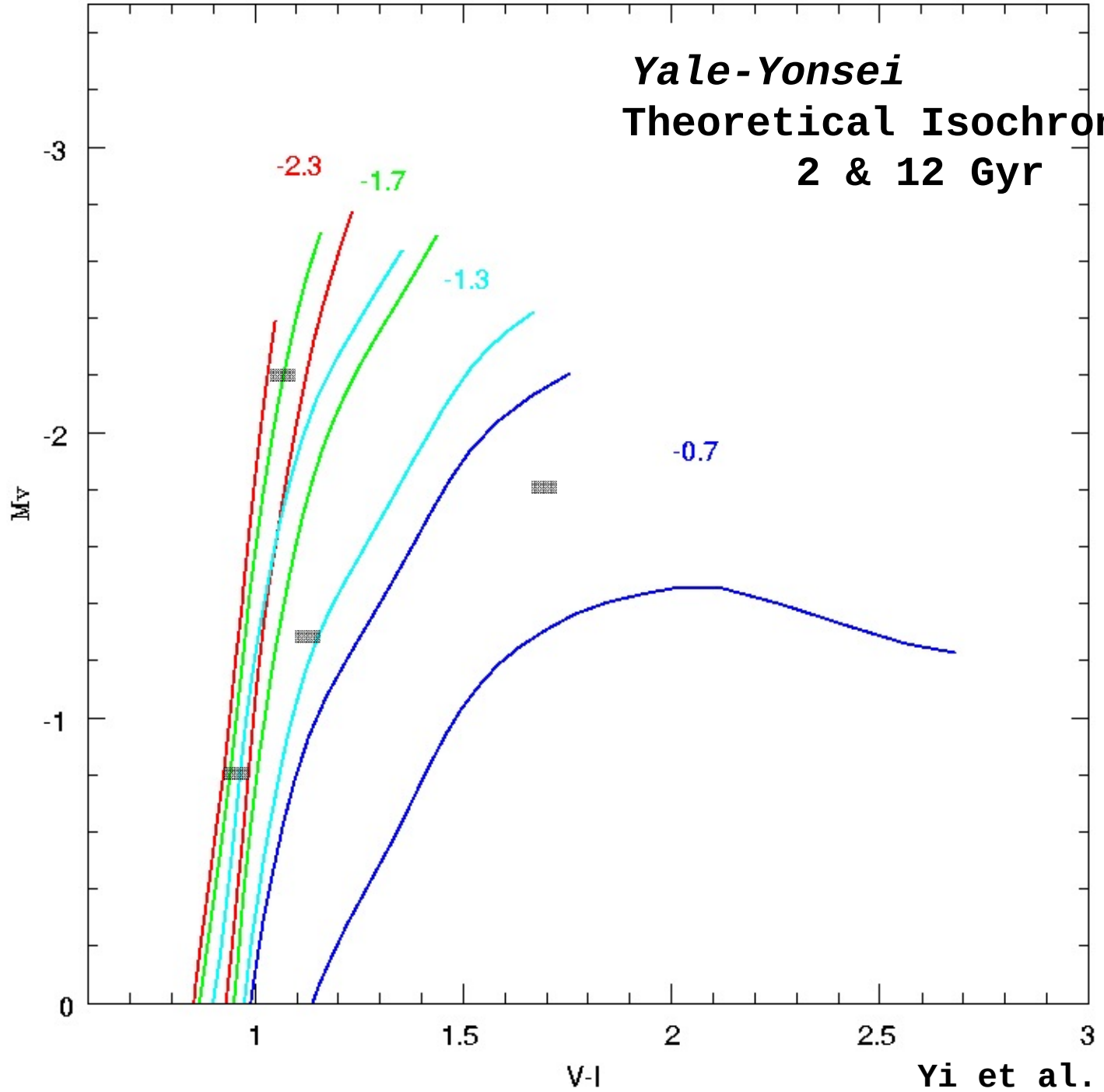


Fig. 3.

Hurley-Keller et al. 1998

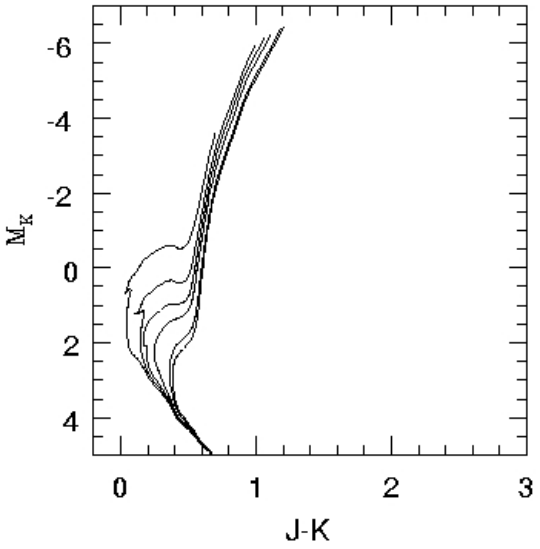

Yale-Yonsei
Theoretical Isochrones
2 & 12 Gyr
-2.3
-1.7
-1.3
-0.7
Mv
V-I
-3
-2
-1
0
1
1.5
2
2.5
3
Yi et al. 2003

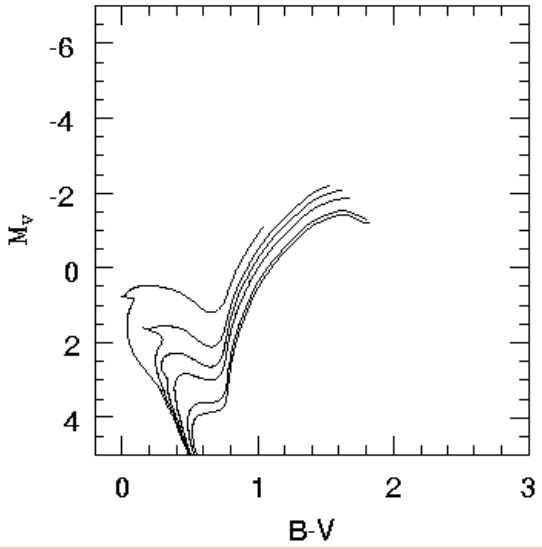
Virgo m-M= 31. (17Mpc)

NGC3379 m-M= 30. (10Mpc)

M81/Scl m-M= 27.7 (3.5Mpc)

M31 m-M= 25. (1Mpc)



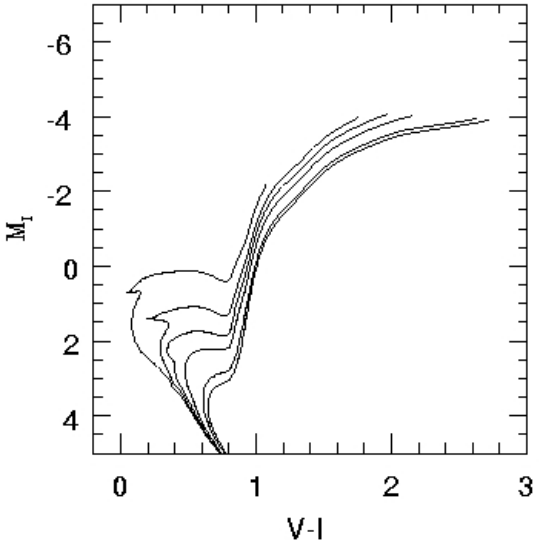


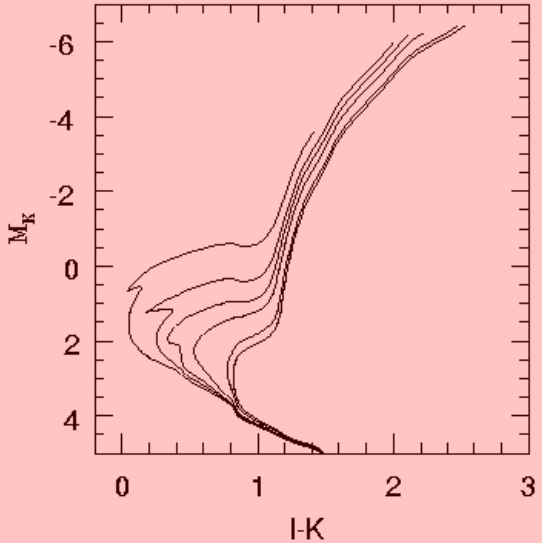
Virgo:

TRGB, K=26.5; I=28.75

HB, K=I=31

5Gyr old MSTO, K=33; I=33.8





[Fe/H] = -0.7; 1,2,3,5,10,13 Gyr

Yi et al. (2003, ApJS, 144, 2

10’’ at 17Mpc (m-M=31.2), is 820pc (equiv. to 4’ fov in LG)

Need at least 100 stars per region of the CMD that needs to be modeled, e.g., to get 100 RGB stars need to look at a surface brightness of ~27□□ with a 10’’ fov at virgo.

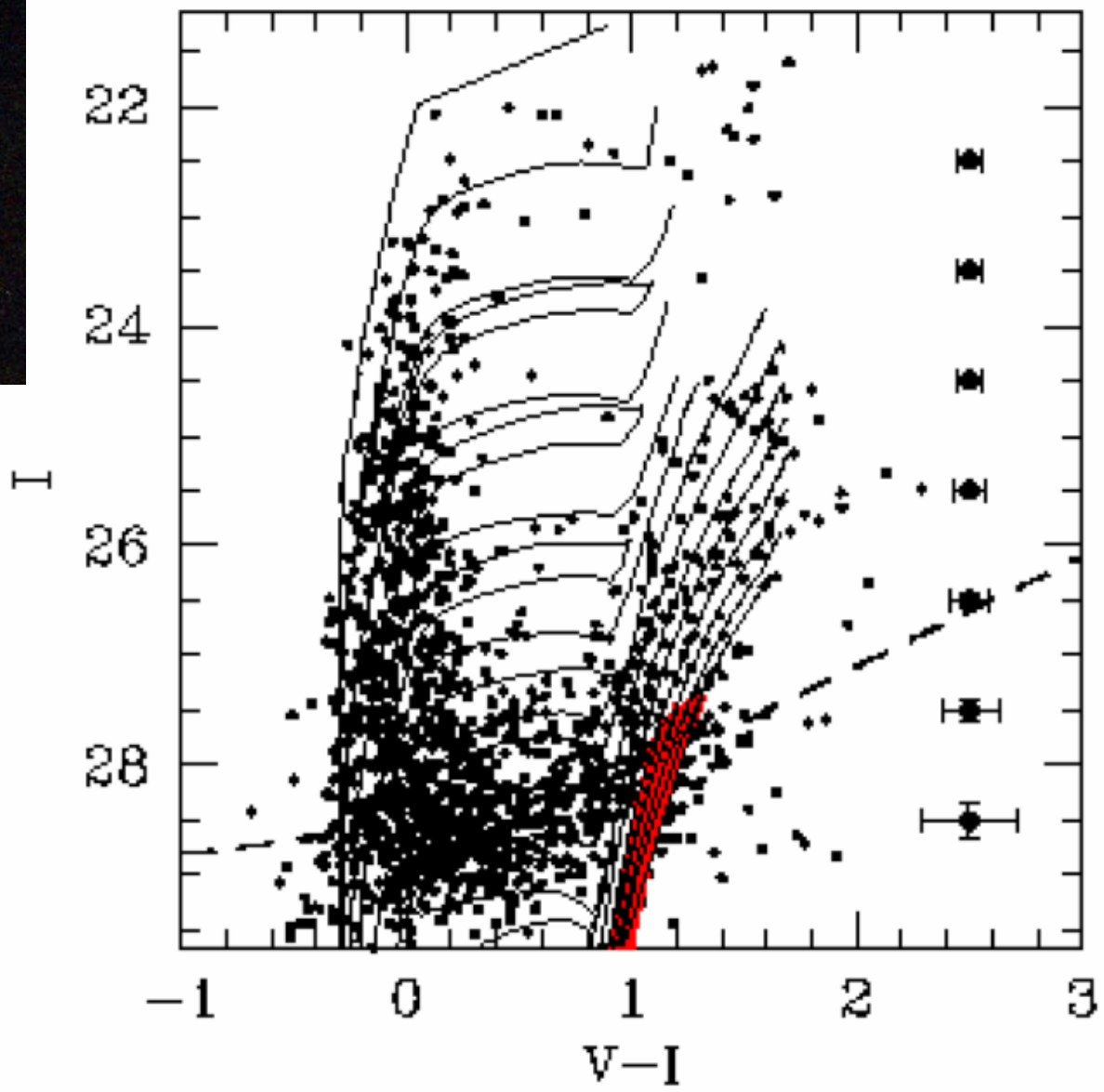
Trade-Offs

Field of View (fraction of galaxy; size of detector)

Pixel Size (resolution; diffraction limit; surface brightness limit)

Sensitivity (MSTO, HB, TRGB, E-AGB, young massive stars)

I Zw 18



~19Mpc (m-M~31.4)

24orbits ACS time

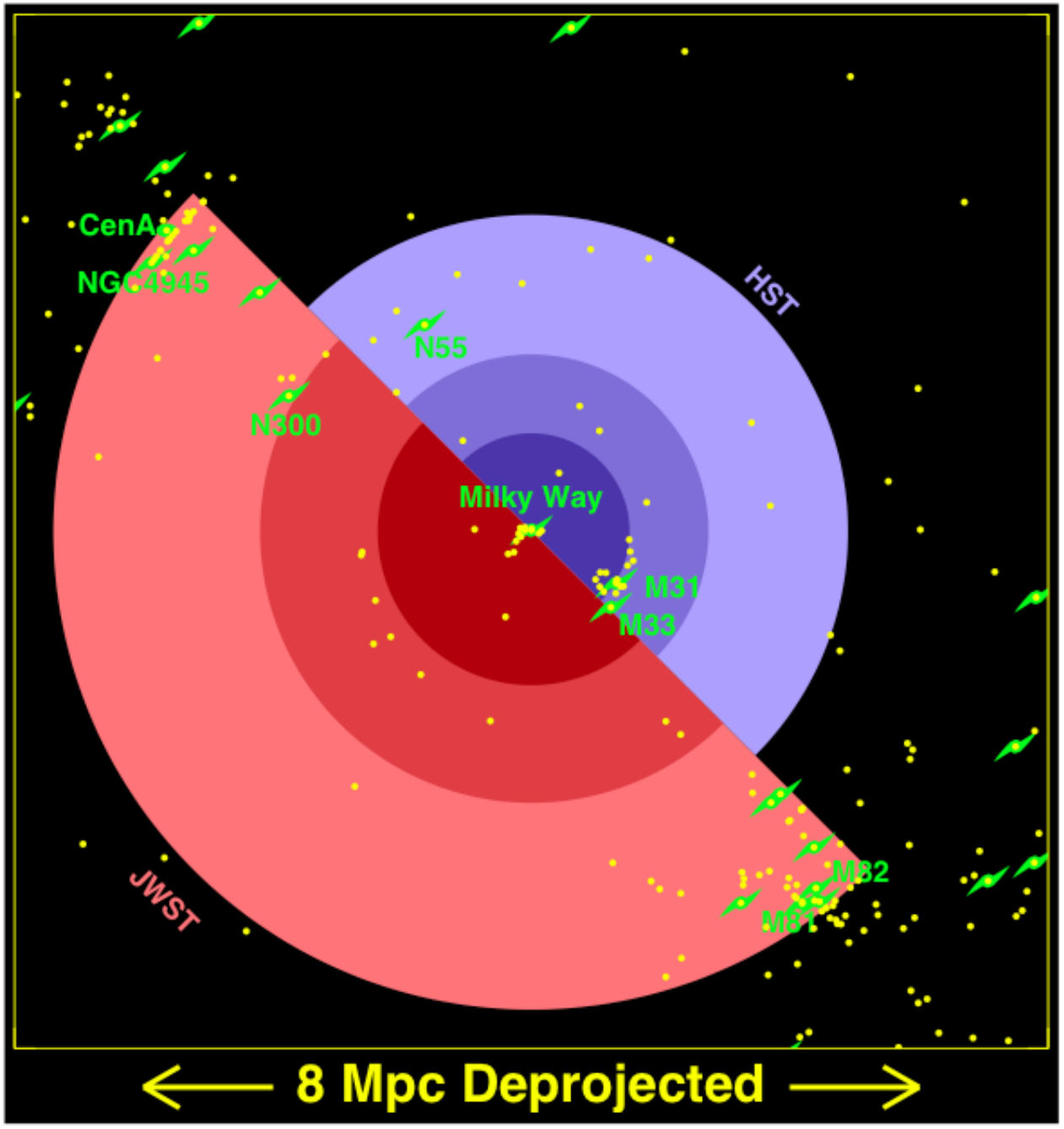
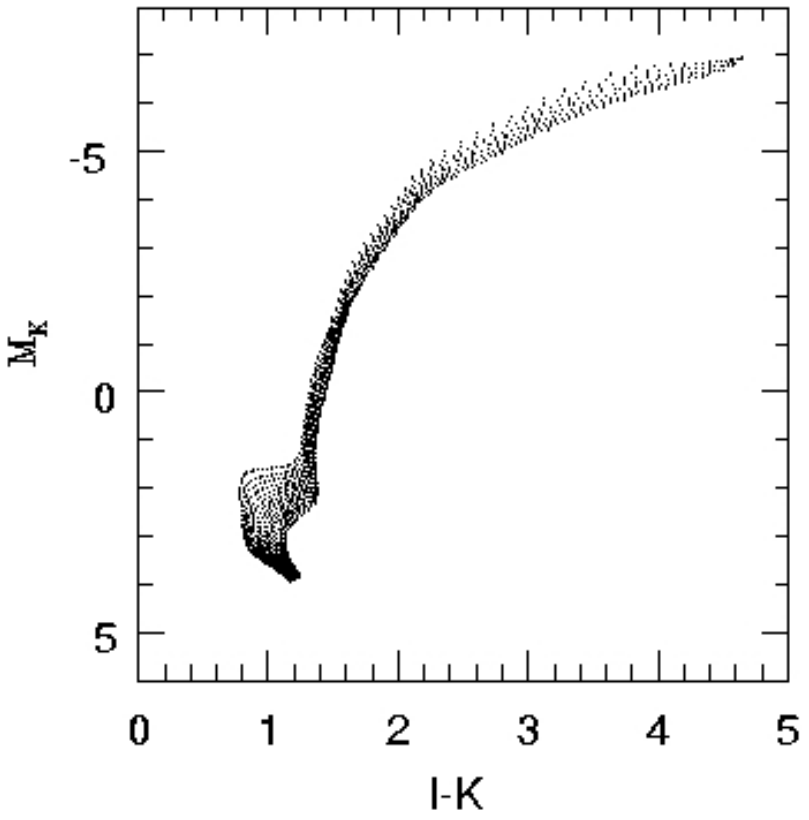
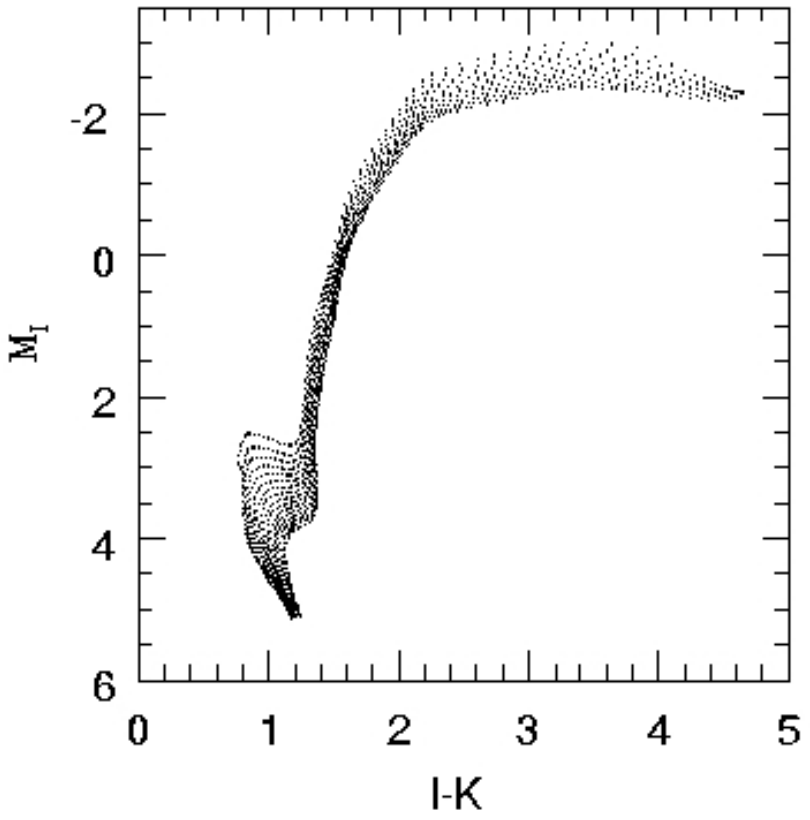

CenA
NGC4945
N55
HST
N300
Milky Way
M31
M33
JWST
M82
M81
8 Mpc Deprojected

Table 1. Potential targets for an ELT

Object	$(m-M)_0$	θ(1 pc)	Ra(J2000)	Dec
LMC	18.5	4"	05 23	–69 45
M31	24.3	0.3"	00 43	+41 16
Sculptor Group	26.5	0.1"	00 23	–38 00
M81/82	27.8	0.06"	09 55	+69 40
Cen A	28.5	0.04"	13 25	–43 00
Leo Group	30.0	0.02"	10 48	12 35
Virgo Cluster	31.2	12 mas	12 26	+12 43
Fornax cluster	32.0	11 mas	03 37	-35 37
50Mpc	33.5	4 mas	…	…
Arp220	34.5	2 mas	15 34	+23 30
Perseus Cluster	34.5	2 mas	03 18	+41 31
Stephan's Quintet	35.0	2 mas	22 36	+33 57
Coma Cluster	35.0	2 mas	13 00	+28 00
Redshift z~0.1	38.5	0.5mas		…
Redshift z~0.3	41	0.2mas		…

Requirements	imaging	spectroscopy
Field of view	stars at 3Mpc: 10' stars at 10Mpc: 3'-10' stars at 18Mpc: 10"-1'	10"-5'
-diameter of 50% enclosed energy circle -strehl ratio (or "diff. lim." for diffraction limited)	diffraction limited	diffraction limited
photometric uniformity in field and/or time	field: 0.02 mag time: repeatability important	
photometric accuracy	0.05 mag (goal: 0.02)	
spectral resolution		5000-40000
wavelength (μm)	0.6-3μm	0.4-1.5μm
multiplex	N/A	100+ @LR (~5000) 50+ @ IR (~20 000) 5+ @ HR (~40 000)
typical magnitude	see table below	see table below
object size	1" - 5" (10"-5')	
typical exposure time	8-10 hours	8-10 hours
target density	stars at 3Mpc: 10^3 stars/arcsec^2 stars at 10Mpc: >10^3 stars/arcsec^2 stars at 18Mpc: >10^3 stars/arcsec^2	
dynamic range	maximum ~10^4	
background/emissivity	as dark and stable as possible	as dark and stable as possible
astrometric/plate scale stability	critical for spectroscopic targets	critical
polarisation	no importance	no importance
sky coverage		north and south ok
Date/Time constraint	no importance	no importance
can be done with 30m can be done with 42m can be done with 60m	For both imaging and spectroscopy the larger the aperture the more can be done at greater distances	
can be done with JWST		
obs type	imaging	mulit-object or single-object spectroscopy
comments - add additional requirements	Preferred ELT aperture: 50m (or more) pixel scale: 1-5mas Adaptive Optics: LTAO S/N central pixel: >10 Virgo Cluster of galaxies preferably less than 30° from Zenith in the meridian	Preferred ELT aperture: 50m (or more) pixel scale: 1-5mas Adaptive Optics: LTAO S/N central pixel: >10@LR --->>40@IR and HR Virgo Cluster of galaxies preferably less than 30° from Zenith in the meridian





a “typical” elliptical galaxy, which stopped forming stars 5Gyr ago.

Thus a representative stellar population to begin the modelling. It is just a list of stars with no fancy assumptions - no incompleteness - no noise etc. this should ideally come from the conversion into an image. It is assuming a V band surface brightness= 24 mag/arcsec^2