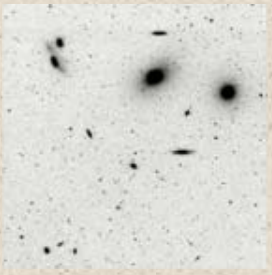
Science case for an ELT: stars & galaxies

Florence Meeting, 8 -10 November 2004

- E. Tolstoy: Star formation history up to Virgo
- L. Origlia: Science case for a 50-100m ELT: playing with stellar clusters
- C. Evans: The population of extragalactic massive stars
- A. Ardeberg & P. Linde: Simulations of star clusters up to Virgo and beyond

Resolved field stars out to Virgo

Eline Tolstoy



Imaging , V=35 in 10 hours, S/N=20 **MSTOs @ Virgo**

LR spectroscopy: CaT V=28 **CaT (RGB) @ Virgo**

HR abundances V=25 **RGB @ M31, CenA**

Massive stars -8; TRGB -4; oldest MSTO +4

M31 & around: (m-M)=24 -25

VIIZw403, CenA	**28**
IZw18	**30**
Virgo	**31**
Redshift z=0.3	**41**

Es with range of luminosity

Resolved stars in extragalactic stellar clusters

Livia Origlia

stars clusters as population tracers in different galaxies

optical & IR imaging

Tip RGB up to Virgo , MS - TO of the LG

spatial resolution: 1 - 10mas

FoV: optical 20” x 20”, IR 5” x 5”

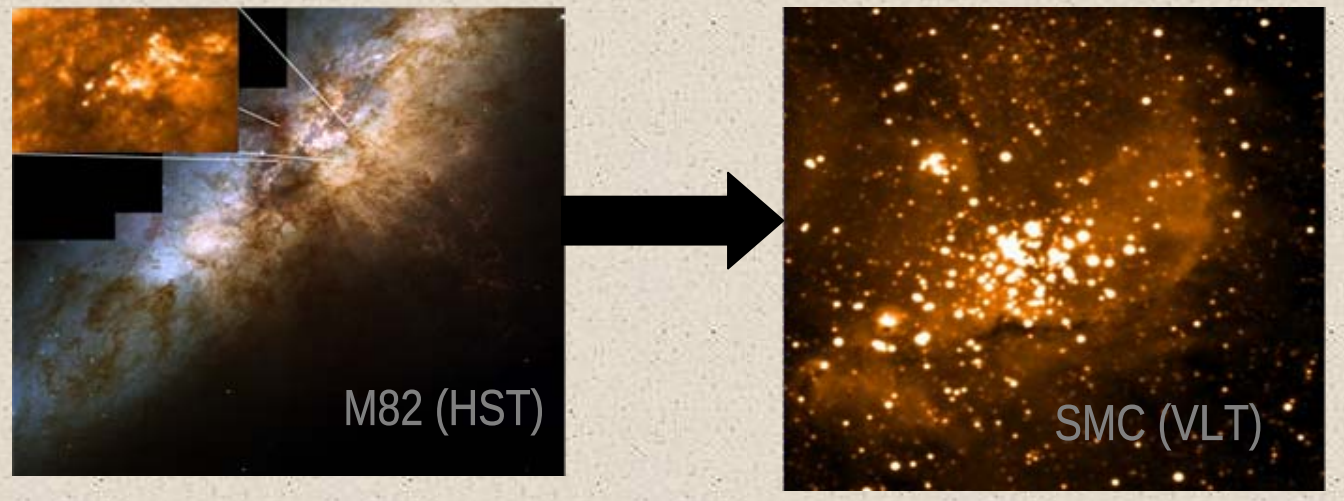
optical & IR spectroscopy

abundances & kinematics of RGB stars in the LG

spectral resolution: R$\lambda/\Delta\lambda \geq$ 30,000 $\Delta\lambda \leq$10 mas
multi-object capabilities desirable

Resolved massive star populations beyond the LG

Chris Evans



Young stellar clusters can be resolved in a wide-range of host systems:

- **Investigate the universality of the upper-IMF**
- **Test the dependence of stellar evolution on metallicity, to more accurately interpret Ly-break galaxies and other high-redshift star-forming regions.**

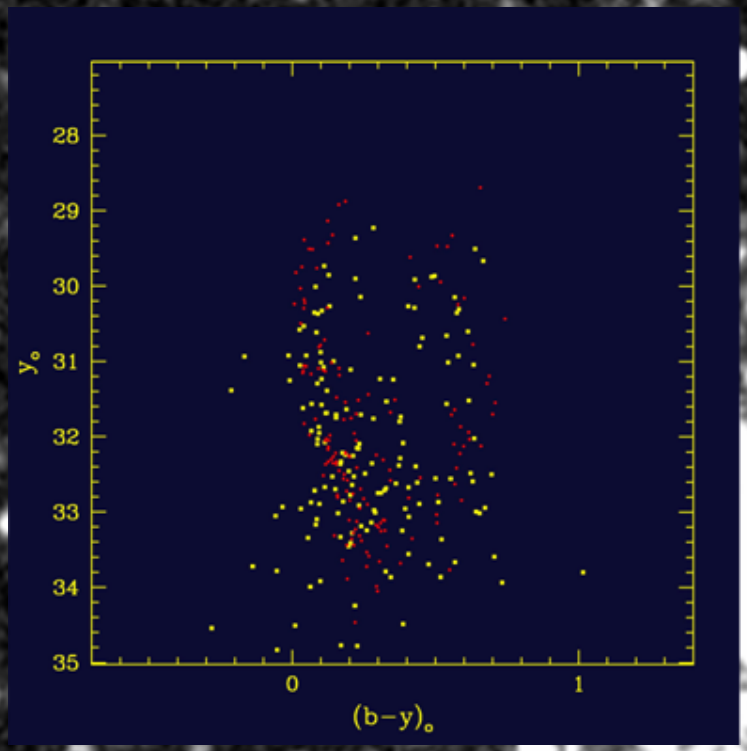
High-quality observations of very low-metallicity stars:

- **Determine stellar abundances to test evolutionary yields etc.**
- **Drive stellar evolution to better understand Pop. III stars**

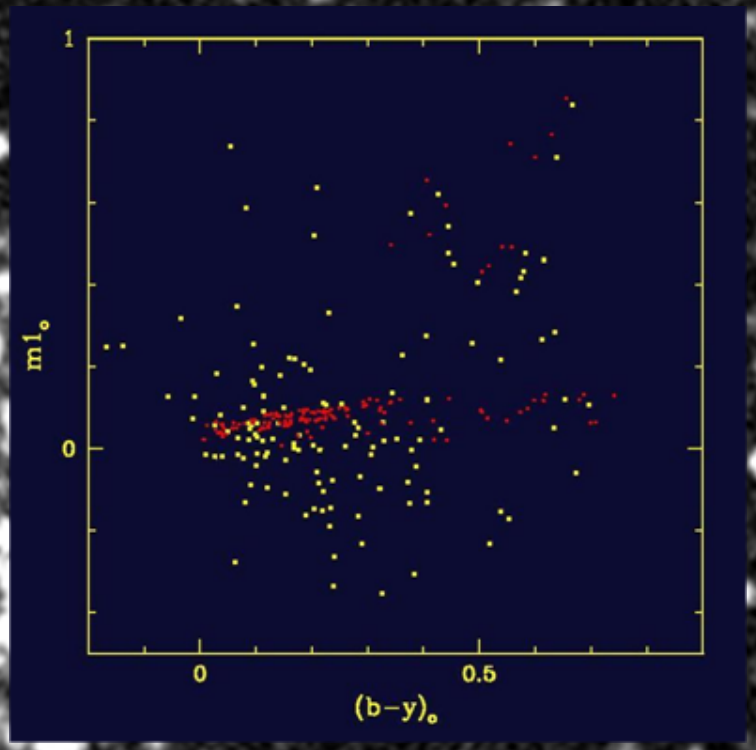
Open cluster simulation: Virgo distance

Arne Ardeberg & Peter Linde

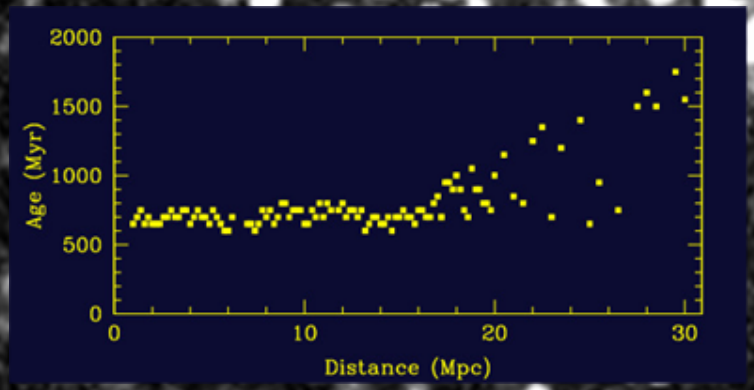
- Euro50
- Exposure: 10 hours / passband
- PSF: 0.003” (non-segmented)
- Seeing disc: 0.3”
- Strehl Ratio: 0.7
- Deformable M2 actuator spacing 7 mm

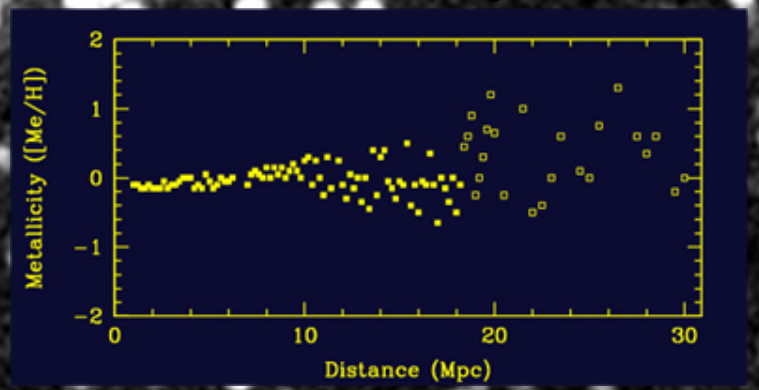


CMD



Metallicity





Euro50 – Lund Observatory

Ardeberg and Linde, 2004

Science requirements: summary

Project	FOV	spatial res	spectral res	λ range	observation	target	special	Comparison of				obs time
	(arcmin)	(mas)	(R)	(microns)	type	density	req?	30 m	50 m	100 m	JWST	(for 100m)
Field Stellar Populations to the Virgo Cluster	0,1	2	broad filters	0.7 - 1.5	imaging	N/A	N	1	2	3	0	30h/target
The population of extragalactic massive stars	1	2	2000&10000	0.4-2.0	spectroscopy	10-20/'		1	2	3	1	100h
Extragalactic star clusters	0,3	2	30000	0.35 - 2.5	imaging & spectroscopy	100/sq"	multi-IFU	1	2	3	1	4h

Science topics

- **BHs, AGN & host galaxies**: A. Marconi, M. Hughes & L. Origlia
- **Star formation history up to Virgo: field & cluster populations**: E. Tolstoy & L. Origlia
- **The population of extragalactic massive stars**: C. Evans
- **Ultra-high resolution in the ISM**: A. Adamson
- **Star formation history in the Universe from SNe**: M. Della Valle
- **The intergalactic stellar populations**: R. Gratton, M. Arnaboldi
- **Kinematic archeology in galaxies**: M. Merrifield
- **Simulations on stellar photometry in galaxies up to Virgo & beyond**: A. Ardeberg, P. Linde