Summary

- How to feed a giant?
- What is SkyMapper? A southern SDSS but different…
  - Full hemispheric coverage
  - Time series
  - Unique niche:- stellar astrophysics
- How SkyMapper is integrated into galactic archaeological studies by feeding MOS such as AAOmega and HERMES
  - Ultimately distill a sample for close scrutiny by the ELT generation

SkyMapper

- 1.3m modified Cassegrain with a 5.7 square degree field of view
- Sited at the Australian National University’s Siding Spring Observatory
- Fully automated, remote facility
- Data transferred via Gigabit link to ANU
- To conduct the Southern Sky Survey:
- Five year
- Multi-colour (6 filters)
- Multi-epoch (6 exposures, each filter)
- entire southern sky to g~23rd
- nightly data rate up to 0.8TB, data set of 324TB science + 150TB calibration
- Enable global access to 30TB via web

SkyMapper

- The heart of SkyMapper – a 32 2kx4k mosaic
- 268M px
- 0.5”/px – appropriate for the seeing at SSO!
- Gives us a fov 2.38x2.38 degrees
- Utilize PanStarrs Stargrasp controllers (Onaka UH) – provide low readnoise in 12 seconds readout.

Australian National University

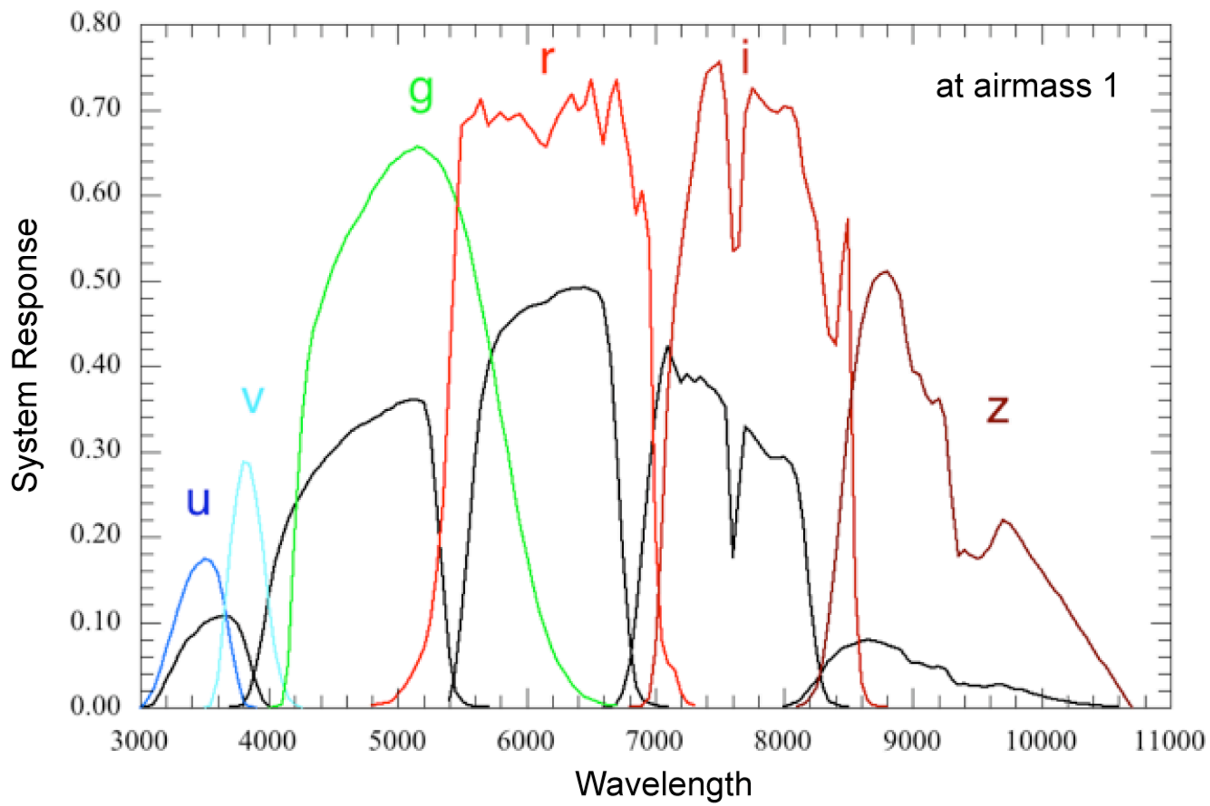
SkyMapper – science goals

- What is the distribution of large Solar System objects beyond Neptune?
- What is the history of the youngest stars in the Solar neighbourhood?
- How far does the dark matter halo of our galaxy extend and what is its mass and shape?
- How did the Milky Way form? Providing input to galactic archaeology programs like HERMES – priors on Teff, logg, [Fe/H]
- Finding extremely metal-poor stars to constrain the first generation of stars. What were the masses of PopIII stars? How did they die?
- Finding undiscovered members of the Local Group of galaxies – “ultra-faint” dwarf galaxies lurking around the Milky Way.
- Finding high redshift QSOs to use as probes of the ionization history of the Universe.

SkyMapper – optimised for stellar astrophysics

- Half of the objects SkyMapper detects are stars
- Optimised our filter set to recover the tightest constraints on fundamental stellar parameters:

  Teff, logg, [Fe/H]
- Our design places the Balmer Jump between u and v ➔ surface gravity sensitivity
- Metal line blanketing in u and v ➔ metallicity sensitivity



The Southern Sky Survey

- 2pi coverage: 3889 fields observed in six filters, six times per filter
- Cadence: hours, days weeks, months, years

	u	*v*	*g*	*r*	*i*	*z*
1 epoch	21.5	21.3	21.9	21.6	21.0	20.6
6 epochs	22.9	22.7	22.9	22.6	22.0	21.5
Sloan Digital Sky Survey comparison	22.0	n/a	22.2	22.2	21.3	20.5

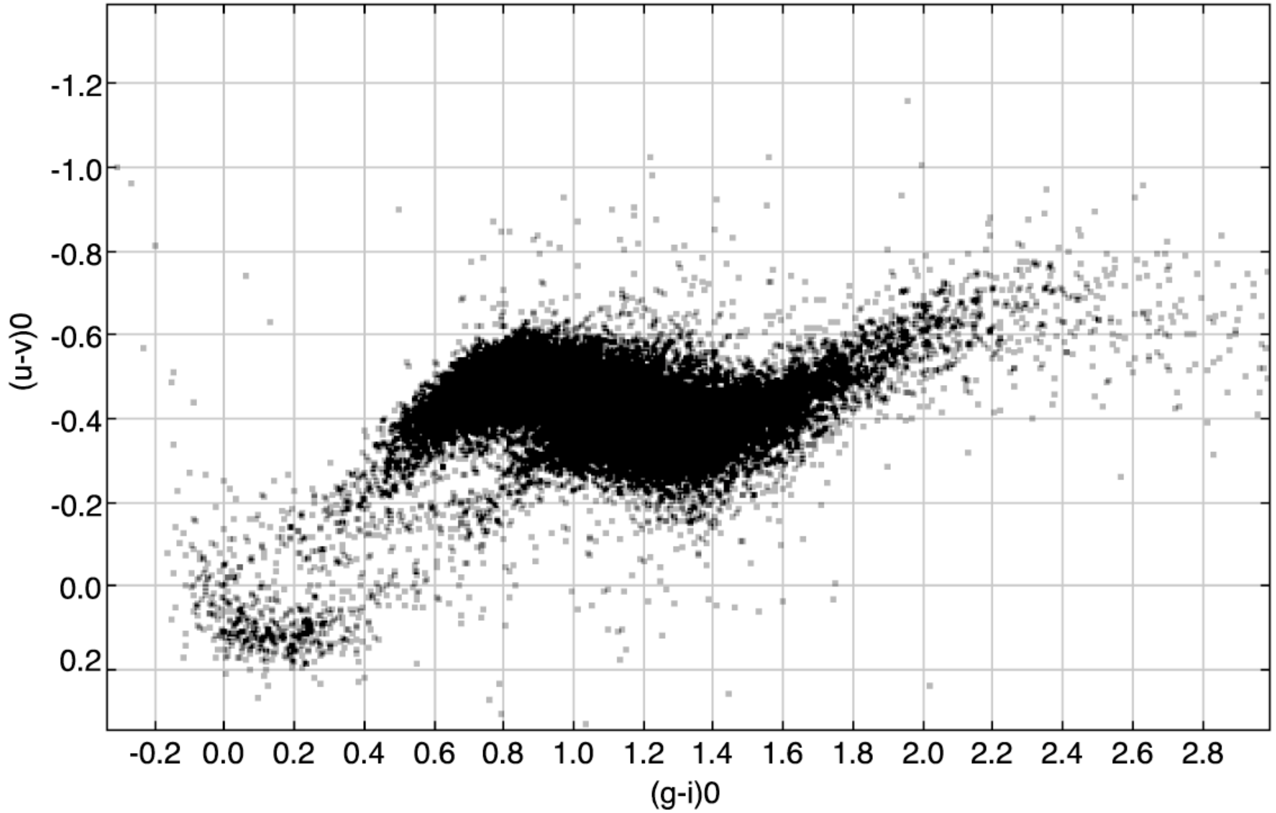
AB magnitudes

Finding those stellar truffles

- The stellar truffles – high value targets
  - Spatially extremely rare objects that can only be found in sufficient numbers by searching a large area of sky
- These stars go to the heart of enduring conundrums:
  - Extremely metal-poor stars: constrain the physical properties of the early Universe – what were the masses of PopIII stars? How did they die? What was the efficiency of mixing of the ISM in the proto-MW? Did reionisation cause a hiatus in star formation?
  - Blue horizontal branch stars and K giants: standard candles of the halo. Use to constrain galactic evolution by tracing accretion.
  - Together with high velocity stars – trace the mass and shape of the MWs dark matter halo.

First results from SkyMapper

- A bulge field at l=0 b=-10



First results from SkyMapper

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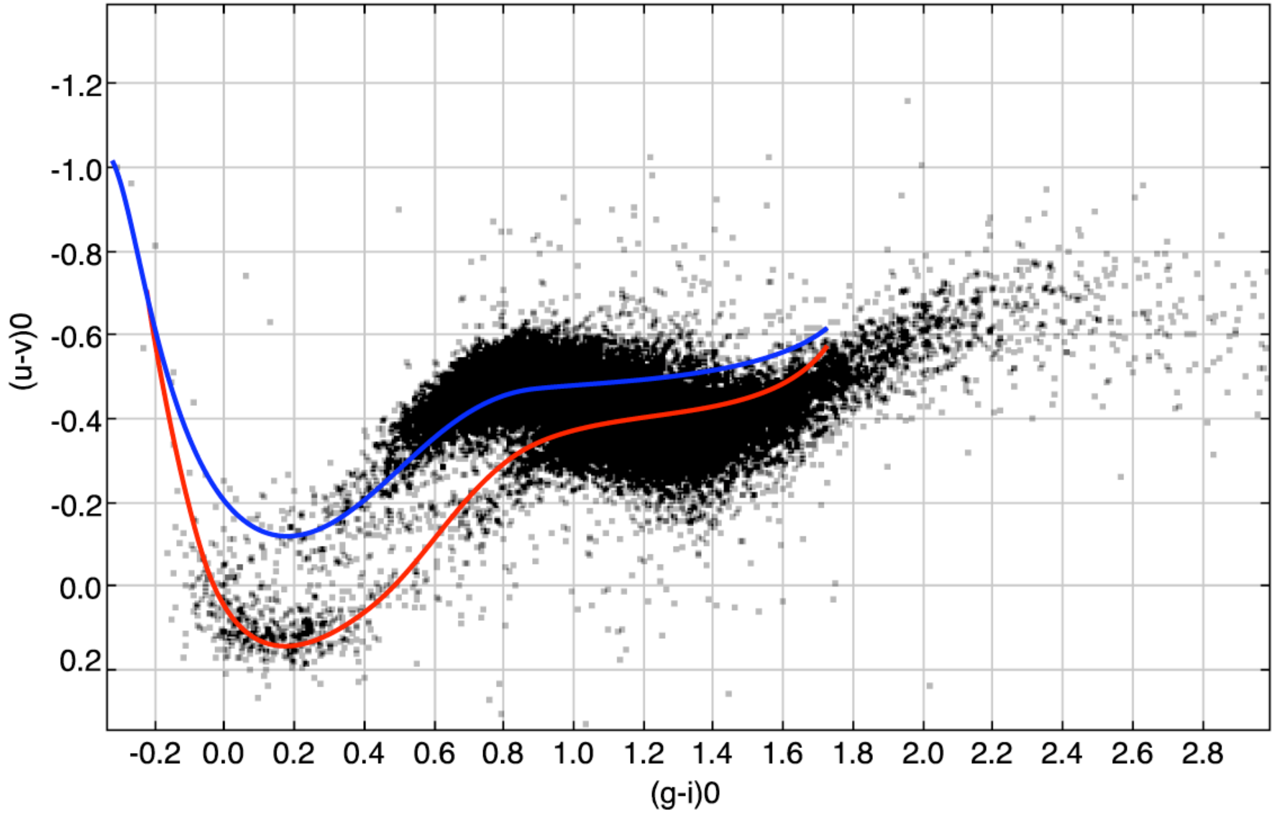
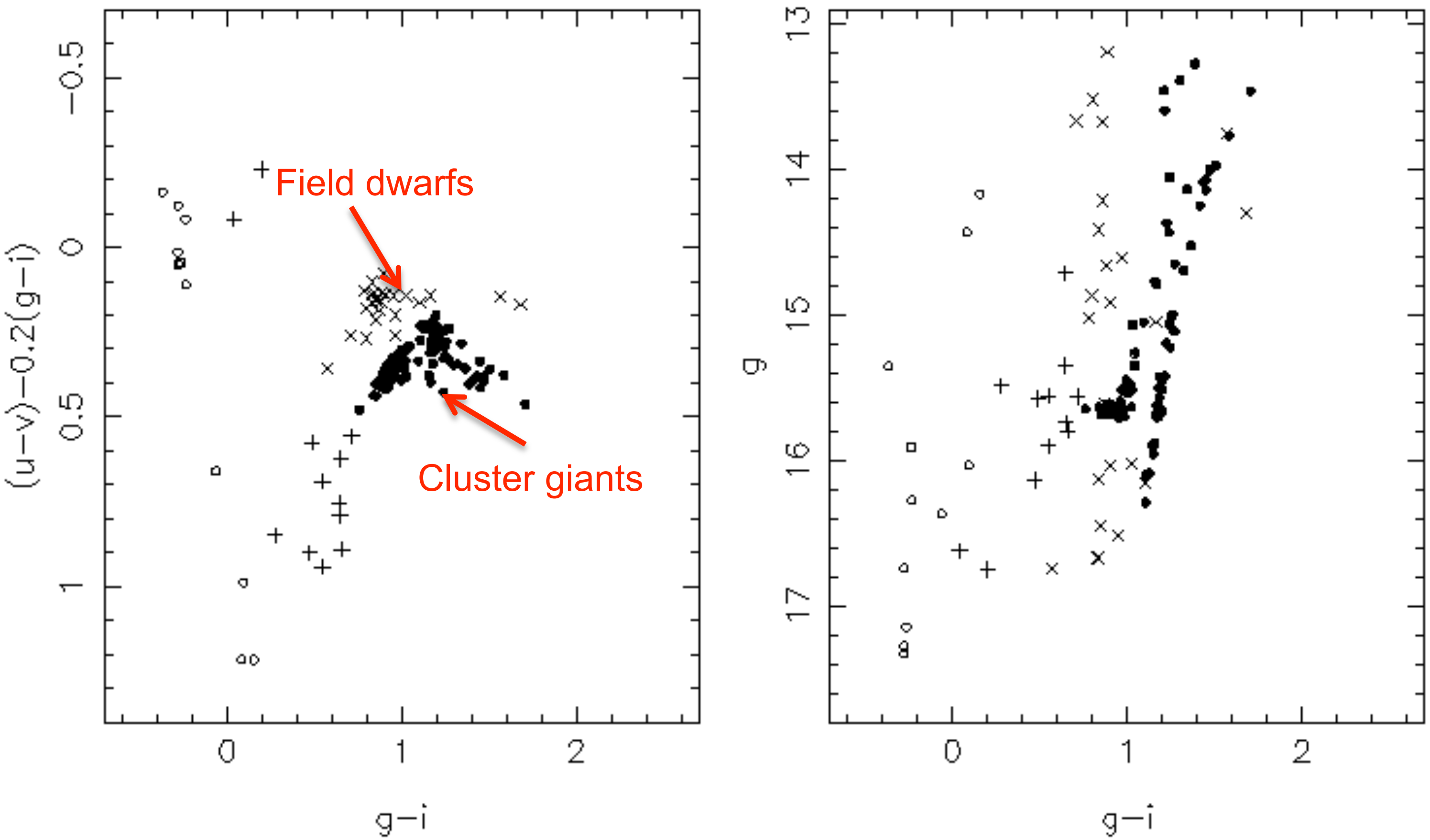


First results from SkyMapper

- Globular cluster NGC 362 projected on to the SMC



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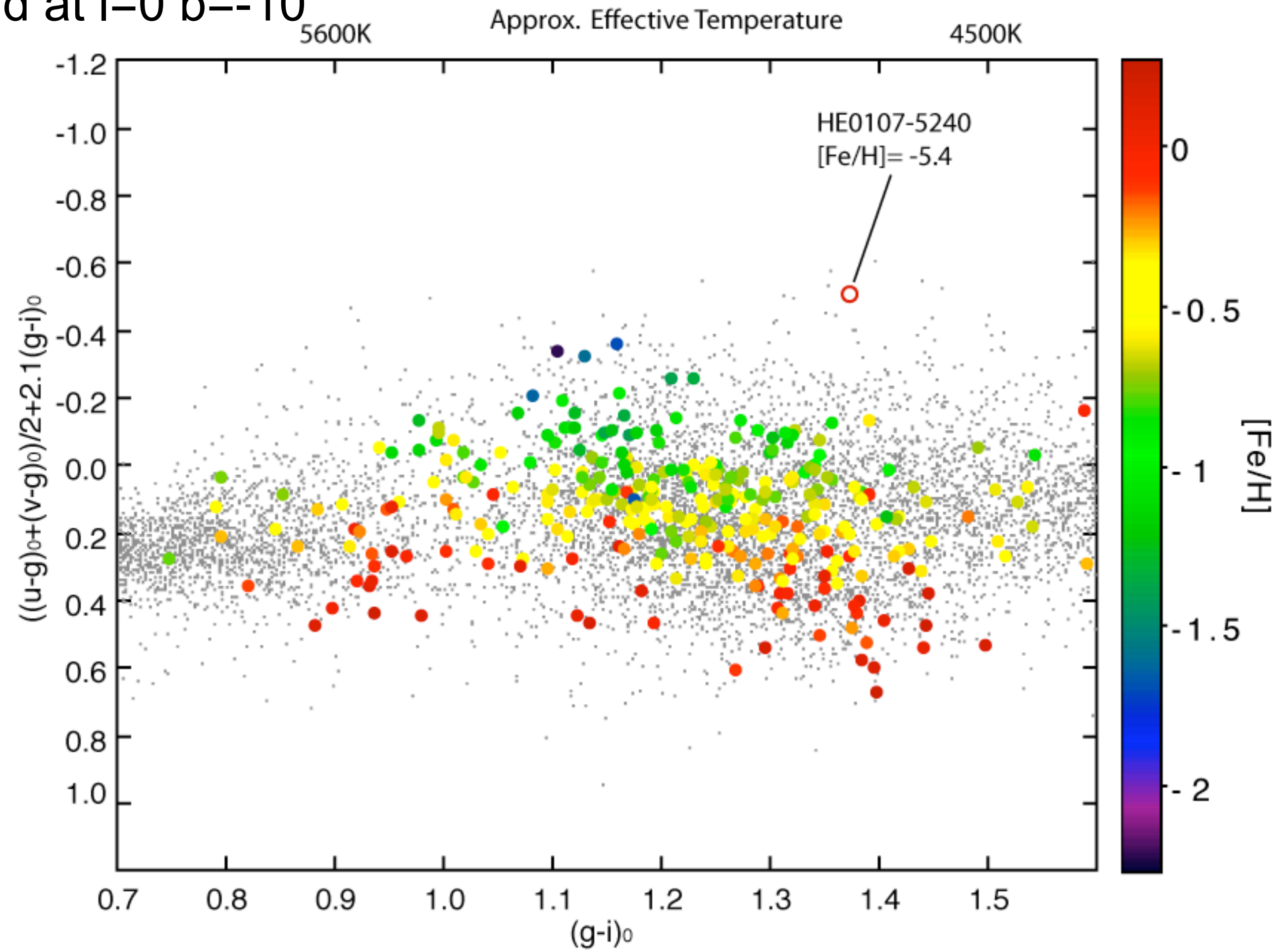
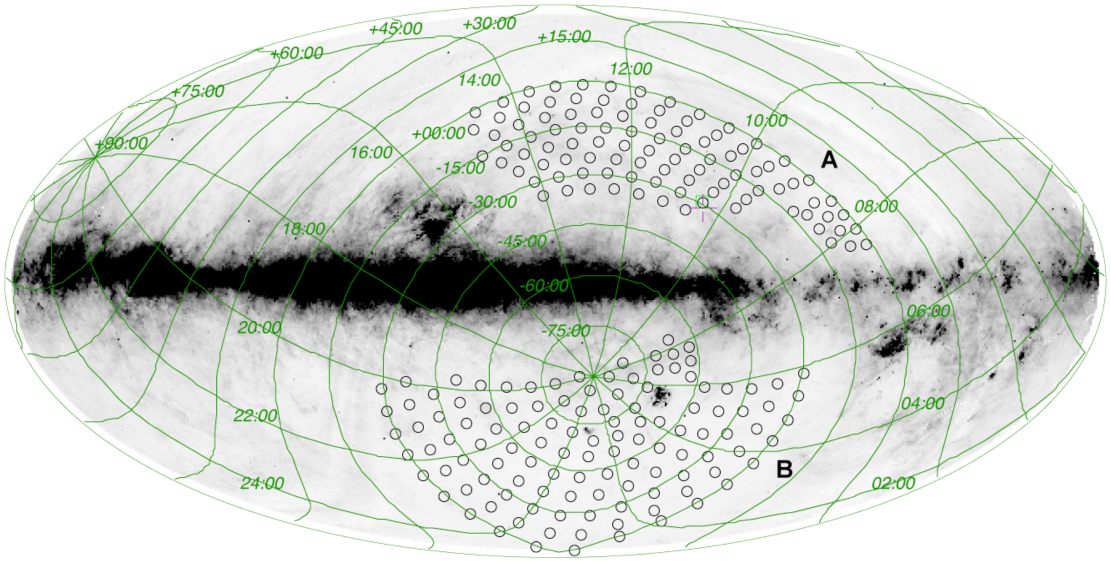


Multi-object spectroscopic follow-up

- MOS is essential to realise the promise of these data.
- We have initiated a large program on the AAT – AEGIS
- Utilise the AAOmega spectrograph – 392 fibres over 2 degrees
- Over the next three semesters we will draw candidates from SkyMapper photometry:
  - EMPs; BHBs; K giants; High Velocity Stars; WDs; QSOs.



AEGIS field centres

The importance of 4-8m in the 2020 landscape

- Important need for 4-8m follow-up into the ELT era
- Let's consider 2020: Gaia + LSST data products offer exquisite photometry and astrometry
- BUT no radial velocities for most Gaia stars and no chemistry
- Moderate / high resolution MOS required to realise the full potential of these data [ngCFHT Davidge; WEAVE on WHT Dalton]
- Hence the importance of programs such as Gilmore et al. Gaia-ESO survey (300 nights; 3 years on the VLT)
- Our AEGIS and HERMES integrate nicely into the GES by focusing on the halo allowing GES to focus on bulge/disk.

Conclusion

- SkyMapper is currently in operation to develop a fundamental reference for the southern sky
- One that is optimised for stellar astrophysics
- Providing input catalogues for galactic studies into the ELT era
- Highlights the imperative for 4-8m MOS follow-up of synoptic surveys
- Essential for unearthing of stellar truffles for the giants