



13–17 April 2015

Santiago de Chile

An ESO Chile Workshop

Satellites and Streams in Santiago

Keynote speakers:

Vasily Belokurov
Gurtina Besla
Michelle Collins
Marla Geha
Oleg Gnedin
Michael Hilker
Rodrigo Ibata
Pavel Kroupa
Dougal Mackey
Steven Majewski
Jorge Peñarrubia
Aaron Romanowsky
Anil Seth
Jay Strader

SOC:

Giacomo Beccari
Vasily Belokurov
Jean Brodie
Michael Fellhauer
Annette Ferguson
Marla Geha
Eva Grebel
Kathryn Johnston
Andreas Küpper (co-chair)
Steffen Mieske (co-chair)

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Satellite Systems | Tidal Streams | The Star Cluster–Dwarf Galaxy Interface

www.eso.org/sci/meetings/2015/Satellites2015.html

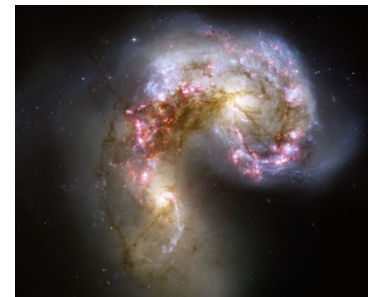
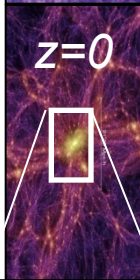
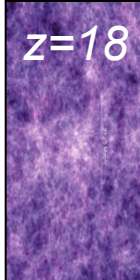


Galaxy Formation and Evolution

- Galaxies form by hierarchical accretion/merging
 - Matter clumps through gravitation
 - Primordial gas starts forming first stars
 - Stars produce heavier elements ('metals')
 - Subsequent generations of stars contain more metals
 - Massive galaxies form from assembly of smaller units

- Galaxy encounters still occur
 - Deformation, stripping, merging
 - Galaxies continue to evolve

- Central black hole also influences evolution



Observational Approaches

■ Study very distant galaxies

- Observe evolution (far away = long ago)
- Objects faint and small: little information



■ Study nearby galaxies

- Light not resolved in individual stars
- Objects large & bright: structure accessible
- Infer evolution through archaeology
- Fossil record is cleanest in early-type galaxies



■ Study resolved stellar populations

- Ages, metallicities and motions of stars
- Archaeology of Milky Way and its neighbours
 - ‘Near-field cosmology’

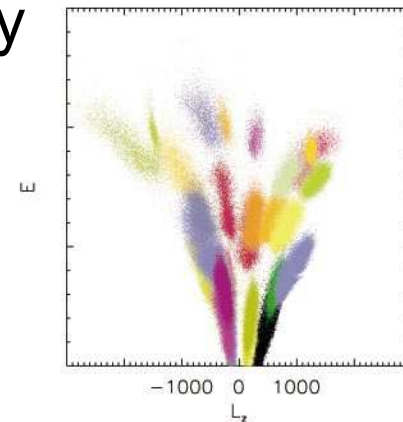


Satellites and Stellar Streams

- Hold much information on galaxy formation process and also allow probing the dark matter distribution
 - Multi-colour surveys useful: distances, streams, ..
 - Spectroscopy: kinematics and element abundances
 - Deduce dark matter distribution and formation history
 - Interpret with help of theoretical models (analytic/simulations)

■ New observational technology driving progress

- GAIA will provide a revolution for Milky Way
- Powerful instruments on VLT system
 - FLAMES, UVES (incl. GAIA-ESO survey)
 - MUSE (90000 spectra over 60"x60")
 - 4MOST on VISTA and MOONS to come
- LSST will provide lots of photometry
- E-ELT will push boundary for resolved studies out to Virgo





VISTA

VST

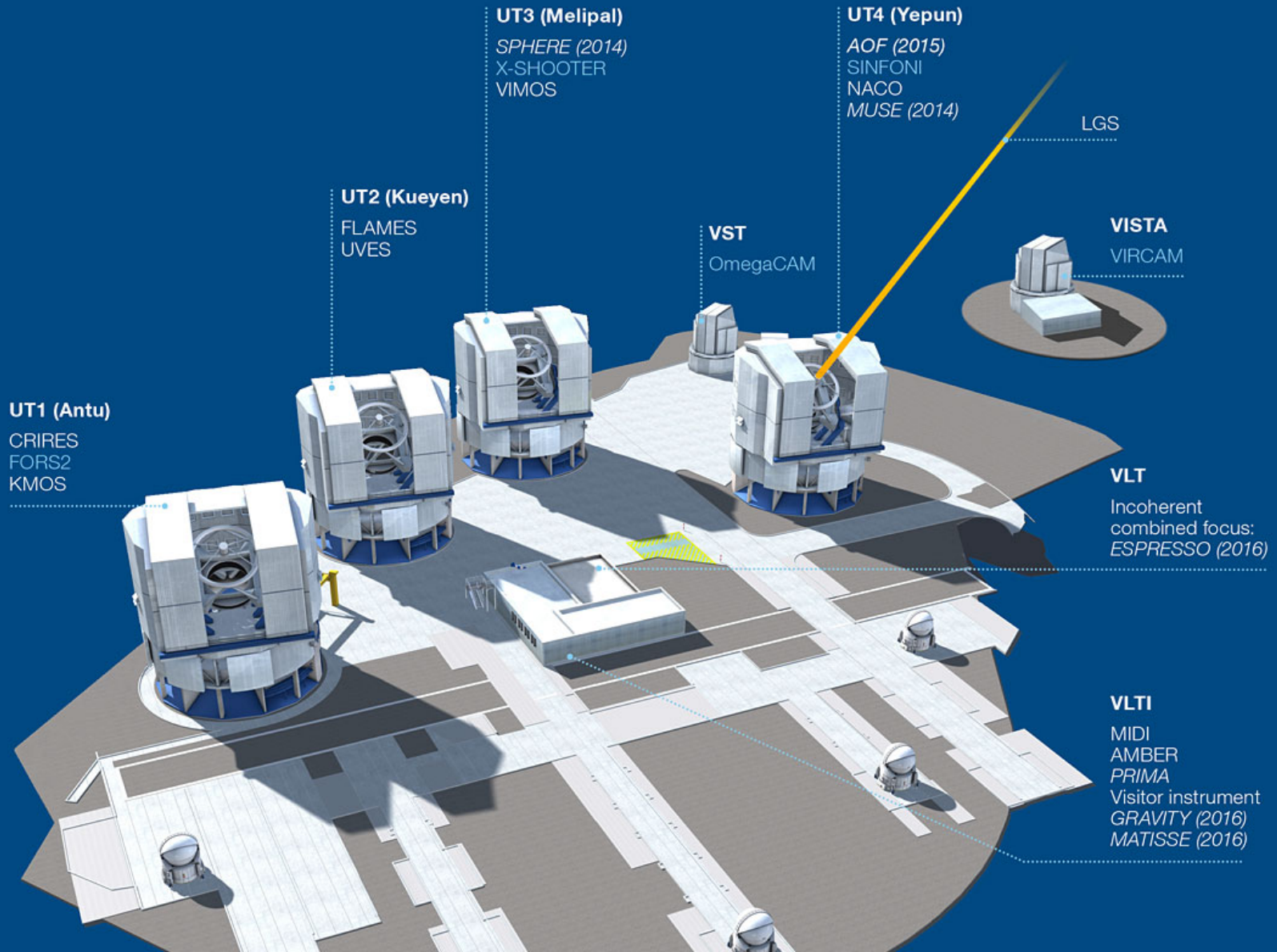
4 UTs

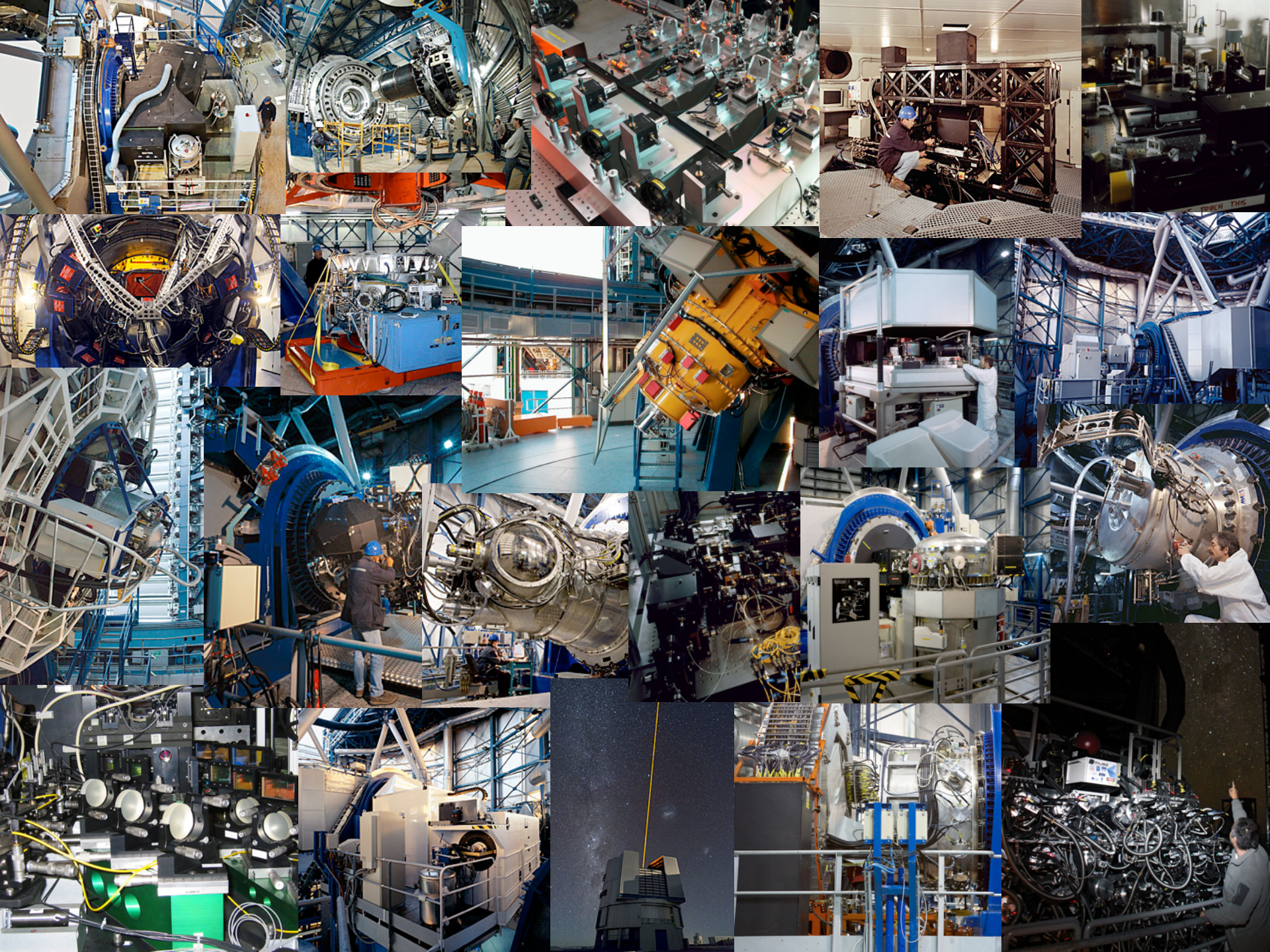
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Control building



Paranal System





E-ELT

- Largest optical/infrared telescope in the world
 - 39m segmented primary mirror: transformational step
 - Science: exo-earth, deep universe, resolved populations
 - On Cerro Armazones, as part of the Paranal system

- Construction has started
 - Cost-to-completion 1122 MEUR (2015 prices)
 - Includes contingency and contribution to first instruments

- Funding
 - Regular ESO income
 - ~30% increase of contributions by 14 Member States
 - Accession of Brazil and Poland
 - Parliamentary ratification moving forward in both cases
 - In Senate in Brazil, already passed Senate in Poland



Armazones and Paranal



Construction in Two Phases

- Council approved E-ELT construction in two Phases
 - Phase 1 affordable without Brazil
 - 39m E-ELT three instruments and most but not all AO capabilities
 - First light late 2024 or soon after; cost 1029 MEUR (2015 prices)
 - Phase 2 (~100 MEUR) will complete baseline E-ELT
- Council authorized spending for entire Phase 1
- The two-phase approach is a back-up plan
 - Path to the E-ELT without Brazil, without additional MS contributions and without any new MS other than Poland
 - By design, Phase 1 starts deviating from baseline in 2017
 - Provides time for Brazil to join ⇒ return to baseline
 - Preferred way forward
 - Will provide fully equipped E-ELT in 2024

