

PI Perspective: Genesis, History, Politics

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Visible and Infrared
Survey Telescope
for Astronomy



What & Why VISTA?

Telescope + infrared camera which images a wide field

- Make infrared **Surveys** of southern sky
- Locate and select interesting objects for ESO's four 8-metre diameter 'Very Large Telescopes' to study in detail
- Do science directly from surveys themselves



Why make Surveys?

- Large object samples for **high significance**
- Large object samples to **find rare objects**
- Large area to find **Large Scale Structures**
- Variability over time in **brightness or position**



Why Infrared?

- Observe Heat rather than Light
- Cooler Objects
- Higher redshift Objects
- See through Obscuring Dust
- Relatively unexplored



General Goals of IR surveys

- Obscured Universe (dust obscures & reddens)
 - Galactic Plane
 - Reddened Active Galactic Nuclei, starbursts, Extreme Red Objects
- Cool Universe
 - Brown dwarfs
- High redshift Universe
 - Distant galaxies – look back in time



Caveat Lector

- This is not a definitive record
- Rather an impression
- too many details not checked with documents
- too many documents not checked for details
- May write the former in retirement!



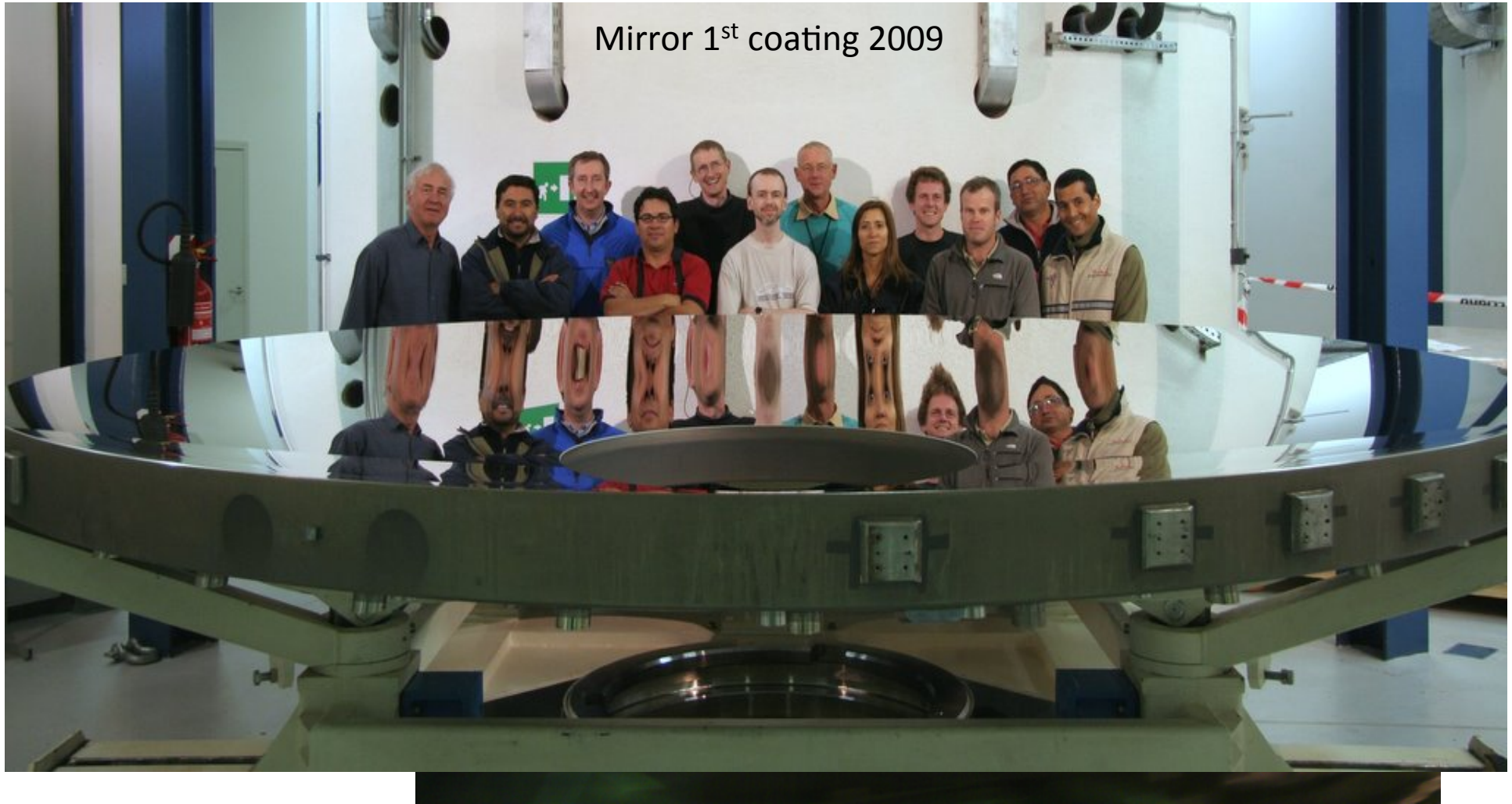
Origins of VISTA - WFAP

- Wide Field Astronomy Panel
- UK Schmidt
- Plate scanners at both Edinburgh (SuperCOSMOS) & Cambridge (APM)
- 1998 August visit to Tucson to discuss a joint wide field Telescope
- But- funding unlikely, even jointly, for more than a 2-m yet the depths required needed a 4-m
- Needed a miracle



Origins of VISTA – JIF bid

- 1998 Sep/Oct Joint Infrastructure Fund opportunity announced
- 1999 Jan Application by VISTA Consortium of 18 UK Universities – technical advice from ATC
- 1999 May £24.8m awarded by JIF to be spent over 5 years
- 1999 Jun purchased 4-m mirror blank from Schott glas – 1st purchase as primary mirror often the longest piece to procure



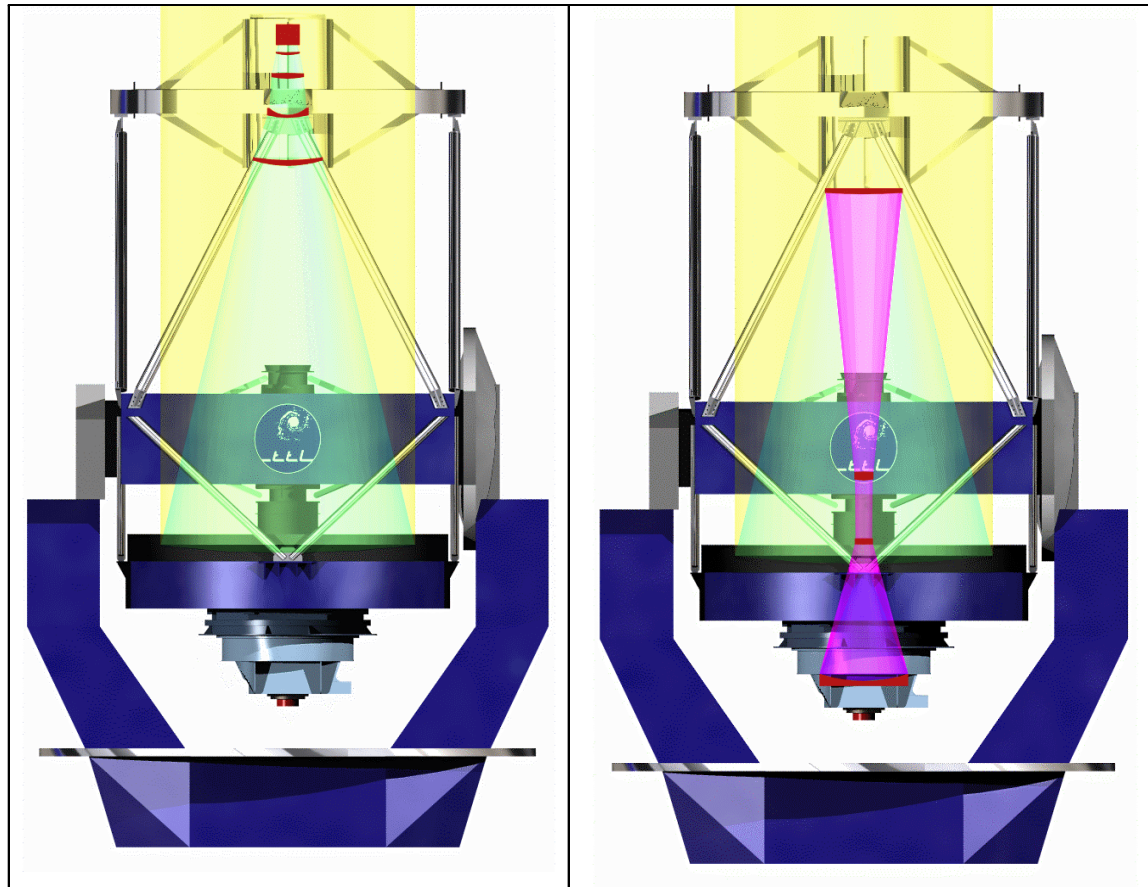
12 December 2005

VISTA



JIF proposal

Optical (left) and Infrared (right) configurations of VISTA.



- F/2.5 primary
- Optical channel prime focus
- IR channel at Cassegrain
- Flip Top-end

What is



THE UNIVERSITY OF BIRMINGHAM



SUSSEX



KEELE UNIVERSITY



University of St Andrews



University of Durham



UNIVERSITY OF CAMBRIDGE



University of Herfordshire



University of Leicester



CARDIFF UNIVERSITY



UCL MSSL



JMU



THE UNIVERSITY OF EDINBURGH



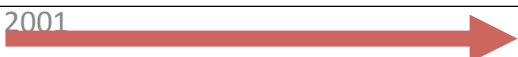
THE UNIVERSITY OF NOTTINGHAM

VISTA (Visible and Infrared Survey Telescope for Astronomy) will be a state-of-the-art 4-metre diameter astronomical survey telescope with exceptionally wide field of view. Equipped with the world's largest optical and infrared (heat) cameras it will rapidly image vast areas of southern sky to very faint limits at several wavelengths. VISTA will be operational in 2005 and will produce deep maps of the sky equivalent to a combined Ordnance Survey Map and census – an atlas of thousands of millions of objects, many being galaxies at the Universe's extremes. VISTA provides UK astronomy with a world leading sky survey capability and will enable ground-based telescopes and space missions to perform in-depth studies of hitherto inaccessible celestial objects.

Construction is supported by a grant from the UK Joint Infrastructure Fund (JIF) to Queen Mary University of London on behalf of 18 UK Universities (identified by their logos above) who form the VISTA Consortium. The Particle Physics & Astronomy Research Council will fund operations from the European Southern Observatory's site in northern Chile. The UK Astronomy Technology Centre (Edinburgh) are responsible for the design, construction and commissioning of the telescope.

VISTA url <http://www.vista.ac.uk>

January 2001



Consortium Board | P. Emerson

Poster for IAU

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How was VISTA Organised? A

- 18 Consortium Universities each nominate member to Consortium Board
- Consortium Board
 - Nominates 7 members to the Executive Board => VEB
 - 1 member/University to Science Committee => VSC
- PPARC as representative of funding body
 - Nominates Financial Representative (with veto) to the Executive Board
- PPARC as stakeholder underwriting operations
 - Nominates Representative to the Executive Board
- Queen Mary as Lead Institution
 - Acts as the agent of the Consortium to ensure the project progresses to conclusion, doing so with the assistance of the VISTA Executive Board
 - Provides the legal framework for contracts, decisions and spending
 - Appoints the nominated members and PI to the Executive Board
 - Appoints its Financial Representative (with veto) to the Executive Board



How was VISTA Organised? B

- Executive Board
 - Chooses an Executive Agency
 - Chooses a site (with assistance of EA)
 - Chooses a Managing Organisation (with assistance of EA)
 - Chooses a Project Scientist (interviews Jan 2000 – WJS)
 - Assists Consortium with all Executive and Financial decisions
 - Monitors progress
- Science Committee
 - Advises and supports the Project Scientist & Executive Board on scientific issues
- Executive Agency
 - Ensures Project carried out following instructions from Exec Board
 - Advises the Executive Board of status and issues
 - Monitors the performance of the Managing Organisation



Choice of Executive Agency

- PPARC or University?
- VISTA Project Management Committee



How was VISTA Organised? C

- Managing Organisation (UK ATC)
 - Contracted to the Executive Agency to deliver a working VISTA
 - Project Management
 - System Engineering
 - Design
 - Tendering
 - Contract management; monitoring, delivery and acceptance
 - Building and Integration
 - Commissioning
 - Handover to operations

 - MO not responsible for data pipeline or archiving or data mining
(these to be funded outside of JIF award, through PPARC program)



Origins of VISTA – choice of MO

- ATC win open competition to be Managing Organisation (Dec 1999)
- IR cameras versus Telescopes
- Technical challenges
- 2000 Mar Kick off meeting interim ATC PM
- 2001 PM Interviews



How to Survey?

Surveys need to be FAST:

Needs Depth (low S) & Area (high Ω)

- Depth: large mirror
- Depth: good images, high efficiency, & small pixels
- Depth: good 'seeing' (minimal twinkling) at site
- Area: large instantaneous field of view on sky



Origins of VISTA – choice of site

- 1999 June AURA
- 1999 July PI visits Chilean sites
- 1999 Sep ESO
- 1999 October AURA
- ESO site chosen on science basis
- Originally ESO would operate VISTA in return for 15% of time
- Site choice meant VISTA later became a key to UK joining ESO in 2002 (unforeseen at time of this choice)




VISTA & VLTS





Enclosure





How was it be operated before UK decided to join ESO?

- By ESO at its Cerro Paranal Observatory
- In queue scheduled mode
- In a way that minimises running cost
- With ~75% of the time going to large surveys
- With ~25% of the time allocated on a TAG basis



Time distribution

- Chile: standard 10% of time
- ESO: ~15% of time available to UK.
- Operational costs met by UK
- After initial proprietary periods expire reciprocal preferential access to each others' (ESO/UK) processed VISTA data.
- Public release.
- Some open time



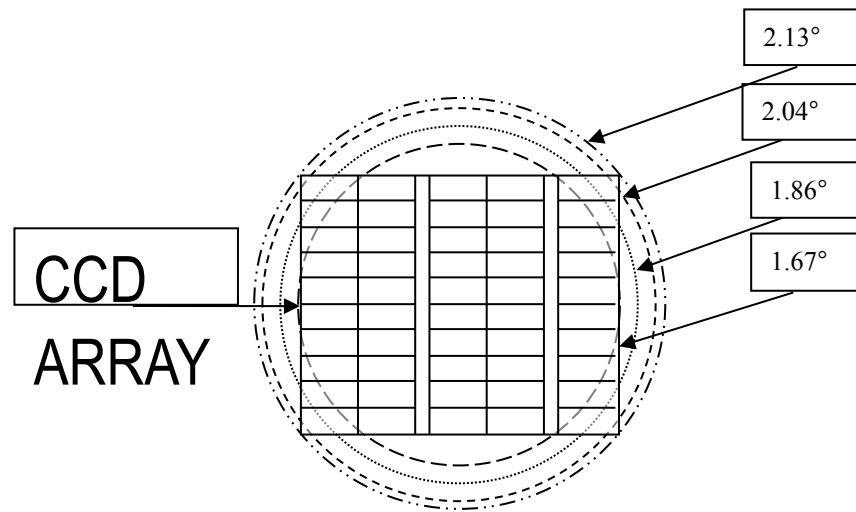
- Combined VISTA/VST collaborative survey, with optical and infrared parts reaching comparable depth by end 2005.
- Optical part by VST starts 2002 taking up to 50% of ESO VST time for 3 years
- Infrared part by VISTA starts 2005 taking up to 25% of VISTA time for 1 year.
- Data available simultaneously to ESO and UK communities.



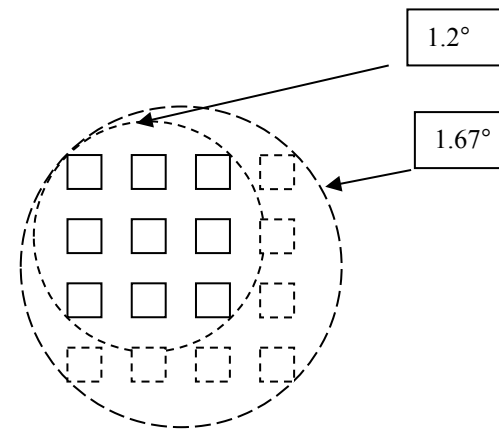
UK Joins ESO

- Discount on joining fee for giving VISTA to ESO on completion
- ESO operates
- Survey data released to whole community
- Community AO to apply to specify surveys
- Penalty for no/late delivery – date originally set based on when ESO would lose expected science synergy with VST surveys – if VISTA ready >2 years after VST

Changes from JIF - Focal Planes



Visible Focal Plane



IR Focal Plane



Design Reference Program

Preliminary Ideas on Surveys

- Wide (a1,a2,a3) 649 nights + overheads
- Deep 219 nights + overheads
- Very Deep 212 nights + overheads
- 3 years or adding
 - i) 10% overhead
 - ii) 25% time to Chile & ESO
 - iii) weather
 - iv) 0% other UKbecomes 5.5 yrs



Data handling VDFS

- VISTA Data Flow System
- E-science funding
- CASU => quick look pipeline -> ESO
- CASU => VDFS pipeline
- WFAU => VDFS science archive
- Setup & do WFCAM surveys per se and as demo for VISTA
- Do VISTA surveys



How it went

- You'll hear from others
- Many meetings to discuss progress, costs, schedule, and chose options make/confirm decisions

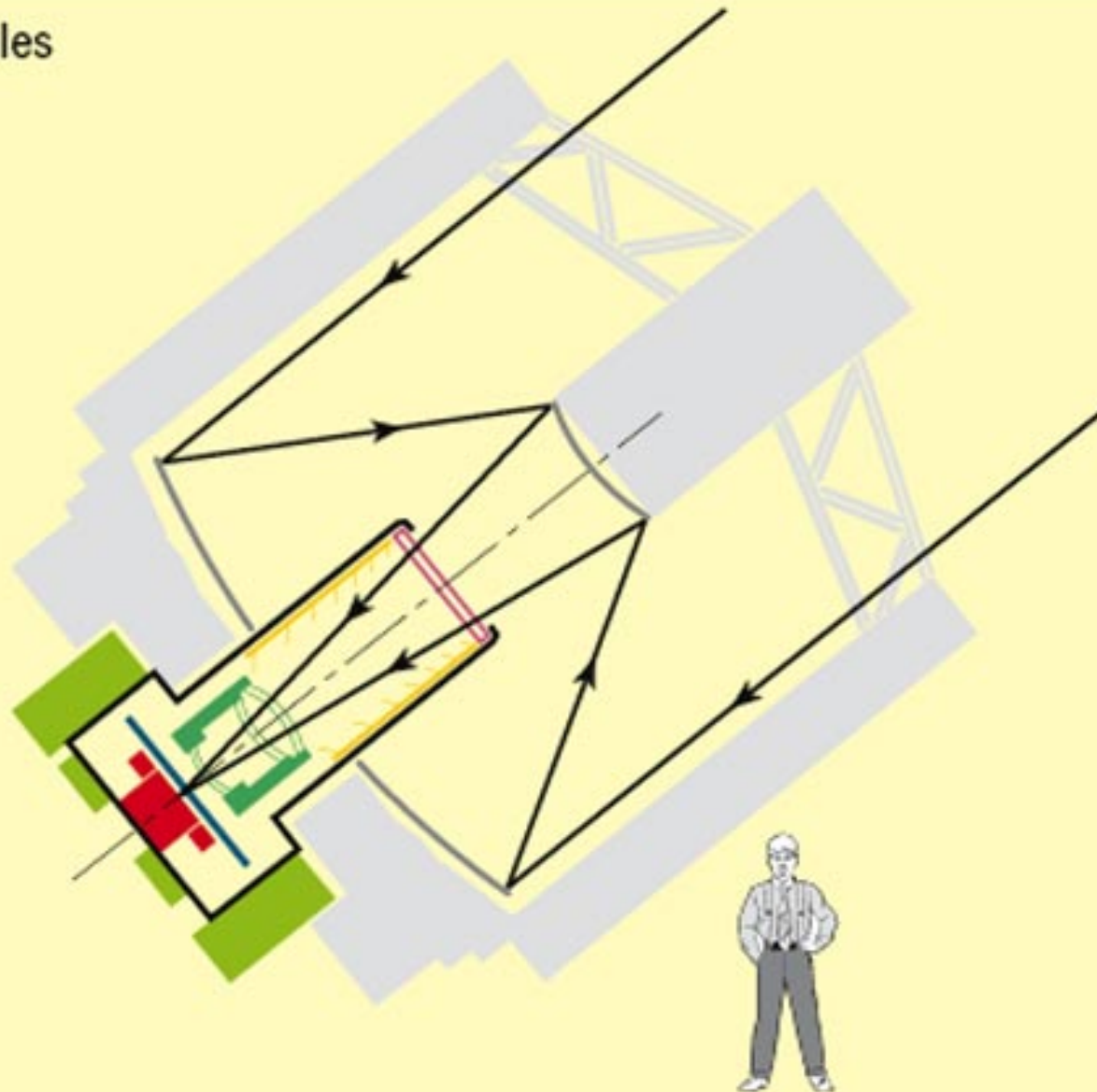


VISTA: Introduction

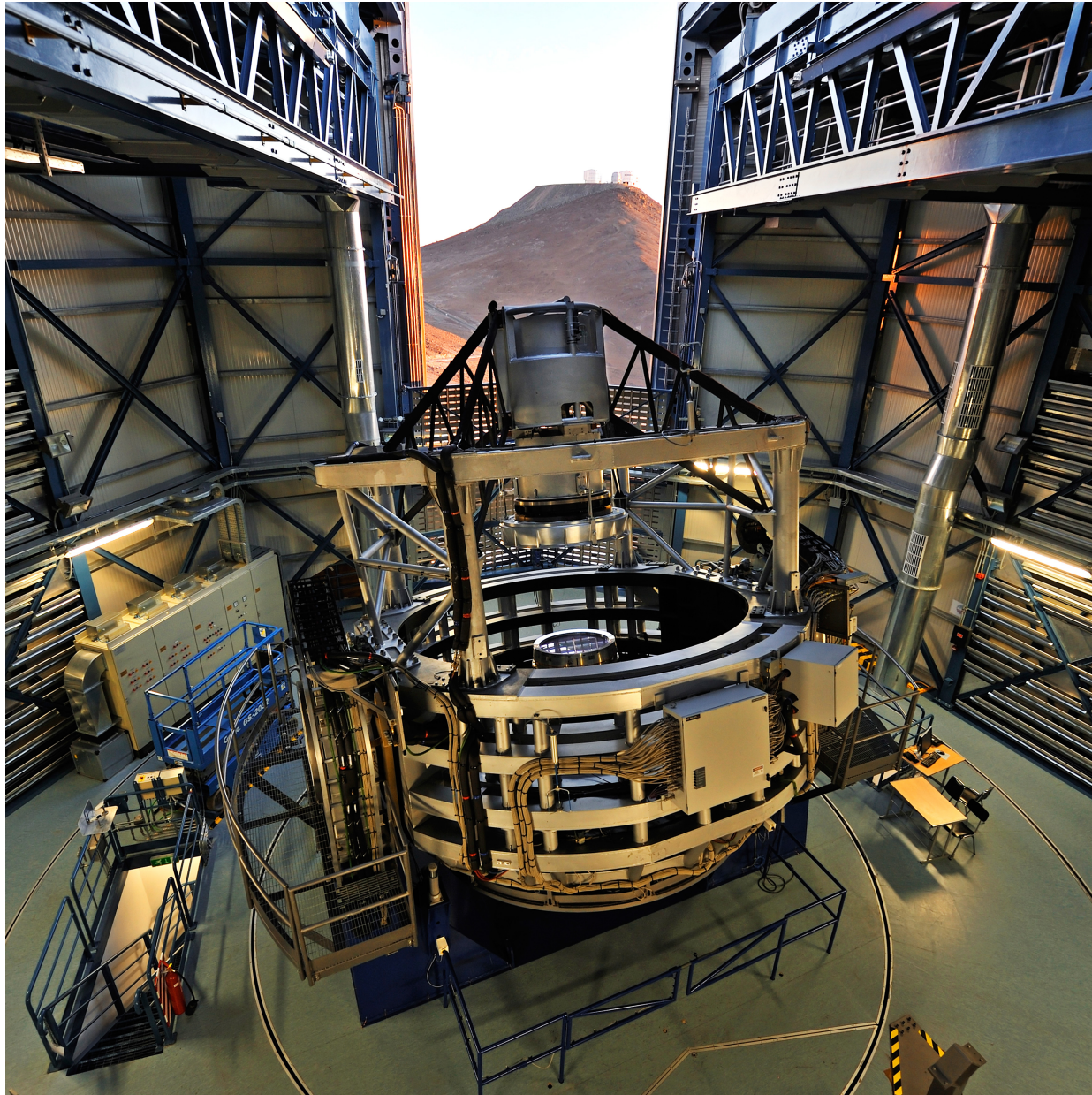
- The MO delivers the technical specification, design, construction, assembly integration and commissioning of VISTA.
- The proposal of the UK ATC as the MO is based on a two phase project:
 - Phase A: conceptual design of VISTA and finalization of specifications.
 - Conceptual design validation review in Nov. 2000
 - Final Design Review Optics in Feb. 2001
 - System design review May 2001
 - Phase B: procurement, construction integration and commissioning

Telescope & Camera Schematic

- detector array modules (infrared and CCD)
- filter barrel
- lens barrel
- baffle tube
- pressure window
- cryostat vessel
- electronics rack
- telescope structure and mirrors



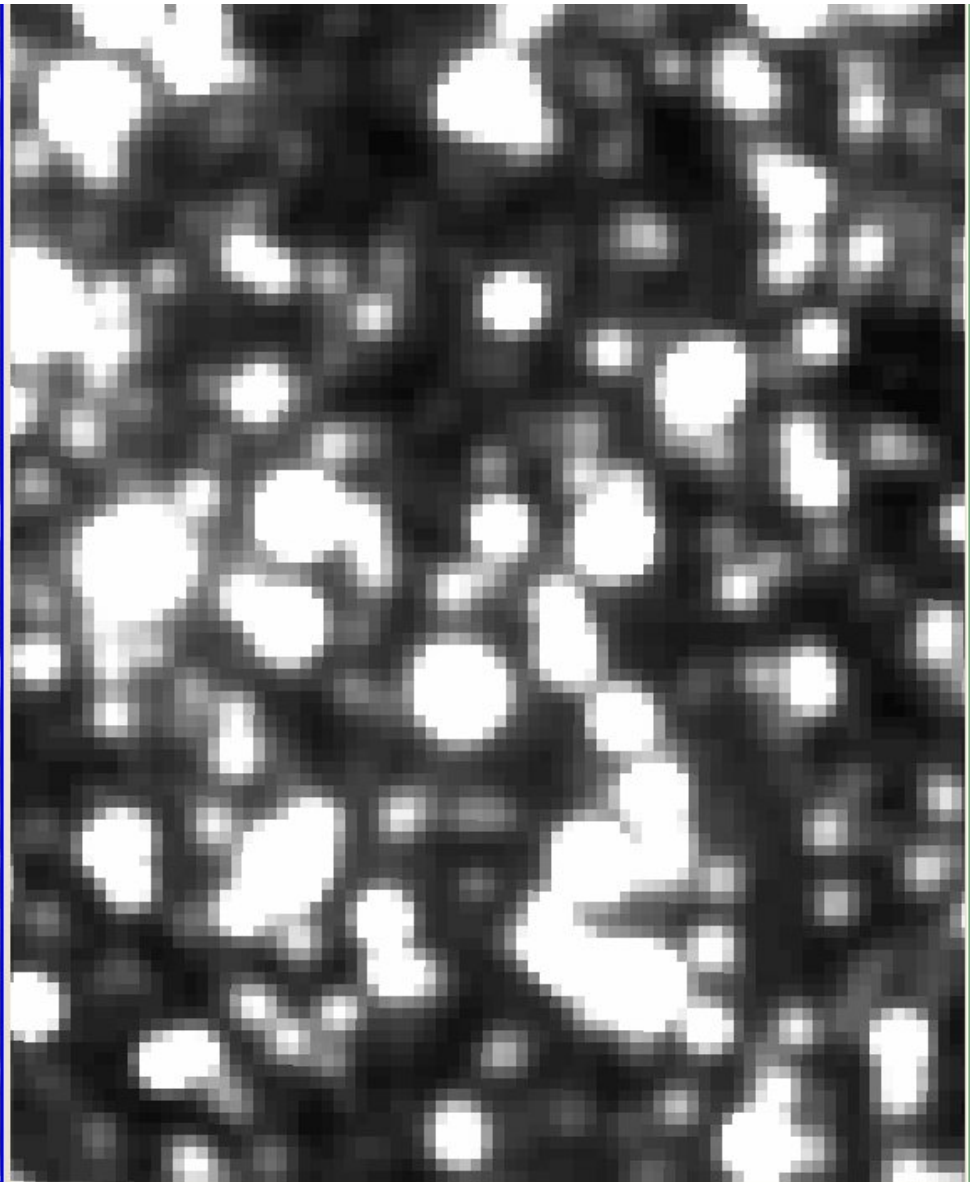
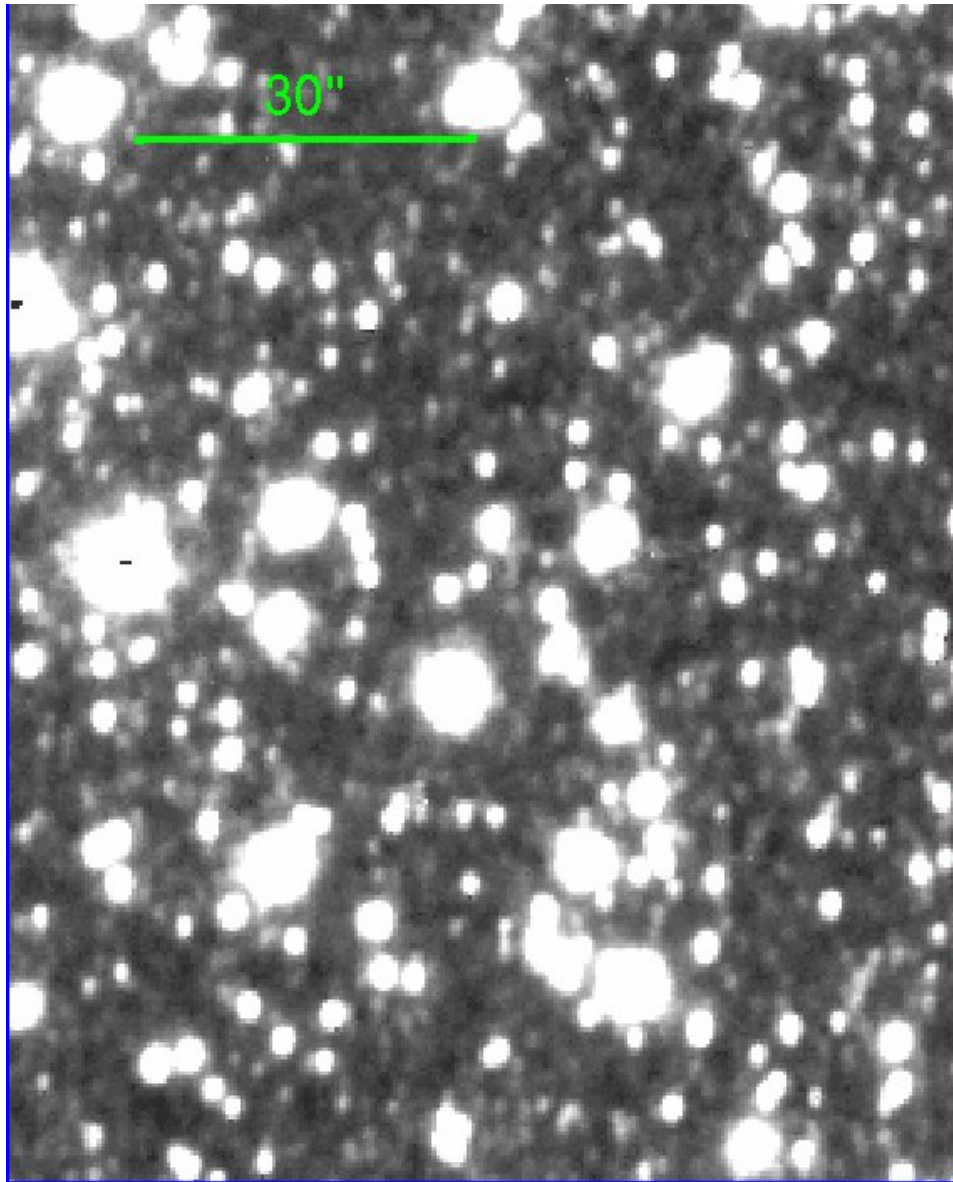
VISTA at sunset – with VLT beyond





Project end & science start

- Handed over for operation by ESO 2009
- Works extremely well – I wasted my time worrying about how the novel bits would work – brilliantly!
- Just one significant intervention - a hexapod leg needed replacement due to wrong internal pre tension
- Least technical downtime of ESO's Paranal telescopes
- Main loss of time (apart from weather) due to failure to find good guide/active optics stars
- Due to poor entries in catalogues not VISTA
- Upgrades to catalogues used and SADT fixed much of this
- Science tomorrow





Conclusion

- ATC designed and, with its subcontractors for the other subsystems, especially with RAL for the camera, produced a superbly productive facility
- VISTA was a key to getting UK into ESO
- VISTA works superbly well
- Thank you from all users of VISTA
- to Will & Alistair as PS &PM
- to all at ATC, RAL, and contractors who helped build VISTA
- to CASU & WFAU for pipeline/archive
- to STFC for funding
- We Astronomers have a lot to celebrate thanks to you!