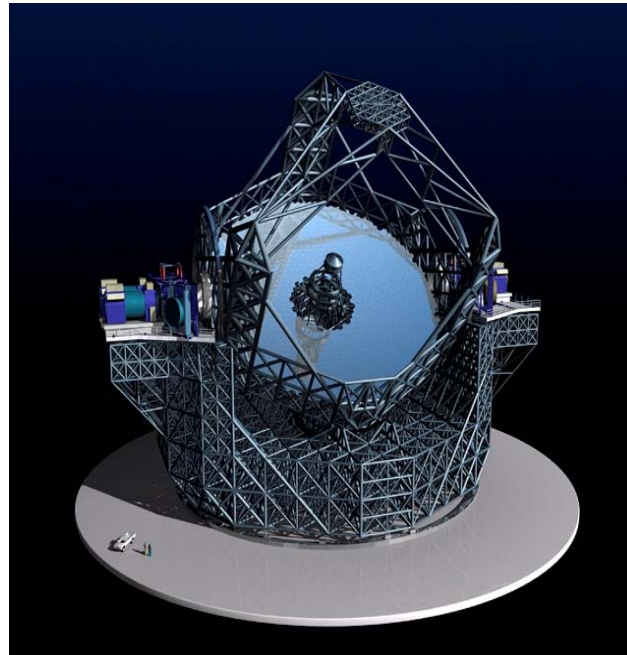


- Summary of Science WG and DRM work so far
- Goals of the Workshop



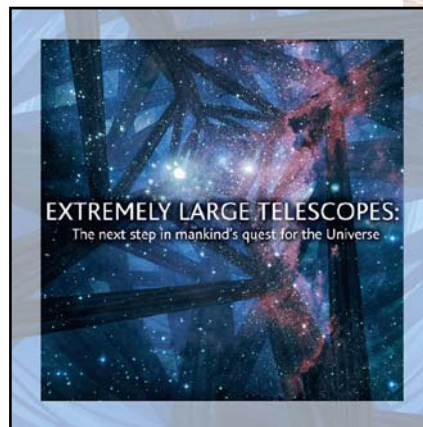
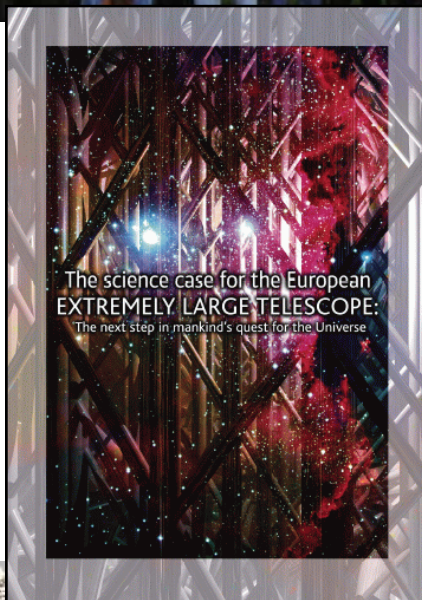
# ELT science case development in Europe



Florence  
2004



Science case  
documents



Marseilles 2003

Marseilles 2006



# E-ELT Science Working Group

Marijn Franx (co-Chair)

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Markus Kissler-Patig

Hans Zinnecker

Arne Ardeberg

Piero Rosati

Martin Haehnelt

Raffaele Gratton

With thanks to previous  
members

Peter Shaver

Bob Fosbury

Willy Benz

Magda Arnaboldi



- Produced first report April 2006
- Provides scientific input to the Project
- Provides a link with the community
- Has begun work on a DRM



# European ELT SWG “Prominent” Science Cases

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- Exo-planets
    - Direct detection
    - Radial velocity detection
  - Initial Mass Function in stellar clusters
  - Stellar disks
  - Resolved Stellar Populations
    - Colour magnitude diagrams
    - Abundances
    - Detailed abundances and kinematics
  - Black Holes
  - The physics of galaxies
  - Metallicity of the low-density IGM
  - The highest redshift galaxies
  - Dynamical measurement of the Universal expansion
- Used as input to DRM
  - Selected from a larger set of cases
  - Not complete
  - Covers parameter space

# European ELT SWG “Prominent” Science Cases

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  - Direct detection
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EUROPEAN SOUTHERN OBSERVATORY

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Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral  
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

APPLICATION FOR OBSERVING TIME PERIOD: 78A

Important Notice  
By submitting the proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the status of COOs and the agreement to act according to the ESO policy and regulations, should observing time be granted.

1. Title	The Physics and Mass Assembly of Galaxies out to $z = 6$			Category	A-1		
2. Abstract	We propose to obtain ELT spatially resolved spectroscopy of a sample of $\sim 100$ massive galaxies at $0 < z < 6$ selected from future large area optical/near-IR surveys. These observations will yield direct kinematics of stars and gas in the first generation of massive galaxies (in the range $11 < M < 5 \times 10^{11} M_{\odot}$ ), as well as their radial population properties. One will also be able to derive dynamical masses, spin, metallicity, star-formation rates, their evolution maps, to investigate the presence of disk and spheroidal components and the importance of dynamical processes (e.g. merging, in-situ/star-form) which govern galaxy evolution. These data will also allow one to study the onset of well known scaling relations at low redshifts, and to witness the gradual shift of our detection from the most massive galaxies in the highest density regime to less massive galaxies in the field. The whole program is designed to provide the ultimate test of galaxy formation theories.						
3. Run Period	Instrument	Telescope	Mount	Seeing	Sky Trans.	Obs.Mode	
A	T1	FORIS2	20k	say	4	PEO	v
4. Number of nights (hours)	Telescope(s)		Amount of time				
a) already awarded to this project							
b) still required to complete this project							
5. Special remarks	This proposal contains only science cases requiring spatially resolved spectroscopy. Other outstanding science cases entirely related to the Formation and Evolution of Galaxies, which require excellent AO performance or just using limited observation, are discussed in a separate proposal.						
6. Principal Investigator	Piero Rosati (ESO, ESO, p.rosati@eso.org)						
Co-PIs	Matteo Pucki (ESO, ESO), Andrea Ceccati (Bologna, I), Sara Terti (ESO, ESO), Marije Franx (Leiden, NL)						
7. Is this proposal linked to a PhD thesis preparation? State role of PhD student in this project							



SWG has produced proposals (with community input)  
3 Demo cases were selected to start things off...

# European ELT SWG “Prominent” Science Cases

- Exo-planets
  - Direct detection
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1. Title				Category	A-1			
The Physics and Mass Assembly of Galaxies out to $z \approx 6$								
2. Abstract	We propose to obtain ELT spatially resolved spectroscopy of a sample of a thousand massive galaxies at $0 < z < 6$ selected from future large area optical/near-IR surveys. These observations will yield direct kinematics of stars and gas in the first generation of massive galaxies (in the range $11 < M < 5 \times 10^{11} M_{\odot}$ ), as well as their radial population properties. One will also be able to derive dynamical masses, spin, metallicity, star-formation rates, their evolution maps, to investigate the presence of disk and spheroidal components and the importance of dynamical processes (e.g. merging, in-situ/starflow) which govern galaxy evolution. These data will also allow one to study the onset of well known scaling relations at low redshifts, and to witness the gradual shift of our detection from the most massive galaxies in the highest density regime to less massive galaxies in the field. The whole program is designed to provide the ultimate test of galaxy formation theories.							
3. Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
A	T3	FORIS2	202h	May	4	$\leq 0.4''$	PEO	v
4. Number of nights (hours)	Telescope(s)		Amount of time					
a) already awarded to this project								
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5. Special remarks	This proposal contains only science cases requiring spatially resolved spectroscopy. Other outstanding science cases entirely related to the Formation and Evolution of Galaxies, which require excellent AO performance or just using limited observation, are discussed in a separate proposal.							
6. Principal Investigator	Piero Rosati (ESO, <a href="mailto:prosat@eso.org">prosat@eso.org</a> )							
Co-PIs	Matthias Piatek (ESO, ESO), Andrea Cezari (Bologna, I), Sara Terti (ESO, ESO), Marja Franx (Leiden, NL)							
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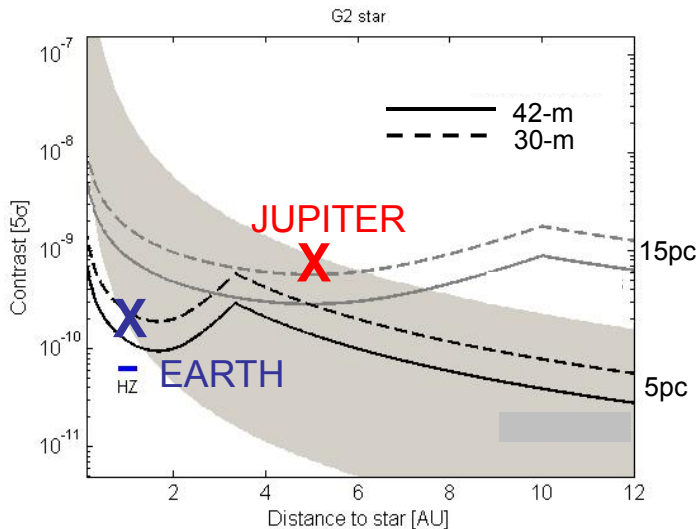
# The Design Reference Mission (SWG + ESO)

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- DRM Goals
  - Produce a set of science proposals and simulations
  - Assess science output and assist with tradeoffs
- Starting with 3“Demonstrator cases” (well underway)
  - Direct Detection of Exo-planets: extreme contrast extraction
  - Stellar populations: I-K Colour-Magnitude Diagrams
  - Galaxy mass assembly: multi-IFU resolved Spectroscopy
- Then a wider set (based on prominent cases)
  - 17 observing proposals completed

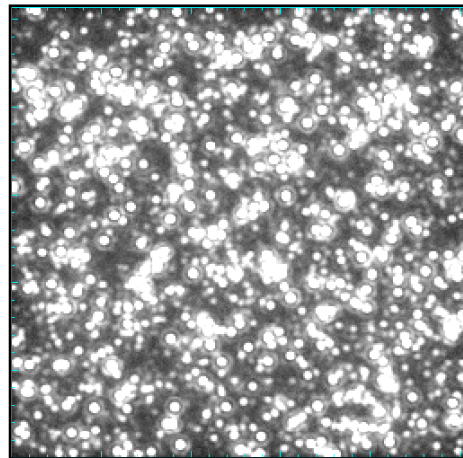
# DRM work areas (cont); current status

## ■ 3 Demo cases have completed first iteration



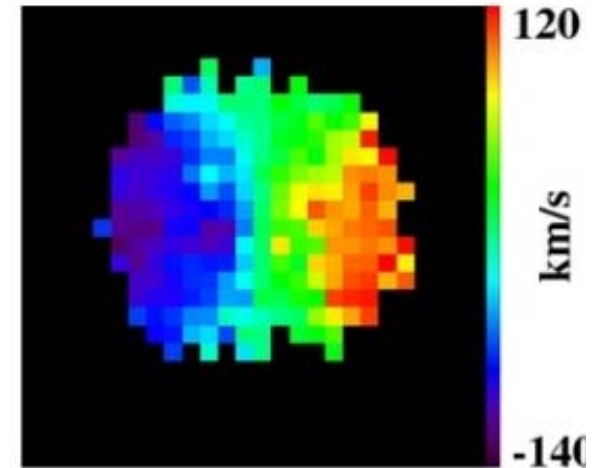
Exo-planets

Extreme contrast detection  
(EPICS team)



Stellar populations

Imaging in crowded fields  
(J. Liske – ESO)



Physics of high-z galaxies

IFU observations  
(M. Puech - ESO)

➤ Issues remain – topics for this workshop

## ■ Need to simulate a wide range of observations

➤ Remaining ~14 proposals



# ELT “Preparatory Phase” WP04000

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- The “ELT Preparatory Phase” program is been funded by EU FP7
- Includes WPs on (e.g.) financial arrangements, industrial links, international cooperation & some technical aspects for future upgrades
- Includes a WP to work on the DRM
  - WP manager : I. Hook, Deputy J. Liske
  - 2 year period: 2008-2009
  - Budget of ~ 1M Euro to fund meetings and staff

# Design Reference Mission WP; Objectives

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- Maintain alignment of the E-ELT project with the scientific aspirations of the community ★
  - Further enhance community involvement in the E-ELT project
- Build a set of simulated astronomical observations followed by scientific analysis of the results ★
  - an essential aid to the E-ELT Project in making critical design-related decisions
- Explore synergy between the E-ELT and other large astronomical facilities
- **Milestones:**
  - M1: 1<sup>st</sup> DRM Community Workshop ( $T_0 + 5$ )
  - M2: 2<sup>nd</sup> DRM Community Workshop ( $T_0 + 17$ )

# Goals and topics for this Workshop

---

- Review simulation work already done
  - as part of DRM
  - by instrument teams
  - by others in the community
- Discussion
  - Are there tools/techniques that we could share?
  - Do the simulation inputs agree?
  - Are we making correct / consistent assumptions?
  - **Do the results of simulations agree?**
  - Are there conclusions that should be fed back to the ELT project?
- Plan future work

# E-ELT science case – next steps

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- DRM development:
  - Finish Demo cases
  - Expand simulations to other cases (already started)
    - High-z galaxy imaging
    - Stellar disks
    - Inter galactic medium
  - Prepare simulations for different site parameters
- Sep 2008: JENAM – E-ELT science session
- Q2 2009: Community Call for Proposals + Workshop
- End 2009: Updated Science Case with simulations

The End