Process:

1. select science cases to include (about one hour)

2. for each science case identify (rest of the day)

   1. science → relevant papers
   2. telescope/instrument requirements (form for Piero and Isobel)
   3. people do this

Cosmological parameters

dark matter, dark energy, expansion history

First light

observe end of reionisation era, identify sources responsible for ionising the universe, primordial chemical enrichment, first molecules

Cosmic Web

observe the build-up of the large scale structure, observe the clumping of the gas

Evolution of galaxies

primordial galaxies, determine the star formation rate as function of age of the universe, mass assembly, chemical evolution

Black hole and galaxy connection

build up of super-massive black holes

Fundamental physics

Changing fundamental constants?, theory of
gravity, particle masses, exotic matter

R. Sharples   High-z emission-line galaxies
  → first objects

(F. Hammer   Hot topics in galaxy evolution)
  → galaxy evolution

J. Bergeron
  → first light

M. Della Valle   Supernovae
  → cosmological parameters, star formation history

D. Burgarella   UV extinction
  → star formation rates

G. Ghirlanda Cosmology with GRBs
  → cosmological parameters, first objects, star formation history

P. Molaro   CODEX
  → fundamental physics, cosmological parameters

(Cassisi & Bono   Cepheids, RR Lyrae, TRGB)
  → cosmological parameters

Malcolm Bremer The first objects

Jacqueline Bergeron Observational strategy for tomography of the IGM and for the first objects

Denis Burgarella Complementarity ELT/ALMA/JWST: Galaxies at low and high z

Massimo Della Valle The evolution of the cosmic SN rate and cosmology with the primary indicators

Francois Hammer Dating the epochs of galaxy formation: dynamics, chemistry & stellar populations

Matt Lehnert Galaxy Dynamics: Understanding the Growth of Galaxies

Paul O'Brien 1. AGN outflows ;2. GRBs

Jacqueline Bergeron's summary in Oxford 2003

science goal	obs. mode	100m	30m	NGST
• reionization epoch				
QSOs & galaxies at $z \sim$10-15	high res spectra	++	+	
id plus GRS	low res spectra	+	+	+
sub $L^\star$ galaxies at high z	imaging	+		
• IGM mapping at $z \sim$2-3.5	high res spectra	+	+	
at $z \sim$3.5-4.5	id	++	+	
• DM distribution at $z \sim$1-2.5	imaging		+	+
• SNIa, Ω_Λ, SN rate				
at $z <$2	low res spectra	+	+	
at $z \sim$2-4	id	+		
• BH masses at $z <$0.5	high res spectra	+	+	
at $z >$0.5	id & spatial res	+		
• galaxies at $z \sim$1-5	low res spectra	+	+	+
spatially resolved spectroscopy	low res IFUs	+	+	
id	high res IFUs	++	+	

Cosmological parameters

dark matter (JWST), dark energy (Leibundgut, Hook, Della Valle, Ghirlanda), expansion history (Molaro, D'Odorico, Cassisi, Bono)

First light

primordial galaxies (Bremer, Cuby, Sharples, Morris), first objects (Della Valle, Ghirlanda), identify sources responsible for ionising the universe (Bremer, Bergeron), primordial chemical enrichment (Bergeron), first molecules (Molaro)

Cosmic Web

observe the build-up of the large scale structure (Bergeron), observe the clumping of the gas (Morris)

Evolution of galaxies

determine the star formation rate as function of age of the universe (Burgarella, Hammer, Della Valle), mass assembly (Cimatti, Hammer Lehnert), chemical evolution (Pettini)

Fundamental physics

Changing fundamental constants (Molaro, Petitjean, Murphy), theory of gravity, particle masses, exotic matter

- Reionisation
- Dark matter, dark energy, expansion history
- Cosmic Web
- Mass assembly
- Evolution of galaxies
- Black hole and galaxy connection
- Chemical enrichment
- Fundamental physics