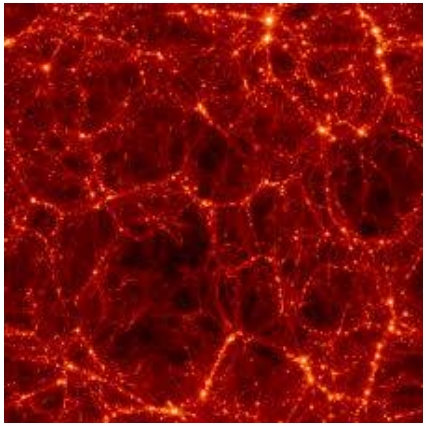
Galaxies & Cosmology (I)

- *Two major scientific objectives for this theme, both of them included among the priorities by the national and international communities, and bringing together the scientific teams and expertise existing in the three laboratories of the Marseille campus (CPPM, CPT and LAM):*
  - *Constraining the **cosmological models** of the universe and their **associated parameters***
  - *Exploring the physics of **Dark Matter** and **Dark Energy***
  - *Understanding the processes of **galaxy formation and evolution in a cosmological context***
- *These two objectives*
  - *feed each other through the **exchange of cross expertise***
  - *share the **access to major facilities** by the development of **innovative instrumentation** and **legacy surveys** within the framework of large international collaborations.*

Galaxies & Cosmology (II)

- *Different actions are conducted by our teams for **constraining the cosmological models of the universe** and their **associated parameters,** including the combination of several **cosmological probes**, such as*
  - The supernovae Ia used as privileged standard candles
  - The study of the primordial universe and the CMB
  - The distribution of galaxies in their Large Scales (including cosmic voids)
  - The measurement of weak lensing effects
  - Galaxy clustering properties
  - Gravitational Waves
  - Abundance and distribution of clusters of galaxies
  - Strong-lensing clusters (DM nature and distribution + gravitational telescopes)
  - Theory / model building beyond GR

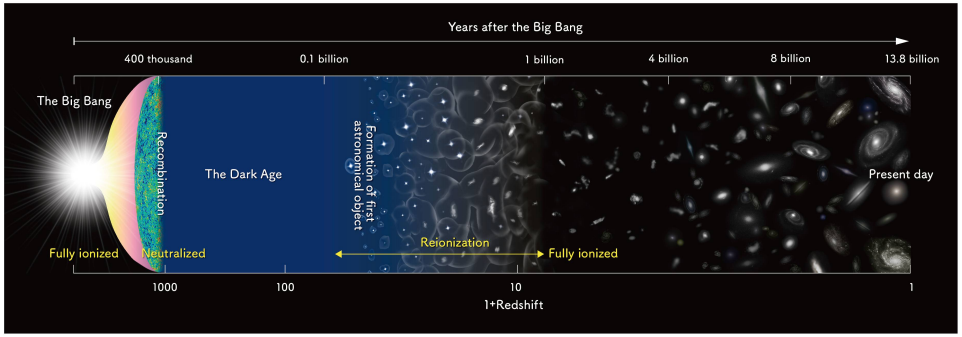


- *All these **high quality data** coming from several experiences (present and future) are used to test and falsify the predictions issued from*
  - fundamental physics,
  - particle physics
  - general relativity
- *A quite **unique landscape** **of crossed expertise** in the Marseille campus.*
- *In particular, the study of the **structure growth in the universe** provides important insides on the **contribution of baryonic and DM** to this process, and allows our teams to explore **new gravity models beyond the general theory of the relativity**.*

Galaxies & Cosmology (III)

- *The **properties of galaxies are directly linked to cosmology**:*
  - *Distribution in **Large Scale Structure**,*
  - *Distribution in **masses, sizes, DM content and morphology***
- *Several important studies are conducted by our teams to understand the processes of **galaxy formation and evolution**.*
- ***Baryonic physics** directly affects the observational properties of galaxies as they appear in cosmological surveys.*
- *The originality of the approach adopted by our teams is to **bring together the combined expertise***
  - *on the physics of galaxy evolution through multi-wavelength observations and modeling*
  - *the analysis of large cosmological surveys of galaxies*
- *An important effort is dedicated to the study of the **first galaxies** formed in the universe and their impact on the **reionization** process.*
- *To achieve these goals successfully, an important effort is dedicated to the development of **innovative instrumentation for the largest facilities available on ground-based and space observatories.***

Observational Programs / contributions



- ***DESI*** *(Dark Energy Spectroscopic Instrument)*
- ***ELT****(Extremely Large Telescope)/Harmoni/Mosaic*
- ***Euclid***
- ***LISA*** *(Laser Interferometer Space Antenna)*
- ***LiteBIRD*** *(Lite satellite for the studies of the B-mode polarization and Inflation from the cosmic background Radiation Detection)*
- ***LSST*** *(The Legacy Survey of Space and Time at Vera C. Rubin Observatory)*
- ***MSE*** *(The MaunaKea Spectroscopic Explorer)*
- ***PFS*** *(Subaru Prime Focus Spectrograph)*
- ***SVOM*** *(Space-based multi-band astronomical Variable Objects Monitor)*
- ***THESEUS*** *(Transient High-Energy Sky and Early Universe Surveyor)*
- ***WFIRST****/ Nancy Grace Roman Space Telescope*

Status & Plans

- ***55*** *subscribers to iphu-galaxies-cosmology@univ-amu.fr*
- ***Actions taken after the zoom meeting (5th JAN 21,*** *22 participants**):***
  - *IPHU Web site & Galaxies-Cosmology page(s):*

    https://www.univ-amu.fr/fr/public/galaxies-and-cosmology

  - Set up of a collaborative space for the WG (wiki, Slack, …), shared with other WGs + specific e-mail distribution lists. The common space will be used to circulate the relevant information regarding events organized in the three labs (like seminars, journal clubs, PhD or HDR defenses, …)
  - Organization and participation to regular thematic meetings, sometimes with other WGs (e.g. GW for LISA and THESEUS thematic day).
  - First “thematic days” of the WG are better organized “in person”. In the meantime, informal intra-WG meetings are proposed, typically 1-2h (zoom) meetings every two weeks. Best slot based on 11 answers to *when2meet poll* : **THURDAY : 9:30-11:00**