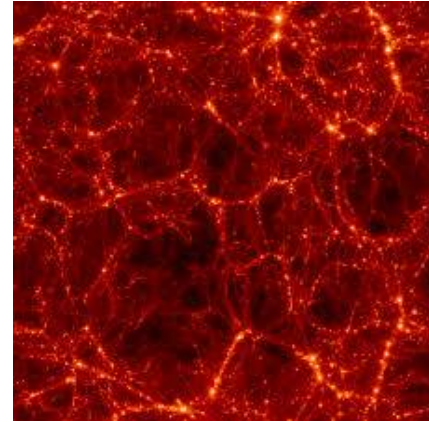


Galaxies & Cosmology (I)

- 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**
 - 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)

- The actions conducted by our teams for **constraining the cosmological models of the universe** and their **associated parameters** include:
 - the study of the primordial universe and the CMB
 - the nature of the Dark Matter (DM) and the Dark Energy (DE).
- To achieve these goals, several **cosmological probes** are combined together, such as
 - the supernovae Ia used as privileged standard candles
 - the distribution of galaxies in their Large Scales (including cosmic voids)
 - the measurement of weak lensing effects
 - galaxy clustering properties,
 - the abundance and distribution of clusters of galaxies.
- 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.**

Galaxies & Cosmology

List of the main missions/projects associated to this theme :

- *EUCLID*
- *PSF*
- *SVOM / THESEUS*
- *LISA*
- *LSST*
- *ELT/Harmoni, ELT/Mosaic*
- *DESI*
- *MSE*
- *WFIRST*

