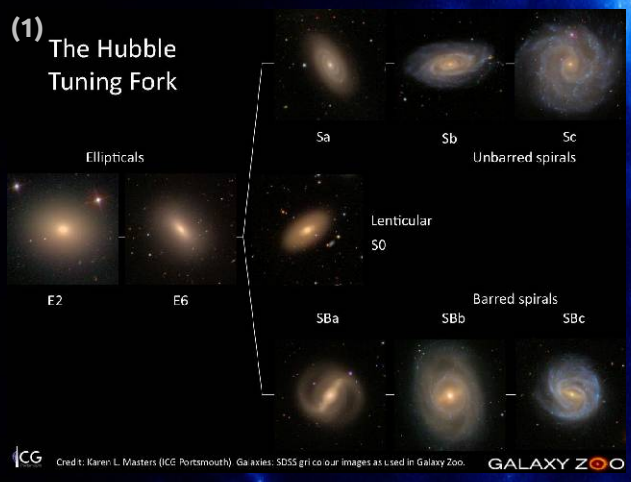
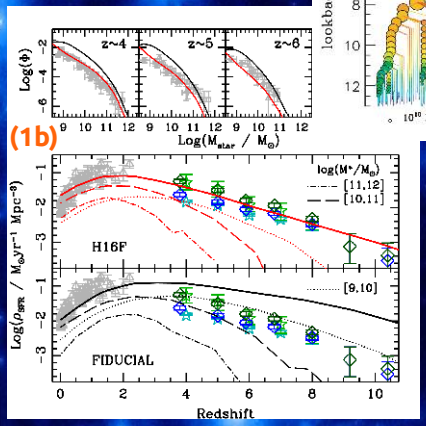
Theoretical Models of Galaxy Formation and Evolution

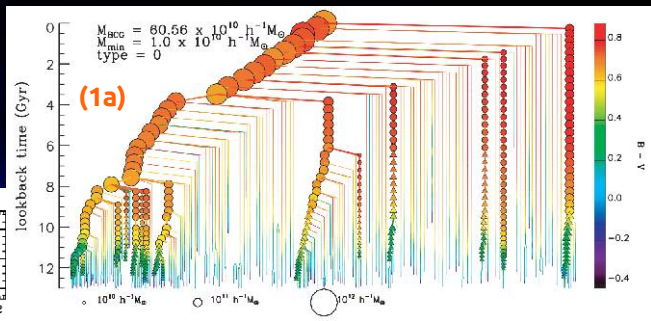
How do galaxies form?

The evolution of galaxies through cosmic epochs is the result of a complex network of physical processes that are responsible for their morphologies and physical properties.



(1) Galaxies show a variety of morphologies, from spheroidal ellipticals to grand design spirals



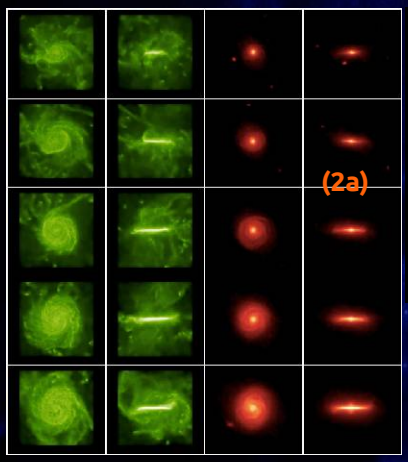


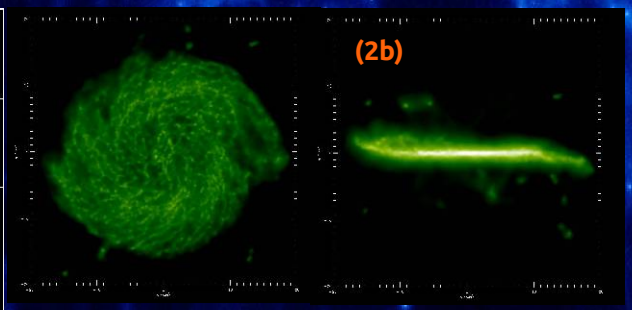
(1a,b) *Semi-Analytic Models* are able to track the complex evolution of galaxies in cosmological volumes and quantify the relative importance of the physical mechanisms shaping their properties

GAEA
GAlaxy Evolution & Assembly

(2) Galaxies do not evolve in isolation but they group in gravitationally bound structures

INAF-OATs and UniTs are world leaders in galaxy evolution studies, thanks to state-of-the-art numerical codes developed and maintained by our group!





MUPPI
MUlti Phase Particle Integrator

(3) Giant Black Holes live at the very center of galaxies and inject incredible amounts of energy into their neirbourough.

(2a,b) *Numerical simulations* are a powerful tool to track the evolution of gas and stellar particles. State-of-the-art simulations are able to reproduce the morphology of galaxies in great detail and shed light on the physical processes responsible for them.

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