

Big eyes on big guys: tracking the formation and transformation of massive galaxies. (Mauro Giavalisco)

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Current facilities, especially spectroscopy, do not yet have the power required to study

The assembly of the mass and the transformations of galaxies' structures are the result of the interplay between gravity, baryon physics and the properties of the dark matter on the one hand, and formation of, and feedback by, stars and black holes on the other. How do massive galaxies transition from star-forming disks to passively evolving spheroids? Why do they stay passive for most of the Hubble time? How do the early thick, hot disks and modern thin, cold ones relate to each other? Why would quenching, in addition to stop star formation, also change the dynamics and morphology of galaxies? The observations required to answer these questions require sensitive (>23 mag/arcsec), spatially resolved (~ 100 pc or better, thus higher than HST/JWST), medium resolution ($R\sim 6000$) spectroscopy and high-resolution imaging at optical to NIR wavelengths that current facilities cannot deliver for systematic studies, except for rare and uncharacteristic bright sources or gravitationally lensed ones. The upcoming generation of 30-meter telescopes holds the promise to finally allow us to understand these issues that are of fundamental importance in cosmology.