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How did it all start? Unveiling the physics of the earliest galaxies

In less than three years since the release of the first data, the James Webb Space Telescope has revolutionised our knowledge and understanding of the evolution of galaxies in the first Gyr after the Big Bang.

Thanks to its unprecedented collecting area and IR sensitivity, JWST has allowed us to detect galaxies up to $z \sim 15$ and to study their physical properties by looking at their rest frame optical emission - both the continuum and the emission line components.

The emerging picture is extremely exciting, as it combines confirmations - with galaxies showing an evolution of their rest frame properties as we approach the Big Bang - and surprises, like the slower-than-expected evolution of galaxies beyond $z \sim 10$ and the large fraction of AGNs that are being detected.

In my talk I will review the status of the field, describe some of our latest results on galaxies at $z > 10$ obtained from ongoing spectroscopic programs with NIRSpec and MIRI, and outline open questions that still wait for an answer, including potential constraints to cosmological models.

Adriano Fontana is a Research Director at INAF-Rome Astronomical Observatory. His research field is the study of high redshift galaxies, AGNs, IGM and their co-evolution, primarily as obtained from deep imaging and spectroscopic surveys with ground based and space telescopes. He conducted several projects with ESO VLT, HST and recently JWST.