Testing a Theoretical Model ("UniverseMachine") for Galaxy Star Formation Histories Derived from the LEGA-C Survey

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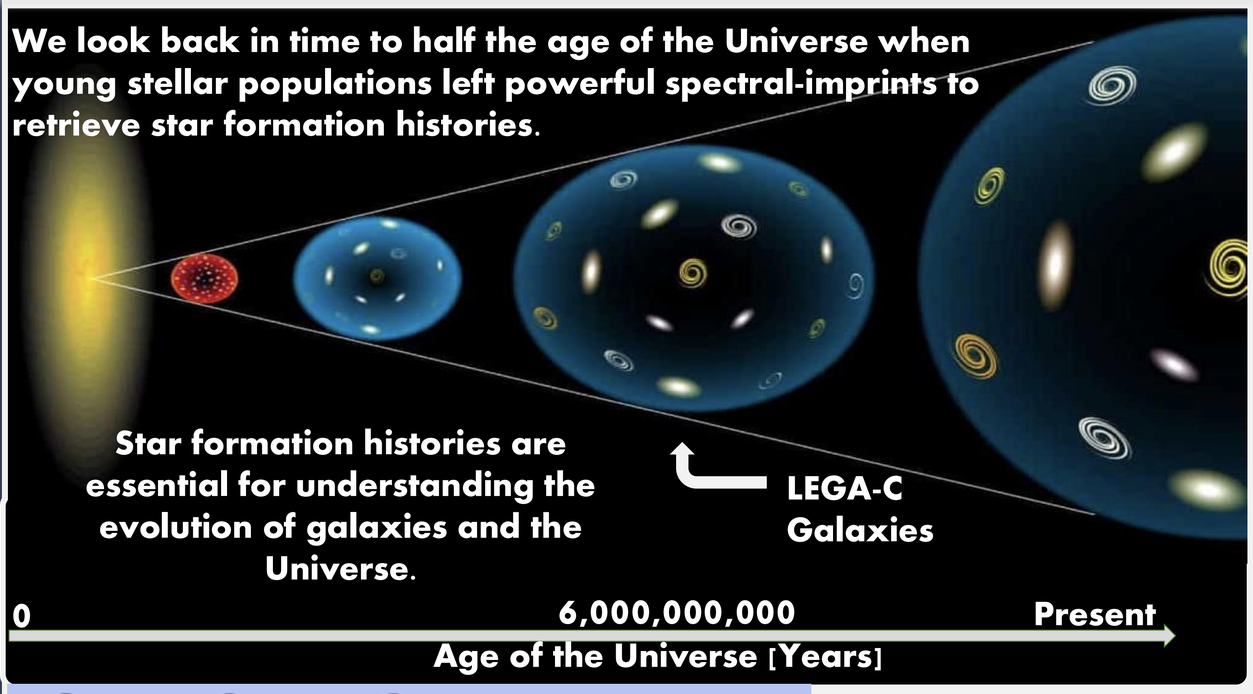
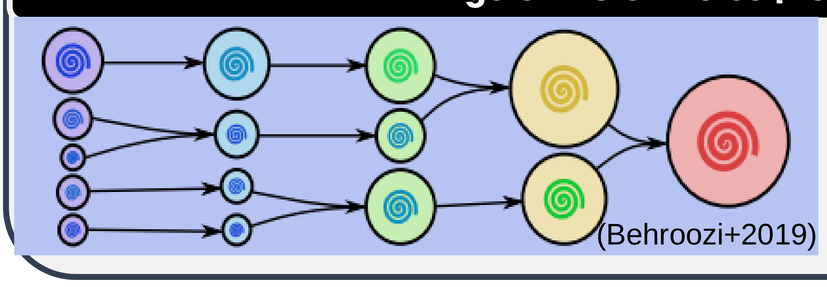
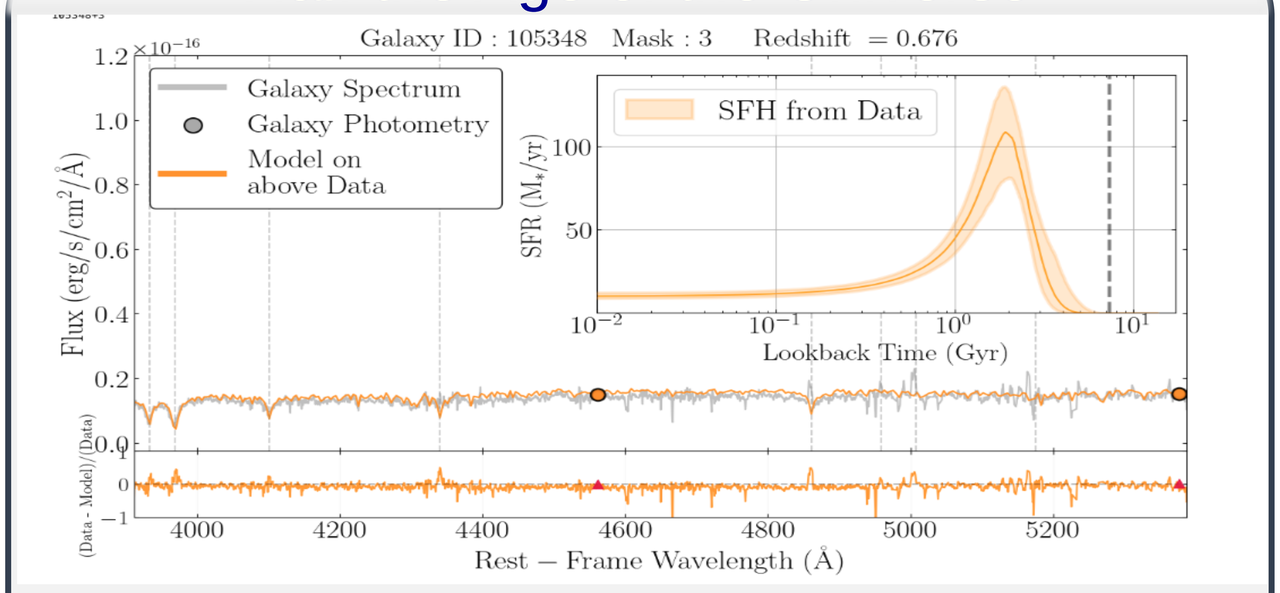
Testing Galaxy Growth in the UniverseMachine with LEGA-C Galaxies





UniverseMachine predicts galaxies become larger with time and quenched.

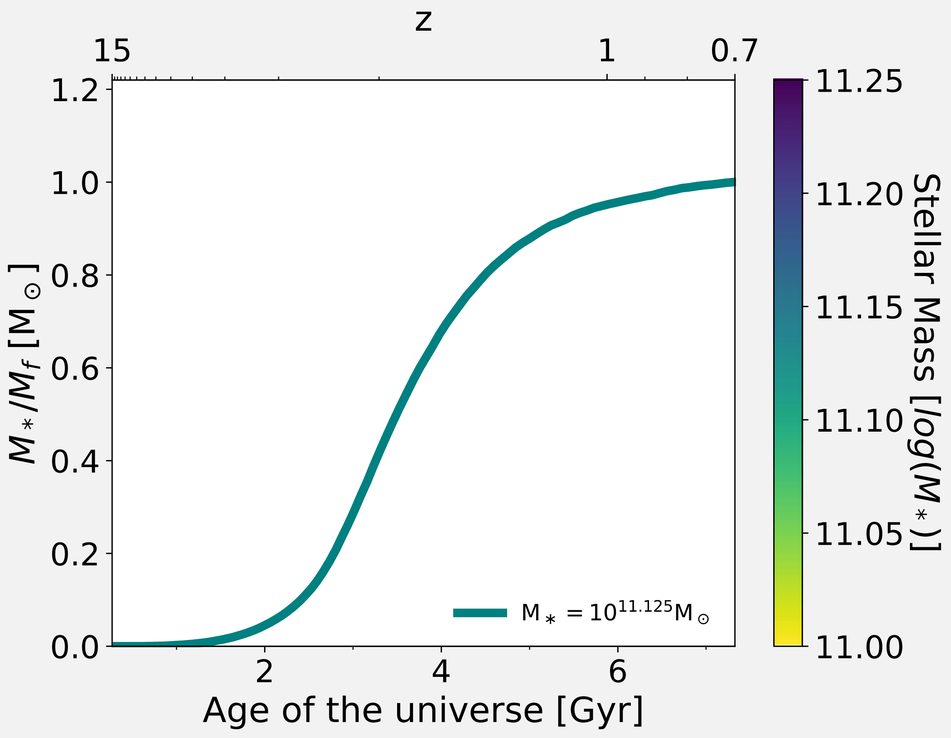
Inferring Galaxy Star Formation History at Half the Age of the Universe



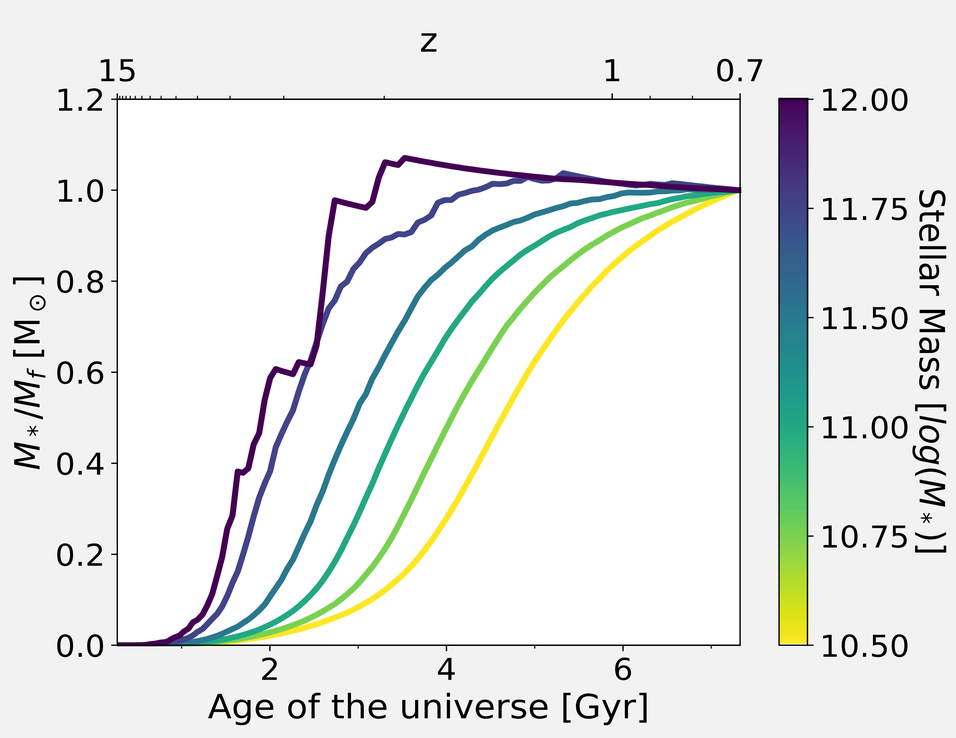
The Large Early Galaxy Astrophysics Census (LEGA-C) collected high-fidelity spectra for ~3000 galaxies observed at half the age of the Universe. These data allow reconstruction of star formation histories into the early universe via "stellar population synthesis modeling".

UniverseMachine Model Predicts that Galaxy Growth Scales with Mass

The UniverseMachine is a theoretical model that describes galaxy demographics across cosmic time, including the growth histories of stars.



Higher mass galaxies increase in mass earlier at a faster rate than lower mass galaxies.



Mass of individual galaxies and their median trend divided by their z = 0.7 mass as a function of time and redshift.

Median mass divided by their z = 0.7 stellar mass as a function of time and redshift.

Data vs. Theory: Testing Average Star Formation Histories in the UniverseMachine Model

Theoretical Expectation:

More massive galaxies form more of their stars at early times over a shorter time period.

Star-forming galaxies have more recent assembly histories.

Conclusions:

Real quenched galaxies form their mass later in time than model galaxies.

Real star-forming galaxies form 90% of their mass later than model galaxies.

Median times at which galaxies reached 50% (t50) and 90% (t90) of their stellar mass at the look back time of LEGA-C.