The Evolution of the Global Stellar Mass Density at 0<z<3

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Comoving Density of Luminous Galaxies changes little for $0<z<3$

Blue line shows the flux-limited survey completeness limit
The UV-Optical color DOES change. High Redshift galaxies tend to be bluer than local galaxies.
Galaxy stellar mass vs. redshift

Line shows completeness of “Maximally Old” model
Do the calculations converge?
Luminosity density – Nothing too exciting here

Black Squares are new data, others are from the literature.
Finally, Stellar Mass density

Now they find a clear difference between redshift bins.
Comoving Stellar Mass Density

fractional age of the universe

\( \Omega_* \) vs. redshift

\log \rho_* (\text{M}_\odot \text{Mpc}^{-3})
Many people have models, some work, some don't.
Interesting Question:

According to this, very little of the present day stellar mass was around at redshift \( \sim 3 \). Others find active populations of LBGs at \( z > 3 \). Also the re-ionizing radiation was emitted at \( z > 3 \) (which presumably was created via star formation), so why are there so few stars formed by \( z \sim 3 \)?

Possible solution:
Maybe the Initial Mass Function (IMF) was different for those stars than the subsequent generations.
**Interesting Question:**
Evidence shows that spheroids contain \(>30\%\) of the stars in the local universe, and those stars formed at high redshift (Renzini 1999). Also, SDSS estimates \(>50\%\) of local stellar mass density is in red galaxies. According to Dickinson (et al. 2002) only \(<20\%\) of the of present day stellar mass was in place at \(2<z<3\), is this a contradiction?

Possible solution:
Stars won't fit in your universe? Get a new universe! Modern world models use \(\Lambda\)CDM cosmology and allow for more proper time per redshift than other models.
Conclusions

The global stellar mass density was changing rapidly around $z=2.7$. It rises to its present value by $z=1$, then changes little since then (half the age of universe).

This study agrees with the integrated cosmic star formation RATE as traced by rest frame UV light (Pei, Fall & Hauser 1999). This shows promise, because at least the data is self consistent even if the models are not there yet.