SOME THOUGHTS ABOUT DE AND LTB

1. DE (or, Λ) is not unnatural

It is remarkably qualitatively similar to 'primordial' DE which is necessary for inflation

$\ldots \rightarrow dS \rightarrow FRWRD \rightarrow FRWMD \rightarrow \widetilde{dS} \ldots \rightarrow$

Furthermore, since dS was unstable, no deep reasons to insist that $\widetilde{dS}$ is stable

2. $\rho_{DE} \sim 10^{-123}$ is small

However, there are many small constants in nature from which an infinite number of arbitrarily small constants can be constructed

$$\rho_{DE} \sim \rho_{water}^{4/3} \sim m_\nu^4$$

3. How many 'coincidences'?

At present, DE can be quantitatively described by one constant only

$(p_{DE} \approx -\rho_{DE} \approx \text{const})$

1 new constant → only 1 new relation ('coincidence') to be derived ('explained')

$\rho_{DE} \sim 10^{-123}$ → DE becomes gravitationally important at $H \sim 10^{-18}\ s^{-1}$

Why do we live at this time?

a) Biological and/or sociological derivation → absent

b) 'Anthropic' explanation

Dicke: $t_{now} \sim t_{almss}$

Satisfied, due to $\rho_{DE} \sim m_p^6$

c) $H^{-1} \sim t_{clust.\,form.}$ $(\sigma_8 \sim 1)$

Satisfied, due to

$$\rho_{DE} \sim m_p^4 \ell^3 \left(\frac{\rho_m}{\rho_b}\right)^4 \left(\frac{n_b}{n_\gamma}\right)^4$$

$\rho_{DE} \sim 10^{-123}$, $R \sim 10^{-5}$, $\frac{n_b}{n_\gamma} \sim 10^{-10}$, $\frac{\rho_m}{\rho_b} \sim 6$

- 4 fundamental constants of present cosmology

5. Arguments for $t_B = 0$ ($t_B < 1s$) in LTB

For $t < t_B$, the LTB solution becomes anisotropic (Kasner, $(-\frac{1}{3}, \frac{2}{3}, \frac{2}{3})$) and vacuum-dominated

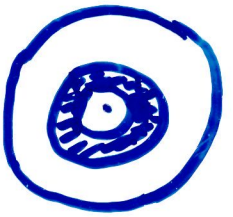
a) Primordial chemical abundance from BBN – completely wrong

b) No reasons for BAO in CMB and galaxy surveys to exist

Primordial perturbations are not completely stochastic, strong correlation between $\vec{k}$ and $-\vec{k}$ modes → requires a singularity of a special (quasi-isotropic) type

CMB : $t_B \simeq 0$ for $z = 1100$

BAO : $t_B \simeq 0$ for $z \sim 0.2\text{-}0.4$



If $t_B = 0$, the theorem of G. Ellis et al. has to be reconsidered.

What is the specific form of $H(z)$ and $q(z)$ in this case (apart from $q(0) > 0$) ?

6. $\tau \simeq 0.09 \neq 0$

One more way to get information inside the past light cone.
In particular, possible inhomogeneity of CMB inside the light cone can be severely restricted

7. LTB + Λ – new conjecture

May help to avoid recent possible phantom behaviour of DE ($\varepsilon_{DE} + p_{DE} < 0$)