Abstract

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It is proposed that the standard Concordance model of cosmology is wrong and that cosmologists have been developing cosmological models based on a faulty redshift scale-factor relation since about 1920. Particle physicists should be aware that the Concordance model may have to be changed. They should also be aware that there is extreme reluctance amongst many cosmologists to acknowledge the true level of the crisis in cosmology. As well as numerous 'tensions', such as the Hubble tension, there are also important philosophical difficulties in Concordance cosmology such as the 'coincidence problem' and singularity problems. When reasonable alternatives are given to address these issues and provide answers to tensions or difficulties, cosmologists are typically ignoring them. Such an example is below and is also the subject of a paper. Particle physicists should treat any results coming from the Concordance model of cosmology with extreme caution.

1. The Basis of an alternative Cosmological Model.

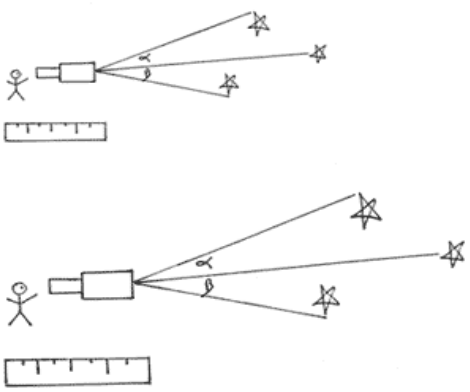
Every quantity Q with n length dimensions changes according to Qa^n so, for example

Table 1 Changes of physical quantities

Physical Quantity		**Change with time**
Planck's constant	h	he^{-2Ht}
Masses	m	m constant
Fine structure constant	α	α constant
Gravitational constant	G	Ge^{-3Ht}
Pressure	p	pe^{Ht}
Speed of light	c	ce^{-Ht}
Density	ρ	ρe^{3Ht}

With t being applied in the cosmologists sense, positive into the past. This is an 'expanding' universe with every length scale changing, as shown in the cartoon below.

Figure 1 Cartoon to show the expanding universe



In this brief letter, it's now shown why the matter density appears to be between 0.25 and 0.33 in Concordance cosmology (LCDM). In the accompanying paper other parameters are discussed and there is a solution to the Hubble tension. Proposals like this have had little proper discussion showing that cosmology is in a very unhealthy state.

2. Redshift and Matter Density

If the energy of a photon emitted (subscript 1) from a distant star towards an observer is conserved.

$$h_0 f_0 = h_1 f_1 \quad (1)$$

Since Planck's constant was lower in the past, there is a redshift of received light according to

$$f_0 = f_1 \frac{h_1}{h_0} \quad (2)$$

$$\lambda_0 = \lambda_1 e^{2Ht} \quad (3)$$

This leads to a new redshift – scale factor relation. The redshift of received light is given by

$$z = \frac{\lambda_1 e^{2Ht} - \lambda_1}{\lambda_1} \quad (4)$$

$$1 + z = e^{2Ht} = \frac{1}{a^2} \quad (5)$$

$$a = \frac{1}{\sqrt{1+z}} \quad (6)$$

An object, a distance d away, would have an apparent velocity v, depending on the redshift.

$$\frac{v}{c} = z = e^{2Hd/c} - 1 \approx \frac{2Hd}{c} \quad (7)$$

$$v = 2Hd \quad (8)$$

comparing with Hubble's law, the expansion constant is half of the Hubble constant approximately 37 $kms^{-1}Mpc^{-1}$

$$H = \frac{H_0}{2} \quad (9)$$

WMAP9 finds Ω_m= 0.28 from $\Omega_m h^2$ = 0.137 $\pm$ 0.005 and a h value of 0.697 $\pm$ 0.02. If h is halved, Ω_m becomes four times as large, giving an Ω_m value of 1.13 $\pm$ 0.10.

If Ω_m is 1.0 then $\Omega_\Lambda = 0$, in a flat universe, and there is no need for a cosmological constant.

A faulty redshift scale-factor relation may have led cosmologists to conclude a matter density of a quarter of the true value - a mistake that, most cosmologists are very reluctant to discuss.

Evidence for a cosmological constant is said to come from supernovae too…

with the new redshift scalefactor relation the luminosity distance for supernovae is

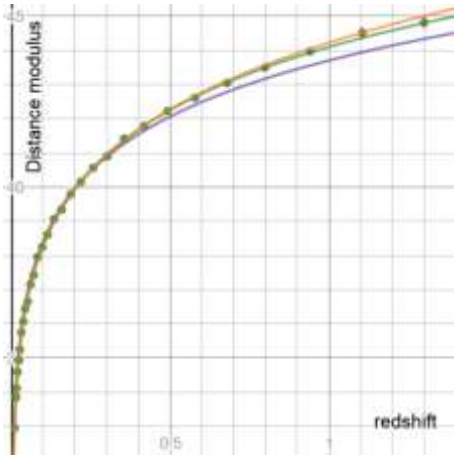
$$D_L = \frac{2c}{H_0}(1+z)(\sqrt{1+z} - 1) \quad (10)$$

In the Concordance Model equation (11)

$$H(z) = H_0\sqrt{\Omega_m(1+z)^3 + \Omega_k(1+z)^2 + \Omega_\Lambda}$$

$$D_L = (1+z)\int_0^z \frac{c}{H(z)} dz \quad (12)$$

Figure 2 New model (top), LCDM Ω_m = 0.3 and 1.0



For low z the binomial expansions are

$$D_M = \frac{c}{2H}\left(z - \frac{z^2}{4} + \cdots\right) \quad \text{(new)} \quad (13)$$

$$D_M = \frac{c}{H_0}\left(z - \frac{3mz^2}{4} + \cdots\right) \quad \text{(LCDM)} \quad (14)$$

Where m is short for Ω_m. Concordance cosmology can vary its parameters to match data, there is a match if Ω_m = 1/3.

In this short letter it's shown that a different redshift scale-factor relation can mimic the apparent cosmological constant, i.e it may not exist. In the paper other parameters are discussed and there is also a solution to the Hubble tension.

This letter does not attempt to rewrite cosmology in two pages - but is to emphasise that the Concordance model may be faulty and that there has not been adequate discussion of alternatives.

Reference:
https://www.researchgate.net/publication/342345062_prdFriedman2