From: JACK SARFATTI <adastra1@me.com>
Subject: **Fwd: Hologram Gravity - the surface term (Dr. Quantum)**
Date: September 17, 2010 10:37:41 AM PDT
▸ 10 Attachments, 1.5 MB

> Comments on "The Entropic Accelerating Hologram Universe"(1)

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Abstract

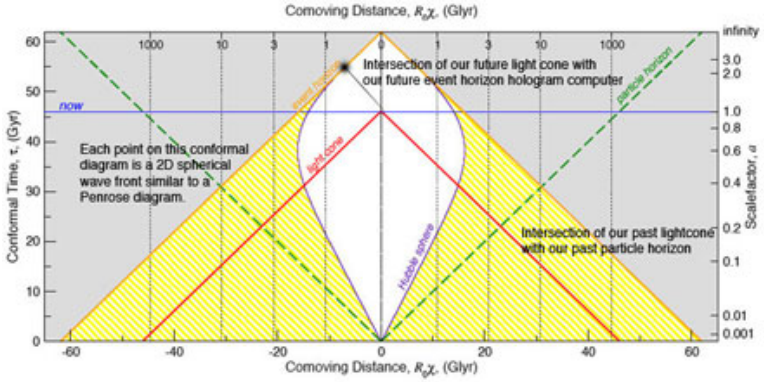
The accelerated expansion rate is no longer surprising. It is the inevitable consequence of the holographic information storage on the surface screen of the universe.

Indeed, but Smoot & Co fail to recognize the important question - when is the surface screen? It must be our future dark energy event horizon. It can't be our past particle horizon.

Smoot et-al propose

> $$I = \int_M (R + \mathcal{L}_m) + \frac{1}{8\pi} \oint_{\partial M} K$$

the above is the global action - for cosmology the surface terms must be our past and future horizons and classical causality + Wheeler-Feynman demand that the two horizons do not act over the spacelike constant conformal time hypersurface, but act along both our future and past light cone intersections with our observer-dependent horizons.



Tamara Davis, modified Fig 1.1

Also note that there is a fundamental asymmetry between the past and future horizons that obviously trivially explains the Arrow of Time left unexplained in Sean Carroll's "From Eternity to Here" - because of

$$\rho_m(t) = \rho_m(t_0)a(t)^{-3} \text{ and } \rho_\gamma(t) = \rho_\gamma(t_0)a(t)^{-4}$$

for ordinary "rest energy" matter (quarks, leptons & composites) and for zero rest mass photons respectively.

In contrast for vacuum dark energy

$$\rho_{DE}(t) = \rho_{DE}(t_0)a(t)^{-3(1+\omega)}$$

$\omega = -1$

$\omega = p/\rho c^2$ is the equation of state.

Clearly the variation of the hologram surface term requires the Wheeler-Feynman advanced propagator "destiny" from our future horizon and the retarded "history" propagator from our past horizon at our here-now interior bulk field point. This is similar to Aharonov's picture of course. Obviously the effect of our past particle horizon is different from the effect on us now of our future event horizon because as a matter of fact

measured dark energy density from our past light cone

~ (area of our future horizon at its intersection with our future light cone)^-1

Obviously if you do it the retarded way from our past particle horizon you will get the wrong answer entirely!

You won't get

$$a_{Horizon} = \left(\frac{2\pi c k_B T_\beta}{\hbar}\right) = cH \sim 10^{-9}\, m/s^2$$

which happens to be same as Pioneer Anomaly - weird.

Curvature of Space – Time *proportional* to the Stress – Energy Content + Surface Terms

$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu} + Surface\ terms \quad (9)$$

Typically the surface terms are neglected though they have not been shown to be negligible. This would in the case of spherical symmetry and homogeneity lead to the Friedmann-Lemaître equations:

Scale factor acceleration = Energy Content deceleration + acceleration from Surface Terms

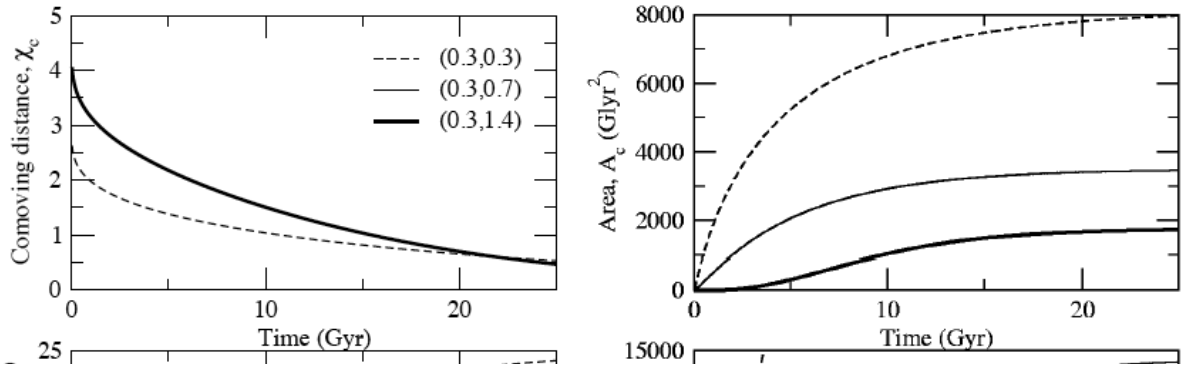
$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}\left(\rho + \frac{3P}{c^2}\right) + a_{Surface}/d_H \quad (10)$$

The accelerated expansion rate is no longer surprising. It is the inevitable consequence of the holographic information storage on the surface screen of the universe. An interesting question is: how does this entropic viewpoint of cosmic acceleration impact on inflationary theory?

Indeed, but Smoot & Co fail to recognize the important question - when is the surface screen? It must be our future event horizon. It can't be our past particle horizon. Note the constant asymptote for our future horizon:

Two types of horizon are shown in Fig. 1.1. The particle horizon is the distance light can have travelled from $t = 0$ to a given time t (Eq. A.19), whereas the event horizon is the distance light can travel from a given time t to $t = \infty$ (Eq. A.20).

see upper right graph middle thin unbroken line - from Tamara Davis's 2004 Ph.D.



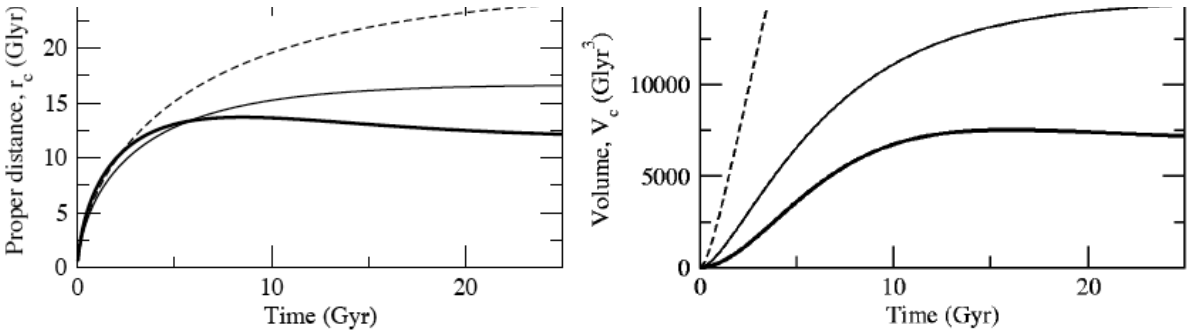


Figure 5.1. The comoving distance, proper distance, area and volume of the cosmological event horizon are shown for three different cosmological models. The models' matter (energy) density and cosmological constant $(\Omega_{\rm M}, \Omega_\Lambda)$ is given in the legend. The dimensionless comoving distance is not shown for the $(\Omega_{\rm M}, \Omega_\Lambda) = (0.3, 0.7)$ case since R_0 is undefined in this model. Note that although the radius and volume within the cosmological event horizon both decrease for periods in the $(\Omega_{\rm M}, \Omega_\Lambda) = (0.3, 1.4)$ universe, the area always increases.

http://www.physics.uq.edu.au/download/tamarad/

(1) by Damien A. Easson, Paul H. Frampton and George F. Smoot
http://stardrive.org/index.php?option=com_content&view=article&id=2164:entropic-accelerating-universe&catid=43:science&Itemid=82