Dark Energy generated by the Evolutionpotential

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Abstract

In this paper i will give an explanation for the source of dark energy which is responsible for the expansion of the universe.At the end of the paper i will give some hints why i have choosed this form of the potential.

Keywords: *dark energy; cosmological constant;universe expansion; golden mean*

1. Introduction

Georges Lemaître discovered Juni 1927 based on the redshift of the galaxies that the universe is expanding.In Einsteins general relativity the expansions comes from the cosmological constant Λ which is a constant factor in the equation.But until today nobody knows what is the reason for that factor.Some say the reason is the vacuumfluctuation but this leeds to the vacuum catastrophe.I want to give an answer by the Evolutionpotential which is conform to Einsteins equations and easily shows why the universe is expanding.

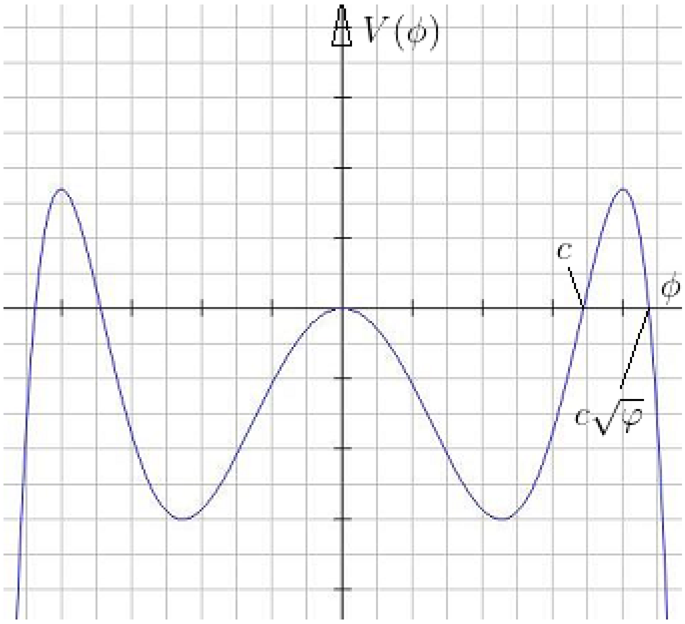
1.1. The Evolution Equation

The equation is an energydensitypotential with speed as variable.

$$V(\phi) = (\frac{\Lambda.c^4}{8\pi G})^2.\left(-\frac{\varphi^3}{\varphi^3+1}(\frac{\mid \phi \mid}{c})^2 + (\frac{\mid \phi \mid}{c})^4 - \frac{1}{\varphi^3+1}(\frac{\mid \phi \mid}{c})^8\right) \tag{1}$$

$speed\ \phi \in \mathbb{O}^5 \ = Octonions^5$
and $\mid \phi \mid \leqq \ c\sqrt{\varphi}$
$c...speed\ of\ light$
$\Lambda...\ cosmological\ constant$
$G...gravitation\ constant$
$\varphi...golden\ mean\ 1,618033...$

1.2. Picture of the equation



the potential is zero on the spheres orshells
$\mid \phi \mid = 0$
$\mid \phi \mid = c$
$\mid \phi \mid = c\sqrt{\varphi}$

1.3. Understanding the 3 terms of the equation

The potential $V(\phi)$ is a $energydensity^2$ and on the zeropoint c (speed of light) we can write it as

$$E^2 = p^2.c^2 + \varrho^2.c^4 + \sigma^2.c^8 = 0 \tag{2}$$

$E...energydensity$
$p...(pressure/c)$
$\varrho...massdensity$
$\sigma...stretchdensity$

Comparing equation (2) with equation (1) on $\phi = c$ we get

$$p^2.c^2 = -\frac{\varphi^3}{\varphi^3+1}(\frac{\mid c \mid}{c})^2(\frac{\Lambda.c^4}{8\pi G})^2 \tag{3}$$

$$\varrho^2.c^4 = 1.(\frac{\mid c \mid}{c})^4(\frac{\Lambda.c^4}{8\pi G})^2 \tag{4}$$

and

$$\sigma^2.c^8 = -\frac{1}{\varphi^3+1}(\frac{\mid c \mid}{c})^8(\frac{\Lambda.c^4}{8\pi G})^2 \tag{5}$$

For $\phi = c$ we can arrange the equation (2) to

$$-p^2.c^2 - \sigma^2.c^8 = \varrho^2.c^4 \tag{6}$$

Substitution by (3),(4) and (5) and dividing by $(\frac{\Lambda.c^4}{8\pi G})^2$ leeds to

$$\frac{\varphi^3}{\varphi^3+1}(\frac{\mid c\mid}{c})^2+\frac{1}{\varphi^3+1}(\frac{\mid c\mid}{c})^8=1.(\frac{\mid c\mid}{c})^4 \tag{7}$$

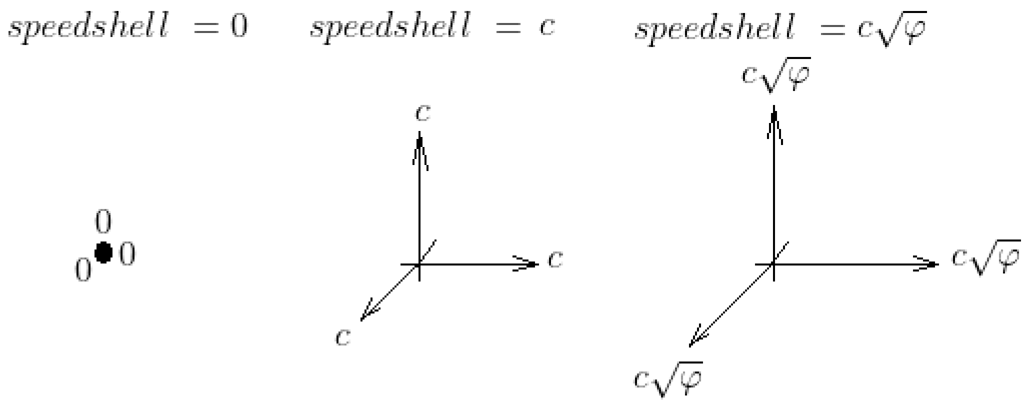
$\Rightarrow$

$$\frac{\varphi^3}{\varphi^3+1}+\frac{1}{\varphi^3+1}=1 \tag{8}$$

We interpret this formular as propability formular and to understand it we want to speek in the language of Quantum field theory of creating and destroying.In our case we create and destroy the speed of the spaceexpansion.
For that we write for $\mid\phi\mid^2=\phi.\phi^*$ (* complex conjungation) the amplitude that speed ϕ is created after destroying.
To go further we have to make some prerequisites.

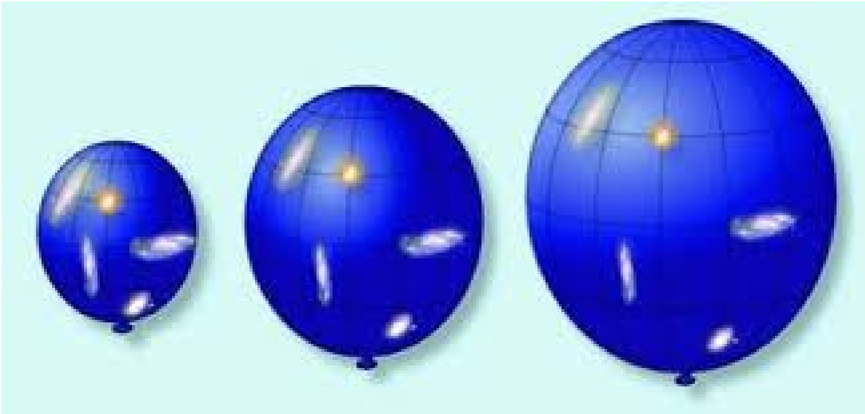
1)In nature only the three speeds $\mid\phi\mid$ is 0 or c or $c\sqrt{\varphi}$ occurs for spaceexpansion.
2)The speed of the spaceexpansion is in all spacedirections equal (isotrop).

1.3.1. Picture spaceexpansions



For better understanding of this speed we should think about a ballon where the radius is expanding by speed 0 or c or $c\sqrt{\varphi}$.

1.3.2. Picture expansion of the Universe



Now for better understanding we write the equation (7) in the following shape and set c= 1

$$\frac{(\sqrt{\varphi}\sqrt{\varphi}^*)^3}{(\sqrt{\varphi}\sqrt{\varphi}^*)^3+(1.1^*)^3+(0.0^*)^3}(1.1^*)+\frac{(1.1^*)^3}{(\sqrt{\varphi}\sqrt{\varphi}^*)^3+(1.1^*)^3+(0.0^*)^3}(1.1^*)=1 \tag{9}$$

$$P(spacexpansion = c\sqrt{\varphi})(1.1^*) + P(spacexpansion = c)(1.1^*) = 1 \tag{10}$$

$P ... Probability$

in the denominator we have the amplitudes for the three possible expansionspeeds and on the two numerators we have the two possible amplitudes for the expansionspeed. Amplitude zero doesn't matter.
So finally we can interpret the equation in the following words.

The possibility that space is expanding with speed c= 1 is 1 (safe) because we have choosen $\phi = c = 1$ and is the sum of two possibilities.
The first term means that the spaceexpansion is in the state of speed $c\sqrt{\varphi}$ and goes to c.
The second term means that the spaceexpansion is in the state of speed c and goes to c.

1.4. conformity with the energy-momentum tensor

We show that our potential leeds to the energy-momentum equation

$$\frac{8\pi G}{c^4}T_{\mu\nu} = \Lambda.\eta_{\mu\nu} \tag{11}$$

$\eta_{\mu\nu}$...*flat spacetime metric*
Λ... *cosmological constant*
$T_{\mu\nu}$... *energy − momentum tensor*

For that we input the 3 terms of equation (2) in the following manner into the energy-momentum tensor

$$\frac{8\pi G}{c^4}T_{\mu\nu} = \frac{8\pi G}{c^4}\begin{pmatrix} \sqrt{\varrho^2.c^4} & 0 & 0 & 0 \\ 0 & -\sqrt{\mid p^2.c^2+\sigma^2.c^8 \mid} & 0 & 0 \\ 0 & 0 & -\sqrt{\mid p^2.c^2+\sigma^2.c^8 \mid} & 0 \\ 0 & 0 & 0 & -\sqrt{\mid p^2.c^2+\sigma^2.c^8 \mid} \end{pmatrix} \quad (12)$$

Using equation (3),(4),(5) we get what we want to show

$$\frac{8\pi G}{c^4}T_{\mu\nu} = \frac{8\pi G}{c^4}\begin{pmatrix} \frac{\Lambda.c^4}{8\pi G} & 0 & 0 & 0 \\ 0 & -\frac{\Lambda.c^4}{8\pi G} & 0 & 0 \\ 0 & 0 & -\frac{\Lambda.c^4}{8\pi G} & 0 \\ 0 & 0 & 0 & -\frac{\Lambda.c^4}{8\pi G} \end{pmatrix} = \Lambda \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix} \quad (13)$$

because $\mid p^2.c^2+\sigma^2.c^8 \mid = (\frac{\Lambda.c^4}{8\pi G})^2$

1.5. How if found the Evolutionpotential

I am not able to describe all the inspirations which leeds to the formular.Therefore i have to write a complete book.But i found it relative fast and it showed a lot of good properties which encouraged me to keep going.First i find an orientation on the Higgspotential which is of dimension GeV^4 and therefore uses the ϕ^4 theory.The Evolutionpotential is of dimension GeV^8 and therefore uses consequentely the ϕ^8 theory.
For some reasons i had to expanded the field behind it to Octonions *exact to* $\mathbb{O}^5$.
It is clear that massdensity and momentumdensity must be a part of the formular to describe the Λ cosmos but i found out that an additional term is possible.
And what theoretical is possible is often possible in nature.
Someone want ask me why do we have the golden mean in the formular.There is a simple reason which leeds to the unique coefficients p, ϱ, σ.
The important behavior of the potential on the interval $[0, c\sqrt{\varphi}]$ is that it is stable.
This means the skewness is zero and only this coefficients leeds to this propertie.

$$\int_0^{c\sqrt{\varphi}} V(\phi)\phi^3 d\phi = 0 \quad (14)$$

2. Conclusion

I showed that the Evolutionpotential for the universe can give an answer to the unresolved question why do we have an expanding universe.It is similar but not equal to the Higgspotential with a third stretching term which acts on the spacecoordinates.Therefore not only massdensity and momentumdensity acts on spacetime.There exists a third component which is stretching oder better generating space.