# THE UNIFICATION OF RELATIVITY AND QUANTUM THEORIES- ABOUT CONSTANCY OF NATURAL CONSTANTS AND THE UNIVERSE MODELS

*Motto: too simple the proportionality and too much symmetry in the laws of physics*

**Abstract.** The theory of relativity is incomplete, because it can not explain the big bang singularity at the beginning of the universe. So, the theory of relativity implicates its own failure, by predicting an infinite density at big bang. This impediment can be avoided by using the theory of distributions for set functions what means that the theory of relativity can be generalised and hereby could be introduced even a two-dimensional time. Consequently, this research work is a new mathematical interpretation for some physical laws and the natural constants.

## 1 Introduction

In present work it is shown that: 1. If the natural constants are constant indeed[1], the contraction of the universe will happen if, *and only if*, its energy value is zero- an asymmetrical time interval of events (such as mass genesis) is permitted; but this universe model is inconsistent, 2. The energy value of

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the universe can not be a constant; the conclusion[2] would be, either (according to much physicists), that the physical laws should be reconsidered, or that the

[1] if the natural constants are not constant, present work can be considered as a demonstration that they are not constant indeed.
[2] present cosmological work is also meant to combat (among other things) the philosophies of negativism and nihilism which were born due to the universe behavior, i.e. that "our" universe, depending on its critical mass, will contract or expand and this processes would lead to the implicit erasement of life within its sense. don't worry, the cosmos is eternal; life goes on. with or without us (*we* could eradicate ourselves). through our species runs a thread, the genome, which is the one and only meant to survive. Go(o)d luck!

natural constants are not (forever) constant[3], 3. The energy value of the universe must be variable (the universe should be a part of the multiverse). The theories presume the existence of a critical mass which is necessary to invert (respectively slow down) the expansion. Note, that the present analysis works without needing a critical mass.The laws of physics are invariant according to those terms which do not appear in the formulas that describe them, e.g., in $E=mc^2$ the time is absent as a term, what means that this law is symmetrical in time (i.e. it is time independent). At the high presumed energy that unifies all forces, generalizing we can say that the laws possess all the symmetries- at those conditions there were no broken symmetries, what in return means that the physical laws break down at big-bang. In the other words, the construction of laws on the basis of formulas is impossible at all the singularities like big-bang, exactly because physical laws are independent of all terms (i.e. each law should be symmetric to all terms).

Another critical point of view is the following: even after symmetry breaks the time symmetric laws can not explain the entrance of asymmetry in the world (such as asymmetry between matter and antimatter[4]), not to mention its localisation in time. Furthermore are analysed some physical laws which contain natural constants. Because the laws fail in the singularities, it is appropriate to use an adequate distribution theory. This is the distributions theory for set functions introduced in [5]. Another wellknown reason is that the derivative of a constant functional is zero if its test function has a symmetrical behavior outside of the compact interval. To each natural constant in the law-describing formula there is assigned a constant functional. The conditions for which the derivative of the constant functional has the value zero furnish additional information about the masses included in the formulas.According to this there are proposed new interpretations for the current cosmological models.To begin with a short scenario about the evolution of universe: accordant to current theories the existence of the universe began with a big-bang which is considered as a singularity. Therefore the models do not handle the existence of the universe including the big-bang moment, but from the time after. The density and temperature at the beginning

[3] according to the anthropical principle this would mean that we nearly exist

[4] the laws of physics should contain a fundamental asymmetry, e.g. between matter and antimatter (see [4], p. 182). according to steven weinberg, between t= 0 and t= 10**-39 seconds, the preserve of baryons number was violated; this is contrarily to the inflationary period (10**-43 until 10**-34) during which the the universe must have been vacuous. present analysis based on the distributions theory allows the asymmetry of mass genesis (during a time interval (at)).

were extremly high. The theory of inflation considers that an extremly rapid expansion of vacuum took place during the time-interval from 10**-43 till 10**-34.The model of chaotic inflation in an eternal multiverse which creates finite universes is a further development of the inflation model, which is an enhancement of the big-bang model. it explains the process of genesis and annihilation of matter particles; during the following cooling down of the expanding universe, the process is followed by the genesis of nuclei, atoms, nebulae, stars, galaxies[5], etc.This theories presume the existence of critical mass which is necessary to invert (respectively slow down) the expansion. Note, that the present analysis works without needing a critical mass[6]. This work is grouped in three parts. In the first, one shows that the universe is closed if and only if its whole energy is zero. The second part is devoted the the analysis of some physical laws to determine the time interval on which they are valid. In the third, it is about the time interval (a,t) during that asymmetry can get into the world.

## 2 The Universe shutting

The process of transformation of energy in mass is described with the following formula:

(0) In the language of distribution for set functions [5], the mass of an “entity” $A$ can be described as $m(A) = \int \rho d\mu_A$ where $\mu$ an adequate measure and $\rho$ the density function.

(i) E = mc² in which E is the energy, m is the mass and c is the speed of light.

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[5] the hot universe includes radiation. according to its cooling down a part of the energy turns into mass. it is assumed that the atoms genesis is closed after 380.000 (terrestrial :)) years. note that to uniform the temperature a process must be faster than light speed (Gamow).

[6] it is assumed that (for a ball including much galaxies but not the whole universe) the following is valid (see [10]):

$E = E_{potential} + E_{kinetic} = mR^2[1/2H^2 - 4/3\pi\rho G]$. thus, if $1/2H^2 = 4/3\pi\rho G$, then E=0. if this leads to the existence of the critical mass then the conclusion is false, because it was enhanced to the entire universe.

on the other hand a galaxy rotates uniformly. according to the gravitation theory, the objects closer to the galaxy center must rotate faster.

furthermore, lambda + omega = critical density (lambda is the mass and omega is the density of the quantum vacuum); it is assumed that, if the critical density is greater/less/equal 1 then the universe is closed/open/flate; note that the proportion effects of dark matter and dark energy are 23% relatively 73%. thus, the proportion of the observable critical mass of 4% is insignificant.

Let now consider the following constant functional f ($c^2$, m) = ∫ ($mc^2$)‘ in the sense of [5].

Then, the integral as well as the derivative[7] are operators depending on time and there are two cases to analyse:

1. If the energy of the entire universe is zero[8] then the derivative of the functional must be zero, what means a symmetrical behavior for the function of genesis of mass (considered as set function [5] outside of the (a,t) time interval[9]). It is notable that if and only if the mass genesis function has the properties of a test function, then the energy of the universe is zero, which means that the universe contents an equal quantity of negative and positive energy at each moment. Also remarkable is that a test function allows asymmetry within the (a,t) time interval and that in this case the universe is closed, whereas the existence of a critical mass is not required and - attention- whereby a symmetrical behavior of the variation of the function (i.e. the derivative, that means the density) is also allowed according to the cosmological theories the temperature of the universe is inversly proportional to its radius[10] and proportional to its contained mass. Thus, at symmetrical moments (outside of (a,t)-interval) not only the equal quantity of mass of the universe exists, but also its temperature, its volume and its mass density (i.e. the derivative of the mass genesis function).

If Heisenberg`s uncertainty principle would be valid for the universe[11] too, then it is not allowed that its whole energy is zero (even if its time is

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[7] if the function of mass genesis is not continuous (each physical object is greater than 10**-43), then it is not differentiable. to avoid this problem one can use the either the wave or the probability description of particles (in mass spectrum), or one can use the distributions theory for set functions (see [5]); respectively one can use fuzzy-sets and noninteger derivatives (even of fractal range).

[8] the conclusions apply also to a part of the universe energy. the entire energy of a closed universe is exactly zero (see. [7], p.131). present analysis argues that the reciprocal proposition is also valid. according to the theory of relativity there exist positive and negative as well as null energy. vacuum energy has generated the inflationary repulsion; according to Newton's theory there is assumed a null vaccum energy of the current universe (s. [1], p. 348-350).

[9] the weak force violates parity, so the cpt-theorem supports an asymmetry between matter and antimatter.

[10] ρ(t) = k*1/r**3 case matter dominates, relatively ρ(t) = k*1/r**4 case radiation is dominating in the universe- ρ is the mass density and r is the radius of the universe (see [10]).

[11] why shouldn`t it apply if the universe dimensions were 10**-30 at the origins?

undefinitly), because in this case it would contradict to the fact that the universe was assumed to be closed.

2. If the energy of the universe is a constant, but not zero, then the derivative of the mass function, i.e. the mass density[12] must be a test function, what means that it should be symmetrical outside of the (a,t) interval. At the same time the mass function itself is not symmetrical, but this model is not valid, because at symmetrical moments (in time) and at equal conditions of temperature and volume in the universe there is not the same quantity of mass. In addition, it is remarkable that the temperature values (e.g. at big bang) can be neither infinite nor zero, either because of the test functions properties, or because a null temperature universe would have an infinite radius. An infinite radius does not accord with a closed universe even if we would accept the existence of a mass function which would be symmetrical as well as its derivative, the following absurd situation would result: the universe as a null energy object (E=0) exerts no gravitation; an constant energy universe (as a gravitation exerting object) would be an open system and at the same time it would be closed because of the symmetrical behavior of its mass function. This fact is in opposition to some cosmological suppositions that the universe contains a constant energy which is almost zero; the value of the energy can not be a constant (not zero). In the case that the functional would be ($1/c^2$, E), i.e. interexchanging mass with energy, the energy would be a test function and the matter quantity would be always (in each moment) equal to the antimatter quantity. This would be one of the impediments which would be identically to the main impediment of the actual cosmological theories.

Also we notice that: a) This conclusions are not surprisingly; it is already known that the physical laws break down in singularities, that they establish a non complet system of axioms and that the current theories can not explain the appearance of asymmetry (see [9]). Thus, the models of the universe ar valid only for the time for which the physical laws from which they were deduced are valid;

b) The (at) time interval, on which the mass genesis function can be asymmetrical, allows an explication for the predominace of matter in relation to antimatter. A preservation of an other mass quantity before (a,t) in comparation to the mass quantity after (a,t) would contradict the symmetrical behavior; i.e. that we are right in this (a,t) time interval. But it was assumed that the time interval in which asymmetry occurs is very short, so the theory of a closed universe (with E=0) is also controversial. In the next it is shown that the (a,t) time interval takes almost the entire existence of the universe; c)

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[12] Edt = ($c^2$, m)`

It is to diagnose that an open universe contents either a variable mass of energy (what accords with the speculations of multi- and baby universes), or that the physical laws are not generally valid, what could also mean that natural constants are not fully constant; they are rather nearly constant for a relatively long time.

## 3 The natural Constants

The natural constants are implicated in all physical laws. Using the distributions theory for set functions there can be descovered new aspects of a closed universe.

(ii) $E = h\nu$ (ii‘. $\lambda\nu = h$) where $\lambda$ is the wavelength, E is the energy, $\nu$ is the frequency and h is the Planck constant. This law applies only for photons, i.e. that it is valid only for the positive energy. Accordind to (i) the quantity of positive energy must be equal to the quantity of negative energy at each moment. During the (a,t) interval the transformations of energy in mass can be compensated by another form of energy. By analogy to the analysis from the first part, the energy is zero (respectively constant) if and only if the frequency (respectively the variation of the frequency), as well as the wavelength (respectively the variation of the wavelength) has a symmetrical behavior outside of the (a,t) time interval. The frequency as well as the wavelength (respectively their variations) must be test functions, what means that, according to (ii)), they can not have infinite or zero values. Only the time during matter exists is relevant, because the frequency and the wavelength (respectively their variations) must be zero outside of the time interval for which, applied on a closed universe (finite in time and space) that would be an absurd situation; frequency and wavelength should not exist (or their values must be zero) outside of the (a,t) interval. As Planck's law is restricted to apply only for the (a,t) interval, it can be used to determine this interval.

(iii) $G = \gamma mM/R^2$. This formula describes the gravity law; m and M are the masses of two heavenly bodies, R is the distance of each other, G the gravity force and $\gamma$ gravity constant. According to up-to - date theories the beginning of the (a,t)-interval is concomitant to the beginning of the R#0 interval. Moreover, the interval (a,t) must be identical to the time interval on which R is not zero (see b) in the previous section). As a part of the universe energy, G hasn`t to be zero. anyway, as shown, the symmetrical behavior of mass[13]

[13] $\gamma(m*M)' = \gamma[(m'*M) + (m*M')] = \gamma[(m'*M) - (m'*M)] = 0$; the mass testfunction allows the derivative transport.

implicates a closed universe (E=0), what furthermore means that $G*R^2 = 0$. G must be zero during the time interval where $R^2$ #0. i.e. that the antigravity (respectively a form of energy which is equivalent to antigravity, e.g. cooling down) takes the contrary value to gravity at each moment in time[14]. As long as a balancing form of energy does not exist, this facts would disaccord to the expansion obviousness. Together with cooling down gravity could balance the expansion. a suggestion is that the nature of the expansion is not analogue to the nature of gravity.Outside of (a,t) G one could speculate if: $G*R^2 = \gamma mM$ (multiplication with zero!?). In this case G is not necessarily zero. But outside of (at) R is rather indeterminated. Taking into account the uncertainty principle (for a field and its time variation) vacuum is filled with virtual particle-antiparticle pairs; the gravity field would be zero, if space wouldn't be filled with v-particles; that means that G may not be zero! This conclusion is disaccording to present analysis; it implicates that the universe is not closed (as supposed).

(iv) The Hubble law $v = Hd$ affirms that the further is a galaxy, the faster it departs. v is the speed of the galaxy[15], d is the distance from here and H is the Hubble constant[16]. In a closed universe even the affirmation that H is a constant is false; in opposition to the expansion time, H must take the reciprocal value as during the crunch. Furthermore during the inflation and the expansion, H should take different values- expansion happens nonlinear. The speed is a form of energy. It is only a part of the entire energy. Hence, v must not be zero. But d is zero outside of the time interval during galaxies exist, what means that d is a test function and v must be zero at any time. i.e. that there are posive and negative speeds as well. The conclusion is absurd because, during the expansion there is no crunch (or warming) to observe. It is necessary to assume that H is not constant. Furthermore, if d would exceed a limit, galaxies would be faster than light and if the energy of the universe is constant, than the mass density can not be proportional to the square of H (see [10], p. 179), because the density must be a test function in the sense of [5].

(iv`) $v*1/H = d$ : in the case of swapping d to v, d must be zero, because v would become a test function [5]. But, even in a curved universe, the distances are positive. Consequently, the law of Hubble is not generally valid. On the

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[14] virtual particles turn to real ones by passing a Higgs-field.

[15] speed is a form of energy; increasing the temperature of a particle means that it is faster.

[16] the constant of Hubble is also named deceleration constant; its inverse (1/H) is assumed to be the age of the universe.

other hand, hypothetically, the law of Boltzmann is to apply only in a closed system(!):
(v) $s = ß*\ln w$ where s is the thermodynamical entropy[17], w is the number of the arrangement possibilities of n particles in two volumes and ß is the Boltzmann constant. The entropy is a measure for the utilisation value of the energy which is included in the system. The thermodynamic principles affirm that in each closed system the energy quantity is conserved and that all irreversible transformations enlarge the measure of entropy; the reversible transformations do not decrease it.

According to the present analysis, the energy of a closed universe must be always zero. The logarithm function is not symmetrical. So, the boltzmannian law can be valid only during the time period until (or from) the inversion of expansion (ix). In the case the law validity begins and ends exactly with (a,t) and (ix) (respectively with (ix) and (a,t)), the law can be helpful to determine the (a,t) interval (see the next part).
(v‘.) $s*1/ß = \ln w$ by swapping the terms, w must be 1, so that lnw=0. That means the existing of only one arrangement posibility of particles in the universe. Such a Laplacian determinism is contrary to the principles of quantum mechanics (e.g. Heisenberg’s uncertainty principle).

The entropy of a black hole is determined by the following formula:
(vi) $S = A*ß*c^3/4*\gamma*h$, or (vi‘.) $S = A*k$,
S is the entropy and A is the surface of the black hole. the other symbols are constants (see [9] p. 333). The black holes disintegrate themselves, that means a symmetrical acting outside of a time interval. Therefore, their entropy is zero. This event isn`t a typical for the present analysis, because, according to the boltzmannian point of view, a black hole is an open system. Generally speaking, the present analysis is not adequate for analysing all dimensional natural constants; describing some of them on the basis of constant functionals and according to the symmetrical behavior of mass (matter) it seems that they are not constant, because the value of each dimensional constant would be zero (see, for example, the analysis of the fine structure constant[18]) below. But, we note, that this would be valid only in a closed universe.
(vii) $\alpha = e^2/2hc\ \varepsilon 0$, $\varepsilon 0$ is the vacuum dielectricity constant;
(vii’) $\alpha = 2\pi e^2/hc$, is the electromagnetical force description;
(vii’’) $\alpha g = Gme^2/hc$, the gravity coupling constant (see [1]),

[17] the quantity of entropy in the universe is equivalent to the photon quantity.
[18] if only dimensionless constants destine the world, then they destine the worlds (due to their changes).

G is the gravity constant, m is the proton mass, c is the speed of light, h is the planckian constant and e is the charge of the electron.Outside of a time interval the electron does not exist, i.e. either the fine structure constant is zero (this is absurd), or the universe is open (i.e. $\alpha$ is not constant (see[1])). We also remark that the present analysis shows that an abdication of symmetry even for a limited time-interval, allows an explication for some cosmological problems[19].The inflationary speed of vacuum must be faster as light speed and this could be explained by a fifth field (see [8]).

The quantum mechanics viewpoint is that time symmetry implicates the energy conservation equation (see [2], p.79). The present analysis (cases 1 and 2) concludes that the universe is open if its energy is variable in time. In this situation, the energy conservation equation must include the quantum vacuum too. This would accord to the multiverse and babyuniverse speculations.

## 4 The Time interval

The case vacuum is not charged and does not rotate, a cosmological problem consists in the detecting of the nature of symmetry-breakings (see [7], p. 135). The present analysis allows an asymmetrical behavior of the mass genesis; the new problem consists in the determination of the time interval during that the asymmetry enters into the world and its localisation relative to the big-bang. Some of the physical laws described could be helpful to determine the (a,t) time interval.

Furthermore, the big-bang (bb) occurred before (a,t) and, as shown, the gravity and antigravity must annihilate one another on the (a,t) interval, what means that this symmetry break took place outside of (a,t), i.e. by the beginning of (a,t) the latest. The whole inflationary period must have resided outside of (a,t), because it happend in the vacuum. because the universe was assumed to be closed, the existence of a time symmetrical big-crunch (bc) can not be excluded (more, it is not allowed that only one of the two events (bb) or (bc) happens outside of (a,t); the inflationary period must have its symmetrical inversion before big-crunch (bc).On the other hand if the energy of the

[19] the searched unification of quantum mechanics with relativity must implicate the asymmetry of time (see [9], p. 342); laws should be probably constructed on more than only proportionality.
superstring theory assumes that: string = 1/L**2, L = length = 10**-33; one of its axioms is: a*b = -b*a, where a,b are real numbers; one analogy to present analysis is: u`v = -uv`, where u and v are functions. numbers should be maybe replaced by functionals.

universe is variable[20], then a new analysis is necessary. Under this terms the multiverse model seems to be more consistently: the universes take their energy from an unlimited infinitely vacuum space[21]; which is permanent connected to the universes. This facts would not support the philosophies about the death of the universe. Even Kant`s argument that an infinitely universe does not need to be created by reason of its own infinity, finds its clarification: in an infinitely unlimited set, a Creator can create a limited infinitely set, i.e. big-bang[22].

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[20] the longer a system exists, the less is its energy; this proposition seems to be invalid for an open universe.

[21] some cosmologists assume about 50 rotations of our universe. Einstein's equation allows a solution in case of rotating universe. other cosmologists presume a non rotating universe (see [7], p.133).

[22] to be or not to be, is not the question; there are two! since gravitation exists there is nothing and nobody free anymore. everything ever changes. thus nobody could find a final cognition. another sysiphos- always another stone.