Causation **4** (2006), 5-19.

Unified field equation.

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Abstract

Could the time have had a beginning, will the time have an end? Is it possible that there is a period of time during which nothing changes? Is energy time, is time energy? Is time the negation of energy, is energy the negation of time? Can energy pass over into time and vice versa? Question like this are forcing us to put some more light on the basic relation between energy, time and space. Albert Einstein has proved that energy and time, both equally separated in one equation, can be described very well using his basic field equation. Contrary to Einstein, Heisenberg has shown that it is not possible to separate energy from time and vice versa, both are tighten together. In so far, on the one hand, Albert Einstein has proofed, how our world has to change, on the other hand, Heisenberg has proved, that our world has to change. Both contradict each other and belong together. Thus, it is time to unify general relativity and quantum mechanics, to unite Einstein and Heisenberg, it is time to enter this unknown land. This publication will proof, that the most basic relationship between energy, time and space, **the unified field equation**, derived according to the general contradiction law from the very deterministic Einstein's basic field equation is highly indeterministic and can be expressed as

$$((4 * \pi * \gamma)/(c^{4}))* (T_{ab} * R * g_{ab}) \leq ((R_{ab})*(R_{ab})) / 4.$$

Key words: Unified field equation, General relativity, Quantum mechanics, Antimatter, Matter, X, Anti X, General Contradiction Law, Energy, Time, Space.

1. Background

Gravitation, electromagnetism, the weak interaction and the strong interaction are counted by modern physicists as the four fundamental interactions of nature. *Gravitation* as such is always attractive and by far the weakest interaction. Gravitation acts over great distances. According to Einstein, Gravitation is rather a manifestation of curved space and time caused by the presence of matter and energy and not due to a force. *Electromagnetism* acts between charges. At least since the time of Albert Einstein there have been numerous attempts to unify gravitation and electromagnetism but without a real breakthrough or solution in sight.

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2. Material and Methods

Einstein investigated the relationship between energy, time and space too. He discovered the field equations of general relativity, which relate the presence of the curvature of space-time and matter. The Einstein field equations are a set of 10 non-linear, simultaneous, differential equations whose solutions are metric tensors of space-time. Einstein's field equation is based on a distinction between matter and gravitational field. Einstein denotes everything but the gravitational field as matter, in so far vacuum too. **Einstein's field equation** deals thus about gravitation and electromagnetism. As likely as not, the starting point of our attempt to unify gravitation and electromagnetism can only be found in Einstein's field equation too.

2.1. Einstein's field equation.

Einstein's theory of general relativity, especially **Einstein's field equation** describes how energy, time and space are interrelated, how the one changes into its own other and vice versa.

Einstein's basic field equation (EFE).

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

h denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**

π denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about

π ≈ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,

c denote the speed of all electromagnetic radiation in a vacuum, the speed of light, where

c = 299 792 458 [m / s],

γ denote Newton's gravitational 'constant', where

γ ≈ (6.6742 ± 0.0010) * 10^{-11} [m^3 / (s^2 * kg)],

Einstein's field equation describes how a field or energy (or matter) and time changes space and vice versa. Einstein's basic field equation (EFE) is usually written in the form

$$(((\ 4 * 2 * \pi * \gamma\ ) * T_{ab}\ )\ /\ (\ c^4\ ))\ +\ ((\ R * g_{ab}\ ) / 2\ ))\ =\ (\ R_{ab}\ ). \quad (1)$$

The stress-energy-momentum tensor as the source of space-time curvature, describes the density and flux of **energy** and momentum in space-time in Einstein's theory of gravitation. The stress-energy-momentum tensor is the source of the gravitational field, a source of space-time curvature.

According to general relativity, the metric of space-time is determined by the matter and energy content of space-time. The Ricci scalar/metric tensor completely determines the curvature of space-time and defines such notions as **future, past**, distance, volume, angle and ...

The Ricci tensor, named after Gregorio Ricci-Curbastro, is a key term in the Einstein field equations and more or less a measure of **volume distortion**.

2.2. Properties of Einstein's field equation.

The path along which Albert Einstein arrived at the final form of his General Field Equation of 1916 is based on the basic relation between matter, gravitational field and energy, since pure matter (m) as such is nothing else then pure energy ($E = m * c^2$). Einstein himself has made a distinction between the "gravitational field" and "matter" as such. In so far, according to Einstein, everything is denoted as matter but the gravitational field. According to Einstein, there is no third between "matter" as such and the "gravitational field". The word "matter" according to Einstein includes therefore not only "matter in the ordinary sense", but also the "electromagnetic field" too.

"Wir unterscheiden im folgenden zwischen 'Gravitationsfeld' und 'Materie', in dem Sinne, daß alles außer dem Gravitationsfeld als 'Materie' bezeichnet wird, also nicht nur die 'Materie' im üblichen Sinne, sondern auch das elektro-magnetische Feld. " (Einstein, 1916).

Einstein wrote:

We make a distinction hereafter between '**gravitational field**' and 'matter' in this way, that we denote everything but the gravitational field as 'matter'. Our use of the word therefore includes not only **matter in the ordinary sense**, but the **electromagnetic field** as well.

We can express this mathematically as

matter = matter in the ordinary sense + electromagnetic field,

or since matter = energy

energy = matter + gravitational field.

Einstein's word matter includes therefore matter in the ordinary sense and the electromagnetic field too. In so far, Einstein's energy-tensor of matter is an energy-tensor of matter in the ordinary sense and equally an energy-tensor of electromagnetic field too. Thus, the solution of the problem of gravitation and electromagnetism can be found only in Einstein's field equation.

2.3. Tensors

William Rowan **Hamilton** introduced the word tensor in 1846. Gregorio **Ricci-Curbastro** developed the notation tensor around 1890. The notation tensor was made accessible to mathematicians by Tullio **Levi-Civita** in 1900. **Einstein**'s theory of general relativity (1916) is formulated completely in the language of tensors. A **tensor** is an mathematical object **in and of itself**, a tensor is independent of any chosen frame of reference, a tensor is independent of human mind and consciousness. A tensor can be defined with respect to any system of co-ordinates by a number of functions of the co-ordinates. This functions of the co-ordinates can be called the components of the tensor. The components of a tensor can be calculated for a new system of co-ordinates according to certain rules, if the components of a tensor for the original system of co-ordinates are known and if the transformation connecting the both systems is known too. The equations of transformation of the components of tensors are homogeneous and linear. Consequently, if all the components of a tensor in the original system vanish, all the components in the new system vanish too. Tensors are more or less functions of space and time. There are a set of tensor rules. Following this tensor rules, it is possible to build tensor expressions that will preserve tensor properties of co-ordinate transformations. A **tensor term** $A_iB^jC_k^lD_{mn}$ ... is a product of tensors A_i B^j C_k^l and D_{mn} ... . A **tensor expression** is a sum of tensor terms $A_iB^j + C_k^lD_{mn}$ ... . The terms in the tensor expression may come with plus or minus sign. Addition, subtraction and multiplication are the only allowed algebraic operations in tensor expressions, divisions are allowed for constants. The metrical properties of space-time are more or less defined by the gravitational field. Gravitation, the metrical properties of space-time or a laws of nature as such are thus generally covariant if they can be expressed by equating all the components of a tensor to zero. With this in view, it is possible formulating generally covariant laws by examining the laws of the formation of tensors.

It is not the purpose of this publication to represent an introduction into the general theory of tensors that is as simple and logical as possible. My main object is to give a quick introduction into this theory in such a way that the reader can follow the next chapters in this publication and to be able to find a path to logic and thus to probability theory to. Closely related to tensors is Einstein's general relativity (1916) which is formulated completely in the language of tensors. The following is based on Einstein's publication (Einstein, 1916).

2.2.1 Four-vectors

2.2.1.1 Contravariant Four-vectors

Let a linear element be defined by the four components dx_v. The law of transformation is then expressed by the equation

$$dx'_\sigma = \left(\sum_v \frac{(\partial x'_\sigma)}{(\partial x_v)} dx_v \right) \tag{2}$$

The dx'_σ are expressed as homogeneous and linear functions of the dx_v. These co-ordinate differentials are something like the components of a tensor of the particular kind. Let us call this object a contravariant four-vector. In so far, if something is defined relatively to the system of co-ordinates by four quantities A^v and if it is transformed by the same law

$$A'^\sigma = \left(\sum_v \frac{(\partial x'_\sigma)}{(\partial x_v)} A^v \right) \tag{3}$$

it is also called a contravariant four-vector. According to the rule for the addition and subtraction of tensors it follows at once that the sums $A^\sigma \pm B^\sigma$ are also components of a four-vector, if A^σ and B^σ are such.

2.2.1.2 Covariant Four-vectors

Let us assume that for any arbitrary choice of the contravariant four-vector B^v

$$\left(\sum_v A_v \; B^v \right) = \text{Invariant} \tag{4}$$

In this case, the four quantities A_v are called the components of a covariant four-vector. Let us replace B^v on the right-hand side of the equation

$$\left(\sum_\sigma A'_\sigma \; B'^\sigma \right) = \left(\sum_v A_v \; B^v \right) \tag{5}$$

by an expression which is resulting from the inversion of (3),

$$\left(\sum_{\sigma} \frac{(\partial x_{v})}{(\partial x'_{\sigma})} B'^{\sigma} \right) \tag{6}$$

thus we obtain

$$\left(\sum_{\sigma} B'^{\sigma} \right) * \left(\sum_{v} \frac{(\partial x_{v})}{(\partial x'_{\sigma})} A_{v} \right) = \sum_{\sigma} B'^{\sigma} A'_{\sigma} \tag{7}$$

This equation is true for arbitrary values of the B'^{σ}, thus we obtain the law of the transformation of a covariant four-vector as

$$A'_{\sigma} = \left(\sum_{v} \frac{(\partial x_{v})}{(\partial x'_{\sigma})} A_{v} \right) \tag{8}$$

The covariant and contravariant four-vectors can be distinguished by the law of transformation. According to Ricci and Levi-Civita, we denote the covariant character by placing the index below, the contravariant character by placing the index above.

2.2.2 Tensors of the Second and Higher Ranks

2.2.2.1 Contravariant Tensors

Let A^{μ} and B^{v} denote the components of two contravariant four-vectors

$$A^{\mu v} = A^{\mu} B^{v} . \tag{9}$$

Thus, $A^{\mu v}$ satisfies the following law of transformation

$$A'^{\sigma \tau} = \left(\frac{\partial x'_{\sigma}}{\partial x_{\mu}} \right) * \left(\frac{\partial x'_{\tau}}{\partial x_{\nu}} \right) A^{\mu \nu} \tag{10}$$

Something satisfying the law of transformation (10) and described relatively to any system of reference by sixteen quantities is called a contravariant tensor of the second rank.

2.2.2.2 Contravariant Tensors of Any Rank

A contravariant tensors of the third and higher ranks can be defined with 4^3 components, and so on.

2.2.2.3 Covariant Tensors

Let A_{μ} and B_{v} denote the components of two covariant four-vectors

$$A_{\mu v} = A_{\mu} B_{v} . \tag{11}$$

Thus, $A_{\mu v}$ satisfies the following law of transformation

$$A'_{\sigma\tau} = \left(\frac{\partial x_{\mu}}{\partial x'_{\sigma}} \right) * \left(\frac{\partial x_{\nu}}{\partial x'_{\tau}} \right) A_{\mu\nu} \qquad (12)$$

This law of transformation (2) defines the covariant tensor of the second rank.

2.2.2.4 Mixed Tensors

A mixed tensor is a tensor of the second rank of the type which is covariant with respect to the index μ, and contravariant with respect to the index v. This mixed tensor can be defined as

$$A^{v}{}_{\mu} = A_{\mu} B^{v} . \qquad (13)$$

The law of transformation of the mixed tensor is

$$A'^{\tau}_{\sigma} = \left(\frac{\partial x'_{\tau}}{\partial x_{\nu}} \right) * \left(\frac{\partial x_{\mu}}{\partial x'_{\sigma}} \right) A^{\nu}_{\mu} \qquad (14)$$

2.2.2.5 Symmetrical Tensors

A contravariant or covariant tensor of the second or higher rank is said to be symmetrical

$$A_{\mu v} = A_{v \mu} \qquad (15)$$

or respectively,

$$A_{\mu v} = A_{v \mu} . \qquad (16)$$

2.2.2.6 Antisymmetrical Tensors

A contravariant or a covariant tensor of the second, third, or fourth rank is said to be antisymmetrical if

$$A^{\mu v} = - A^{v \mu} \qquad (17)$$

or respectively,

$$A_{\mu v} = - A_{v \mu} \qquad (18)$$

or

$$A^{\mu v} = - A^{v \mu} . \qquad (19)$$

That is to say, the two components of an antisymmetrical tensor are obtained by an interchange of the two indices and by an opposite sign. In a continuum of four dimensions it seems to be that there are no antisymmetrical tensors of higher rank than the fourth.

2.2.3 Multiplication of Tensors

2.2.3.1 Outer Multiplication of Tensors

The components of a tensor of rank n + m can be obtain from the components of a tensor of rank n and from the components of a tensor of rank m by multiplying each component of the one tensor by each component of the other. Examples.

$$C_{\mu \nu \sigma} = A_{\nu \mu} B_{\sigma} \tag{20}$$

$$C^{\mu \nu \sigma \tau} = A^{\nu \mu} B^{\sigma \tau} \tag{21}$$

$$C^{\mu \nu}{}_{\sigma \tau} = A^{\nu \mu} B_{\sigma \tau} \tag{22}$$

2.2.3.2 "Contraction" of a Mixed Tensor

The rank of mixed tensors can be decreased to a rank that is less by two, by contraction that is by equating an index of contravariant with one of covariant character, and summing with respect to this index. The result of contraction possesses the tensor character.

2.2.3.3 Inner und Mixed Multiplication of Tensors

The inner und mixed multiplication of tensors consist at the end in a combination of contraction with outer multiplication.

3. Results

Let the tensor product of the follwoing tensor obey the distributive law (K-theory).

3.1. Identity of the stress-energy-momentum tensor and the Ricci scalar/metric tensor

According to Einstein, the stress-energy-momentum tensor T_{ab} must not be dominant over the Ricci scalar/metric tensor ((R*g_{ab}) /2)). Both can be equal to each other, both can be present in equal amount. Thus, we must investigate now this case of **non-dominance** of each over its own other.

Theorem 1. Unified field equation I.

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

h denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**

π denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about

π ≈ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,

c denote the speed of all electromagnetic radiation in a vacuum, the speed of light, where

***c* = 299 792 458 [m / s],**

γ denote Newton's gravitational 'constant', where

$\gamma \approx (6.6742 \pm 0.0010) * 10^{-11}$ [m^3 / (s^2 * kg)],

Einstein's field equation describes how a field or energy (or matter) and time changes space and vice versa. Einstein's basic field equation (EFE) is usually written in the form

$$(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)) + ((R * g_{ab}) / 2)) = (R_{ab}).$$

Further, let us assume that **$(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)) = ((R * g_{ab}) / 2)),$**

then

$$((4 * \pi * \gamma) / (c^4)) * (T_{ab} * R * g_{ab}) = ((R_{ab}) * (R_{ab})) / 4.$$

Proof. Eq.

$$(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)) = ((R * g_{ab}) / 2)) \quad (23)$$

$$(((4*2*\pi*\gamma) * T_{ab}) / (c^4)) + (((4*2*\pi*\gamma)* T_{ab}) / (c^4))= (((4*2*\pi*\gamma)* T_{ab}) / (c^4)) + ((R * g_{ab}) / 2)) \quad (24)$$

$$2 * (((4*2*\pi*\gamma) * T_{ab}) / (c^{4})) = (R_{ab}) \quad (25$$

$$(((4*2*\pi*\gamma) * T_{ab}) / (c^{4})) = ((R_{ab})/2) \quad (26)$$

$$(((4*2*\pi*\gamma) * T_{ab}) / (c^{4})) - ((R_{ab})/2) = 0 \quad (27)$$

$$((((4*2*\pi*\gamma) * T_{ab}) / (c^{4})) - ((R_{ab})/2))^2 = 0 \quad (28)$$

$$((((4*2*\pi*\gamma) * T_{ab}) / (c^{4}))*(((4*2*\pi*\gamma)*T_{ab}) /(c^{4}))) - ((((4*2*\pi*\gamma)* T_{ab})/(c^{4}))*((R_{ab})))) + ((R_{ab})*(R_{ab}))/4 = 0 \quad (29)$$

$$((((4*2*\pi*\gamma) * T_{ab}) / (c^{4}))*(((4*2*\pi*\gamma) * T_{ab}) / (c^{4}))) - ((((4*2*\pi*\gamma)* T_{ab})/(c^{4}))*((R_{ab})))) = - ((R_{ab})*(R_{ab}))/4 \quad (30)$$

We obtain the next equation after the operation Eq. (30) * (- 1).

$$\mathbf{- ((((4*2*\pi*\gamma)/(c^{4}))*T_{ab})* (((4*2*\pi*\gamma)/(c^{4}))*T_{ab})) + ((((4*2*\pi*\gamma)/(c^{4}))*T_{ab})*(R_{ab})) = + ((R_{ab})*(R_{ab}))/4} \quad (31)$$

$$((((4*2*\pi*\gamma)/(c^{4}))*T_{ab})*(R_{ab})) - ((((4*2*\pi*\gamma)/(c^{4}))*T_{ab})* (((4*2*\pi*\gamma)/(c^{4}))*T_{ab})) = ((R_{ab})*(R_{ab}))/4 \quad (32)$$

$$(((4*2*\pi*\gamma)* T_{ab})/(c^{4})) * ((R_{ab}) - (((4*2*\pi*\gamma)/(c^{4}))*T_{ab})) = ((R_{ab})*(R_{ab}))/4 \quad (33)$$

Recall, we defined an anti tensor of a tensor A as Anti A = B = C - A (Barukčić 2006d). Thus we obtain
Anti $(((4*2*\pi*\gamma)* T_{ab})/(c^{4})) = ((R_{ab}) - (((4*2*\pi*\gamma)* T_{ab})/(c^{4}))) = ((R*g_{ab})/2)$

$$(((4*2*\pi*\gamma)/(c^{4}))*T_{ab})* (\textbf{Anti } \mathbf{T_{ab}}) = ((R_{ab})*(R_{ab}))/4 \quad (34)$$

$$(((4*2*\pi*\gamma)/(c^{4}))*T_{ab})* ((R*g_{ab})/2)= ((R_{ab})*(R_{ab}))/4 \quad (35)$$

$$(T_{ab} * R* g_{ab}) = ((c^{4})/(4*4* \pi* \gamma))*((R_{ab})*(R_{ab})) \quad (35a)$$

$$(T_{ab} * R* g_{ab}) = constant*((R_{ab})*(R_{ab})) \quad (35b)$$

$$\mathbf{((4* \pi* \gamma) / c^{4})*(T_{ab} * R* g_{ab}) = ((R_{ab})*(R_{ab}))/4} \quad (36)$$

Q. e. d.

This solution of Einstein's field equation is based on the general contradiction law (Barukčić 2006d), the most basic law of nature. Mathematically, the equation is correct. Only, is it allowed to assume that it is true that $(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^{4})) = ((R* g_{ab}) / 2))$.

Theoretically, it is possible that the one tensor is dominant over the other tensor and vice versa. If there is something like an unified field equation, the same must hold true for this case too. On the other hand, why should the one tensor allow the other to be dominant over its own self?

Recall, we defined dominant (≥) as greater or equal.

3.2. Dominance of the stress-energy-momentum tensor over the Ricci scalar/metric tensor

It is possible that the stress-energy-momentum tensor T_{ab} is dominant (≥) over the Ricci scalar / metric tensor $((R*g_{ab})\ /2))$. This situation must be investigated too.

Theorem 2. Unified field equation II.

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

h denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**

π denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about

π ≈ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,

c denote the speed of all electromagnetic radiation in a vacuum, the speed of light, where

c = 299 792 458 [m / s],

γ denote Newton's gravitational 'constant', where

γ ≈ (6.6742 ± 0.0010) * 10^{-11} [m^3 / (s^2 * kg)],

Einstein's field equation describes how a field or energy (or matter) and time changes space and vice versa. Einstein's basic field equation (EFE) is usually written in the form

$$(((4*2*\pi*\gamma)*T_{ab})\ /(c^4)) + ((R*g_{ab})/2)) = (R_{ab}).$$

Further, let us assume that $(((4*2*\pi*\gamma)*T_{ab})\ /(c^4)) \geq ((R*g_{ab})/2)),$

then

$$\mathbf{((4*\pi*\gamma)/(c^4))*(T_{ab}*R*g_{ab}) \leq ((R_{ab})*(R_{ab}))/4.}$$

Proof. Eq.

$$(((4*2*\pi*\gamma)/(c^4))*T_{ab}) \geq ((R*g_{ab})/2) \quad (37)$$

$$(((4*2*\pi*\gamma)/(c^4))*T_{ab}) + (((4*2*\pi*\gamma)/(c^4))*T_{ab}) \geq (((4*2*\pi*\gamma)/(c^4))*T_{ab}) + ((R*g_{ab})/2) \quad (38)$$

$$2*(((4*2*\pi*\gamma)/(c^4))*T_{ab}) \geq (R_{ab}) \quad (39)$$

$$(((4*2*\pi*\gamma)/(c^4))*T_{ab}) \geq ((R_{ab})/2) \quad (40)$$

$$(((4*2*\pi*\gamma)/(c^4))*T_{ab}) - ((R_{ab})/2) \geq 0 \quad (41)$$

$$(((((4*2*\pi*\gamma)/(c^4))*T_{ab}) - ((R_{ab})/2)) * ((((4*2*\pi*\gamma)/(c^4))*T_{ab}) - ((R_{ab})/2))) \geq 0 \quad (42)$$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (((4*2*\pi*\gamma)/(c^4))*T_{ab})) - ((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (R_{ab})) + ((R_{ab})* (R_{ab}))/4 \geq 0 \quad (43)$$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (((4*2*\pi*\gamma)/(c^4))*T_{ab})) - ((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (R_{ab})) \geq - ((R_{ab})* (R_{ab}))/4 \quad (44)$$

We obtain the next equation after the operation Eq. (44) * (- 1).

$$- ((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (((4*2*\pi*\gamma)/(c^4))*T_{ab})) + ((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (R_{ab})) \leq + ((R_{ab})* (R_{ab}))/4 \quad (45)$$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (R_{ab})) - ((((4*2*\pi*\gamma)/(c^4))*T_{ab})* (((4*2*\pi*\gamma)/(c^4))*T_{ab})) \leq ((R_{ab})* (R_{ab}))/4 \quad (46)$$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab})*((R_{ab})) - ((((4*2*\pi*\gamma)/(c^4))*T_{ab})) \leq ((R_{ab})* (R_{ab}))/4 \quad (47)$$

Recall, we defined an anti tensor of a tensor A as Anti A = B = C - A (Barukčić 2006d). Thus we obtain
Anti $(((4*2*\pi*\gamma)* T_{ab})/(c^4)) = ((R_{ab}) - (((4*2*\pi*\gamma)* T_{ab})/(c^4))) = ((R*g_{ab})/2)$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab}) * (\textbf{Anti } \mathbf{T}_{ab}) \leq ((R_{ab})* (R_{ab}))/4 \quad (48)$$

$$((((4*2*\pi*\gamma)/(c^4))*T_{ab})*(((R*g_{ab})/2)) \leq ((R_{ab})* (R_{ab}))/4 \quad (49)$$

$$(T_{ab} *R*g_{ab}) \leq (((c^4))/((4*\pi*\gamma)*4))*((R_{ab})* (R_{ab})) \quad (49a)$$

$$(T_{ab} *R*g_{ab}) \leq \text{constant}*((R_{ab})* (R_{ab})) \quad (49b)$$

$$\mathbf{((4 * \pi * \gamma) / (c^4)) * (T_{ab} * R* g_{ab}) \leq ((R_{ab})* (R_{ab}))/ 4} \quad (50)$$

Q. e. d.

At this point, it is important to stress that (=) is part of (≤). In so far, we are allowed to state that the relationship between stress-energy tensor (**X**) and anti stress-energy tensor (Anti X) is governed by the inequality

$$\mathbf{X * (Anti\ X) \leq C^2 / 4,}$$

which was already termed as the general contradiction law (Barukčić 2006d). In so far, based on the general contradiction law, we obtain **the unified field equation** as

$$\mathbf{((4 * \pi * \gamma)/(c^4))*(T_{ab} * R * g_{ab}) \leq ((R_{ab})* (R_{ab})) / 4.}$$

3.3. Dominance of the Ricci scalar/metric tensor over the stress-energy-momentum tensor

Theoretically, it is possible that the Ricci scalar/metric tensor ((R*g_{ab}) /2)) is dominant (≥) over the stress-energy-momentum tensor T_{ab} . This must be investigated too.

Theorem 3. Unified field equation III.

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

h denote Planck's constant, h **≈ (6.626 0693 (11)) * 10 $^{-34}$ [J * s],**

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Einstein's field equation describes how a field or energy (or matter) and time changes space and vice versa. Einstein's basic field equation (EFE) is usually written in the form

$$(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)) + ((R * g_{ab}) / 2)) = (R_{ab}).$$

Further, let us assume that $((R * g_{ab}) / 2)) \geq (((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)),$

then

$$((4 * \pi * \gamma) / (c^4)) * (T_{ab} * R * g_{ab}) \leq ((R_{ab}) * (R_{ab})) / 4.$$

Proof. Eq.

$$((R * g_{ab}) / 2) \geq (((4*2*\pi*\gamma)/(c^4))*T_{ab}) \quad (51)$$

$$((R * g_{ab}) / 2) + ((R * g_{ab}) / 2) \geq (((4*2*\pi*\gamma)/(c^4))*T_{ab}) + ((R * g_{ab}) / 2)) \quad (52)$$

$$2 * ((R * g_{ab}) / 2) \geq (R_{ab}) \quad (53)$$

$$((R * g_{ab}) / 2) \geq ((R_{ab})/2) \quad (54)$$

$$((R^* g_{ab}) / 2)) - ((R_{ab})/2) \geq 0 \quad (55)$$

$$(((R^*g_{ab})/2) - ((R_{ab})/2)) *(((R^*g_{ab})/2) - ((R_{ab})/2)) \geq 0 \quad (56)$$

$$(((R^*g_{ab})/2)^* (R^*g_{ab})/2)) - (2^*((R^*g_{ab})/2)^* ((R_{ab})/2)) + (((R_{ab})/2)^* ((R_{ab})/2)) \geq 0 \quad (57)$$

$$(((R^*g_{ab})/2)^* (R^*g_{ab})/2)) - (2^*((R^*g_{ab})/2)^* ((R_{ab})/2)) \geq - (((R_{ab})/2)^* ((R_{ab})/2)) \quad (58)$$

We obtain the next equation after the operation Eq. (58) * (- 1).

$$- (((R^*g_{ab})/2)^* (R^*g_{ab})/2)) + ((R^*g_{ab})/2)^* (R_{ab})) \leq + ((\boldsymbol{R_{ab}})^* (\boldsymbol{R_{ab}})) / 4 \quad (59)$$

$$(((R^*g_{ab})/2)^* (R_{ab})) - (((R^*g_{ab})/2)^* (R^*g_{ab})/2)) \leq ((\boldsymbol{R_{ab}})^* (\boldsymbol{R_{ab}})) / 4 \quad (60)$$

$$(((R^*g_{ab})/2)^*((R_{ab}) - ((R^*g_{ab})/2)) \leq ((R_{ab})^* (R_{ab})) / 4 \quad (61)$$

Recall, we defined an anti tensor of a tensor A as Anti A = B = C - A (Barukčić 2006d). Thus we obtain
Anti $((R^*g_{ab})/2) = ((R_{ab}) - ((R^*g_{ab})/2)) = (((4^*2^*\pi^*\gamma)^* T_{ab})/(c^4))$

$$(((R^*g_{ab})/2)^*((((4^*2^*\pi^*\gamma)^* T_{ab})/(c^4))) \leq ((R_{ab})^* (R_{ab})) / 4 \quad (62)$$

$$((4^* \pi^* \gamma) / (c^4))^* (T_{ab}^* R^* g_{ab}) \leq ((R_{ab})^* (R_{ab})) / 4 \quad (63)$$

Q. e. d.

Because of the properties of the stress-energy tensor and Anti stress-energy tensor, the apparent imbalance of both is a fundamental puzzle for physics and for astronomy, it doesn't matter if either the stress-energy tensor is dominant over the Ricci scalar/metric tensor or vice versa, we obtain the same mathematical formula of the unified field equation. In general, the mathematical formula of

the unified field equation

can be expressed as

$$((4 * \pi^* \gamma) / (c^4)) * (T_{ab} * R^* g_{ab}) \leq ((R_{ab})^* (R_{ab})) / 4, \quad (64)$$

or equally as

$$(((R_{ab})^* (R_{ab})) / 4) - (((4 * \pi^* \gamma)/(c^4))^*(T_{ab}^*R^*g_{ab})) \geq 0. \quad (65)$$

Equation (64) is not just another solution of Einstein's field equation. This equation defines the most basic and general relation between energy, time and space. Space as the unity and the struggle of energy and time can be created and destroyed according to the equation above and much more then this. It appears possible that energy is able to pass over into time and vice versa.

4. Discussion

The final form of Einstein's General Field Equation of 1916 is based the law of excluded middle and thus on pure classical bivalent logic. Einstein himself states that all but the "gravitational field" has to be taken as matter. In so far, the electromagnetic field, the vacuum, the pure matter and what ever you like, all that as a complementary of the "gravitational field" has to be taken as matter. Only, according to Einstein, matter = energy. Thus, his General Field Equation of 1916, if the same can be confirmed as correct, has the potential to serve as a foundation for a unified field equation. Einstein himself wrote:

"Wir unterscheiden im folgenden zwischen 'Gravitationsfeld' und 'Materie', in dem Sinne, daß alles außer dem Gravitationsfeld als 'Materie' bezeichnet wird, also nicht nur die 'Materie' im üblichen Sinne, sondern auch das elektro-magnetische Feld. " (Einstein, 1916).

Let us translate the words of Albert Einstein into English:

>>We make a distinction hereafter between 'gravitational field' and 'matter' in this way, that we denote everything but the gravitational field as 'matter'. Our use of the word therefore includes not only matter in the ordinary sense, but the electromagnetic field as well. << (Einstein, 1916).

If energy and time or all that is existing can be expressed with Einstein's basic field equation as

All that is existing = "gravitational field" + (the rest but the "gravitational field")

then Einstein's basic field equation has the capability to explain the beginning of our world too.

This publication has proofed that the unified field equation, the most fundamental relationship between energy, time and space based on Einstein's basic field equation and equally on the general contradiction law can be derived as

$$\left(\left(4 * \pi * \gamma \right) / \left(c^{4} \right) \right) * \left(T_{ab} * R * g_{ab} \right) \leq \left(\left(R_{ab} \right) * \left(R_{ab} \right) \right) / 4. \qquad (66)$$

Ricci-flat manifolds are known to be manifolds with a vanishing Ricci tensor or manifolds with a Ricci tensor $R_{ab} = 0$. Let us assume that the stress-energy tensor doesn't vanish. The unified field equation in this case would achieve something negative like

$$\left(\left(4 * \pi * \gamma \right) / \left(c^{4} \right) \right) * \left(T_{ab} * R * g_{ab} \right) \leq 0. \qquad (67)$$

The unified field equation derived from the highly deterministic Einstein's basic field equation is very indeterministic and thus compatible with quantum theory. The other fundamental consequence of the unified field equation is that it appears possible that energy can pass over into time, time can pass over into energy. Space seem to be this vanishing of the one into its own other and vice versa.

Acknowledgement
None.
Published: December 15th, 2006.
Revision: May 05th, 2007.

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