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Dialectical tensor logic.

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Abstract

Classical logic is more or less free of uncertainty and deals about the values either 0 or 1. Classical logic as such has a strong capacity to exploit structure and is in this sense at the end familiar with general relativity. Contrary to Classical Logic, **Probability theory** is known to be powerful enough to handle uncertainty and is in this sense at the end very familiar with quantum mechanics. The world of probability theory is always located between 0 and 1, probability is a number between 0 and 1. An impossible event is known to have a probability of exactly 0, a certain event has a probability of 1. In so far, it appears to be difficult to find a connection between classical logic and probability theory, it appears impossible to unify general relativity and quantum mechanics into one theory using the same language. The one appears to be the complementary of the other, the opposite of the other, the one seems to exclude the other out of itself and vice versa. Consequently, where logic governs, there is no probability and vice versa. Where probability governs, there is no logic. On the first sight, it appears to be impossible to unite both. Is there logic in probability, is there probability in logic, is there something like a probabilistic logic (Nilsson, 1986)? Is there relativity in quantum mechanics? Is there uncertainty in general relativity? This paper provides

a contribution to unify classical logic and probability theory.

Key words: Logic, Probability theory, Dialectics, Tensors, General relativity, Quantum mechanics, Dialectical tensor logic, Probabilistic logic, Probability logic

1. Background

Classical logic has been studied throughout the history of mankind. Although exact dates are uncertain, the first rules of formal logic descends from the Greek tradition and were written by Aristotle. The laws of classical logic, especially the three classic Aristotelian laws of thought (Boole 1854) are treated more or less as something dependent on **human mind** and consciousness. At this point, although the nature of logic is still an object of intense dispute, the laws of classical logic are nature grounded and mind independent. Classical logic investigates at the end the most basic and most general laws of nature. In opposite to classical logic, the development of **probability theory** is historical backgrounded by **practical things**, by games of chance in 17th century France. The scientific study of the laws of probability were influenced by Pierre de Fermat, Blaise Pascal (1654), Christiaan Huygens (1657), Jakob Bernoulli (Ars Conjectandi, posthumous, 1713), Abraham de Moivre (1718), Pierre-Simon Laplace (1774) and many others. The successful attempts of Kolmogorov and Cox to formalise probability are still not suitable to unified classical logic and probability theory. On this point of view, the usual quantum mechanics can be regarded something like a probability calculus resting upon logic. The empirical success of quantum mechanics calls for a unification of classical logic and probability theory to enable a fully relativistic quantum theory. This view is associated with the demand to unify quantum theory and relativity into one theory using the same tools, language and formulas. In particular, we must go beyond Aristotle, Boole, Kolmogorov and Cox, we must negate the same but equally preserve them too.

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2. Material and Methods

The mathematical tools which are presented in the following pages constitutes the farthest-reaching generalisation of classical logic and probability theory and are at the based upon the research on non-Euclidean manifolds by Riemann, Gauss and Christoffel which have been systematised by Ricci and Levi-Civita. The necessary new mathematical tools developed in this paper are presented in as simple and transparent manner as possible. A special study of the mathematical literature is useful but not required. The laws of classical logic and probability theory must be unified in such a way that they apply to any systems of references. In this case under consideration, the general laws of classical logic and probability theory are of such a nature that they are to be expressed by equations which hold good for both or for all systems (generally co-variant according to Einstein (Einstein 1916)). With this aim in view we will at the end develop mathematical tools that enable us to unify general relativity and quantum mechanics into one theory. Since Einstein's theory of general relativity is completely expressed in the language of tensors, this paper is based on the use of tensors too. Having seen the foregoing, the fundamental idea of this paper is thus the following :

Let a tensors be defined with respect to any system by a number of functions which are called the "components " of the tensor. There are certain rules by which these components can be calculated for a new system, if the transformation connecting the two systems is known and if they are known for the original system. The equations of transformation for the components of tensors are linear and homogeneous. Consequently, if all the components vanish in the original system, the components in the new system will vanish too.

The laws of nature may remain the same under any circumstances but this is not proofed and secured so far. Thus, to ensure the validity of that what follows in every reference frame, this paper is based only on **one postulate**: the constancy of the law of identity (in vacuo) or on A = A (in vacuo) or in accordance with Einstein, on the constancy of the velocity of light c = c (in vacuo).

2.1. Classical logic

Logic as nature grounded and mind-independent investigates and classifies the most basic, the most general and the most fundamental laws of nature. In so far, there must be a path to tensors too. The three classic laws of thought according to Aristotle are the law of contradiction, the law of the excluded middle and the law of identity. Thus let the last be the first.

2.1.1. Identity law. Lex identitatis.

2.1.1.1. Self-identity and local hidden variable

The law of identity or **lex identitatis** according to Barukčić (Barukčić 2006a, pp. 55-60, pp. 44-46) states that something like $\mathbf{A_t}$ at a (space) time t is identical only to itself, it is only itself and without anything else, it is **the 'purity' as such**, it is without the other of itself, it is without any form of a local hidden variable (Barukčić 2006a, pp. 55-60; Barukčić, 2006b) or

$$\mathbf{A_t = A_t}. \tag{1}$$

A_t is the simple equality with itself, A_t is only self-related and unrelated to an other, any relation to an other is removed, any relation to an other has vanished. In this way, there does not appear to be any relation to an other, A_t is distinct from any relation to an other and contains nothing other but only itself.

Consequently, A_t is in its own self only itself and nothing else and in so far the absence of any other determination. In this sense, A_t is identical only with itself, A_t is just the 'pure' A_t. The identity with itself has consequences. If A_t is only A_t and nothing else, then it is not equally the other of itself, it is not equally the local hidden variable of itself, it is not equally the negation of itself. The other, the local hidden part of A_t, the negative of A_t is not as necessary as the A_t itself, A_t is not confronted by its other. A_t is without any opposition or contradiction, is not against an other, is not opposed to an other, is identical only with itself and has passed over into pure equality with itself or A_t is without any local hidden variable. But lastly, although A_t is identical only with itself it is equally somehow different, this identity with itself is in its own self different. It is a positive A_t that is identical with the positive A_t. But equally, it is the negative A_t the is identical with the negative A_t. In so far, even if A_t is identical only with itself it is equally in its selfsameness different from itself and thus self-contradictory. Thus $+A_t = + A_t$ excludes equally the other out of itself, it is not $-A_t = - A_t$. The identity with itself is based on the exclusion of the other of itself out of itself, it is based on the non-being as the non-being of its other. In excluding its own other ($-A_t$) out of itself $+A_t$ is excluding itself in its own self. By excluding its other, $+A_t$ makes itself into the other of what it excludes from itself or $+A_t$ makes itself into its own opposite, $+A_t$ is thus simply the transition of itself into its opposite. $+A_t$ is therefore alive only in so far as it contains such a contradiction within itself.

Identity and otherness.

Let

A_t denote something, a Bernoulli random variable, that is either true (=+1) or false (=+0) at the (space)time t,

t denote a Bernoulli trial at the (space)time t,

then

$$(A_t = A_t) = (A_t = (\text{Not}(\text{Not } A_t))) = ((A_t > (\text{Not } A_t)) \textbf{ Exclusive Or } (A_t < (\text{Not } A_t))).$$

Proof. **Eq.**

Trial	A_t (1)	A_t (2)	Not A_t (3)	$A_t = A_t$ (4)	A_t>(Not A_t) (5)	A_t <(Not A_t) (6)	((A_t >(Not A_t)) Exclusive Or (A_t < (Not A_t))) (7)	Eq.
1	1	1	0	**1**	1	0	**1**	(2)
2	0	0	1	**1**	0	1	**1**	(3)

Q. e. d.

The identity of $+A_t$ with itself is based equally on the relation to the other of itself, to its own local hidden variable. It is not only true that the identity of A_t with itself is given if $(\mathbf{A_t = A_t})$, it is equally true that the identity of A_t with itself is given if **either** $(A_t > (\text{Not } A_t))$ **or** $(A_t < (\text{Not } A_t))$. It is not possible that $\mathbf{(A_t \cap (\text{Not } A_t)) = 1 = true}$**.** Thus, if the one is, the other is not and vice versa. The one is excluding its own other out of itself and vice versa. But equally, both are determined as distinguished from each other, A_t as the simple equality with itself, as something only self-related and unrelated to its own other is equally determined by its relation to its own other, by the exclusion of the other of itself out of itself. Consequently, even if $(\mathbf{A_t = A_t})$, the relation to its own other is not removed, the relation to its own other has not vanished. The identity of itself with itself is determined by the fact that

$$\mathbf{A_t = (A_t > (\text{Not } A_t)).} \tag{4}$$

But lastly, although A_t is only identical with itself, the same A_t is in its selfsameness equally based on the difference to its own other. It is the same A_t that is in its own self different and thus self-contradictory. A_t in its selfsameness is distinct from its own other, its identity with itself is determined by this relation to its own other.

In accordance with Eq. (4) A_t > (Not A_t) or A_t is **greater than** (Not A_t). This relation is known as a **strict inequality**. Recall, an inequality is reversed if both members of a inequality are divided or multiplied by a negative number. It is the same equality that is determined by an inequality or in other words. An equality has equally a relation to an inequality and vice versa.

Anti-Gill I. An equal is determined by an unequal and vice versa.

Let

1 denote the mathematical constant 1,

> denote the strict inequality which means greater than,

≥ denote the non-strict inequality which means either greater than or equal to,

< denote the strict inequality which means less than,

≤ denote the non-strict inequality which means either less than or equal,

= denote the strict inequality which means equal to,

≠ denote the disequality which means greater than,

then

$$(1 = 1) = 1 - (1 \neq 1).$$

Proof. **Eq.**

Trial	**1**	1 = 1	1 ≠ 1	1 > 1	1 < 1	1 ≥ 1	(1=1)+(1>1)	(1=1)+(1<1)	1 - (1 ≠ 1)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)=(6)=(1)+(4)	(8) =(1)+(5)	(9)=(2)=(1)-(3)	
1	**1**	1	0	0	0	1	1	1	1	(5)
2	**1**	1	0	0	0	1	1	1	1	(6)

Q. e. d.

In accordance to Eq. (5) and Eq. (6) Coll. (9) an equal is grounded on and unequal, the existence of the pure equality would be based on the absence of the disequality. Only a disequality differs from inequality, both are not the same.

Anti-Gill II. An exclusive or is different from an inclusive or and vice versa.
That is to say, (1 ≥ 1) means **(1 ≥ 1) = Either** (1 = 1) **or** (1 > 1).

Let

1 denote the mathematical constant 1,

> denote the strict inequality which means greater than,

≥ denote the non-strict inequality which means either greater than or equal to,

< denote the strict inequality which means less than,

≤ denote the non-strict inequality which means either less than or equal to,

= denote the equality which means equal to,

≠ denote the disequality which means greater than,

then

$$(1 \geq 1) = \textbf{Either } (1 = 1) \textbf{ or } (1 > 1) .$$

Proof by contradiction. **Eq.**

Assumption:

$$(1 \geq 1) = ((1 = 1) \textbf{ inclusive or } (1 > 1)) \quad (7)$$

$$(1 \geq 1) = ((1 = 1) \cup (1 > 1)) \quad (8)$$

$$(1 \geq 1) = 1 - ((1 - (1 = 1))*(1 - (1 > 1))) \quad (9)$$

$$(1 \geq 1) = 1 - (1 - (1 = 1) - (1 > 1) + ((1 = 1)*(1 > 1))) \quad (10)$$

$$(1 \geq 1) = 1 - 1 + (1 = 1) + (1 > 1) - ((1 = 1)*(1 > 1)) \quad (11)$$
$$(1 \geq 1) = (1 = 1) + (1 > 1) - ((1 = 1)*(1 > 1)) \quad (12)$$

The mathematical operation times (*) is identical with the logical operation AND ($\cap$) while we are using the numbers 0 or 1. Thus we obtain the next equation.

$$(1 \geq 1) = (1 = 1) + (1 > 1) - \mathbf{((1 = 1) \cap (1 > 1))} \quad (13)$$

What is the meaning of the term $((1 = 1) \cap (1 > 1))$. The term $((1 = 1) \cap (1 > 1))$ denotes the fact, that (1 = 1) and that (1 > 1) in the same respect, at the same time. Is it possible at all that the same 1 is equal to itself and not equal to itself, that (1 = 1) and that at the same time (1 > 1)? Nonetheless, it is true that (1 = 1) = 1. In so far, we obtain the next equation.

$$(1 \geq 1) = (1 = 1) + (1 > 1) - ((1 \cap (1 > 1)) \quad (14)$$
$$(1 \geq 1) = (1 = 1) + (1 > 1) - (1 > 1) \quad (15)$$
$$(1 \geq 1) = (1 = 1) + 0 \quad (16)$$

In accordance with Eq. (5) and Eq. (6) Coll. (7) we obtain the next equation.

$$(1 = 1) + (1 > 1) = (1 = 1) \quad (17)$$
$$(1 > 1) = 0 \quad (18)$$

Our assumption was that (1 ≥ 1) is determined by an **inclusive or** which is denoted as (1 = 1) OR (1 > 1) is true as long as the term (1 > 1) = 0 . Only, a disjunction is usually defined by two terms, both of them are equipotent, the one is not more powerful then the other. In so far, theoretically it is and must be possible that there is something like (1 >1) = 1 too. Consequently, if there would not exist something like (1 > 1) = 1, our assumption above that (1 ≥ 1) is determined by an **inclusive or** would be grounded on a non-existent second term which is not in accordance with the definition of disjunction. In so far, let us assume that the term (1>1) exists, theoretically it must be possible that the same can be equal to 1, or (1 > 1) = 1. Otherwise we would misuse the disjunction. Thus, we obtain the next equation.

$$\mathbf{1 = 0.} \quad (19)$$

Q. e. d.

Our assumption, that (1 ≥ 1) is determined by an **inclusive or** leads straightforward into a logical contradiction. If we do not accept that (1 > 1), which of course makes sense, since 1 is constant and doesn't change, then equally we cannot claim, that (1 ≥ 1) is determined by an **inclusive or**. In this situation we must claim that, (1 ≥ 1) = **Either** (1 = 1) **or** (1 > 1). If we put some light on the inequality (1 ≤ 1), the situation is the same. It is true that (1 ≤ 1) = **Either** (1 = 1) **or** (1 < 1). This is very important, since in physics and other sciences too, inequalities plays a fundamental role. The things should not change that much is we analyse the relationship between a and b instead of 1.

a ≥ b

The following 2 by 2 table gives an overview of the inequality a ≥ b.

a ≥ b		b	
		1	0
a	1	(a = b)	(a > b)
	0	(a < b)	(a = b)

Table. $a \geq b$						
Without a no b.						
Trial	a	b	(a = b)	(a > b)	(a=b) ∪ (a > b)	(a ← b)
1	1	1	1	0	1	1
2	1	0	0	1	1	1
3	0	1	0	0	0	0
4	0	0	1	0	1	1

The inequality ≥ must be expressed as an **exclusive or** if the same deals about a constant (Eq. (19)) and at the same time, the inequality ≥ must not be expressed as an **exclusive or** if a and b are not constant. In this case, the inequality ≥ can be expressed by the terms of an **inclusive or** as can be seen in the table above. This is a contradiction.

In so far, in accordance to Eq. (5) and Eq. (6) Coll. (7) and the tables above, the relationship (a ≥ b) is determined by the conditio-sine-qua non relationship or (a ≥ b) = without a no b. This could be abbreviated as well as **either** (a = b) **or** (a > b), which is equally true. But, as proofed above, it is absolutely sure, that **we cannot reduced (a ≥ b) only to an inclusive** or like (a=b) ∪ (a > b).

a ≤ b

The situation doesn't change that much, if we regard the term (a ≤ b). This inequality is based on the **conditio-per-quam** relationship (implication) as can be seen in the 2 by 2 table below.

a ≤ b		b	
		1	0
a	1	(a = b)	(a > b)
	0	(a < b)	(a = b)

In accordance with the 2 by 2 table above, the relationship (a ≤ b) is determined by the conditio-per-quam relationship or (a ≤ b) = when a then b.

Table. $a \leq b$						
When a then b.						
Trial	a	b	(a = b)	(a < b)	(a=b) ∪ (a < b)	(a → b)
1	1	1	1	0	1	1
2	1	0	0	0	0	0
3	0	1	0	1	1	1
4	0	0	1	0	1	1

2.1.1.2. Identity law and the law of independence

There is a relation between identity with itself and the law of independence. If A_t is identical only with itself, if A_t is only A_t and nothing else, if A_t is not equally the other of itself, then

Identity and independence.

Let

A_t denote something, a Bernoulli random variable, that is either true (=+1) or false (=+0) at the (space)time t,

t denote a Bernoulli trial at the (space)time t,

then

$$A_t \cap A_t = (A_t > (\text{Not } A_t)) = ((A_t > (\text{Not } A_t)) \cap (\text{Not } (A_t < (\text{Not } A_t)))).$$

Proof. **Eq.**

Trial	A_t	A_t	Not A_t	**$A_t \cap A_t$**	**A_t>(Not A_t)**	A_t <(Not A_t)	((A_t >(Not A_t)) ∩(Not (A_t<(Not A_t))))	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	1	1	0	**1**	1	0	**1**	(20)
2	0	0	1	**0**	0	1	**0**	(21)
	p(A_t)	p(A_t)		p((A_t)∩(A_t))				(22)

Q. e. d.

It is evident that according to Eq. (20) and Eq. (21) Coll. (1) and Coll. (4)

$$p(A_t) = p(A_t \cap A_t). \tag{23}$$

as long as A_t can change from A_t (trial 1) and to Not A_t (trial 2). This situation changes, if A_t cannot change at all, if A_t is all the (space) time **either** $p(A_t) = 1$ **or** $p(A_t) = 0$. Thus, let $A_t = 1$, in so far it is evident that $\mathbf{p(A_t) = 1}$.

Identity and independence I.

Let

A_t denote something, a Bernoulli random variable, that is either true (=+1) or false (=+0) at the (space)time t,

t denote a Bernoulli trial at the (space)time t,

then

$$A_t \cap A_t = \mathbf{(A_t = A_t)} = (A_t > (\text{Not } A_t)) = ((A_t > (\text{Not } A_t)) \cap (A_t)).$$

Proof. **Eq.**

Trial	A_t	A_t	Not A_t	**$A_t \cap A_t$**	**A_t>(Not A_t)**	**A_t = A_t**	((A_t > (Not A_t)) ∩ (A_t))	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	1	1	0	1	1	1	1	(24)
2	1	1	0	1	1	1	1	(25)
	p(A_t)	p(A_t)	p(Not A_t)	p((A_t)∩(A_t))				(26)

Q. e. d.

If that $\mathbf{p(A_t) = 1}$ then it is evident that

$$\mathbf{p(A_t) * p(A_t) = p(A_t \cap A_t).} \quad (27)$$

$$((p(A_t) = 1) * (p(A_t) = 1)) - (p(A_t \cap A_t) = 1) = 0 \quad (28)$$

$$(1 * 1) - 1 = 0 \quad (29)$$

$$0 = 0 \quad (30)$$

If $p(A_t) = 1$ then A_t is equally independent from itself. Any trial to change itself is without any success, A_t was A_t, A_t is A_t and A_t will stay the same A_t for ever. A_t has successfully removed itself from Not A_t or sublates the same as something opposed to it, it is only A_t and nothing else.

A_t in its self-sameness and without any relation to its own other cannot change under such circumstances. Since A_t as one which changes, as yet has not changed, as yet is not its other, would be only on the way to its other, to change to Not A_t. But again, that A_t which begins to change already is itself and equally too, is not as yet.

As yet there is only A_t and there is to become its other, the Not A_t, the A_t cannot be only the pure A_t, but an A_t from which something, the Not A_t, is to proceed; therefore the Not A_t, too, is already contained in the A_t.

The A_t therefore contains both, A_t and not A_t, A_t is the unity of A_t and not A_t; or is Not A_t which is equally A_t, and A_t which is equally not A_t, A_t is the union of itself with its negative, A_t is its otherness, A_t is equally its local hidden variable.

The law of excluded middle and the law of independence I.
Let

A_t denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time t,

$p(A_t)$ denote the probability of something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time t. Even if $p(A_t) = 1$, in the case of independence, the law of excluded middle is valid,

then

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1.$$

Proof.

$$\mathbf{p(A_t) = 1} \quad (31)$$

$$1 - p(A_t) = 0 \quad (32)$$

In accordance with Eq. (26), Col. (3) it is equally true that $\mathbf{p(Not\ A_t) = 0}$, if $p(A_t) = 1$. Thus, we obtain the next equation.

$$1 - p(A_t) = p(\text{Not } A_t) \quad (33)$$

$$p(A_t) + p(\text{Not } A_t) = 1 \quad (34)$$

$$p(A_t) + p(Not\ A_t) - 0 = 1 \quad (35)$$

If **p(A_t) = 1** then **p(Not A_t) = 0** and **((p(A_t) * p(Not A_t)) = 0).** We obtain the next equation.

$$p(A_t) + p(Not\ A_t) - (p(A_t) * p(Not\ A_t)) = 1 \quad (36)$$

$$0 + p(A_t) + p(Not\ A_t) - (p(A_t) * p(Not\ A_t)) = 1 \quad (37)$$

$$+1 - 1 + p(A_t) + p(Not\ A_t) - (p(A_t) * p(Not\ A_t)) = 1 \quad (38)$$

$$1 - (1 - p(A_t) - p(Not\ A_t) + (p(A_t) * p(Not\ A_t))) = 1 \quad (39)$$

$$\mathbf{1 - ((1 - p(A_t))*(1 - p(Not\ A_t))) = 1} \quad (40)$$

Q. e. d.

In so far, even if p(A_t) = 1, if A_t is independent from itself, the otherness of itself back in itself and equally excluded the same out of itself, A_t is equally the unity of itself and its other, it is equally the relation to its otherness within itself.

A_t passes over into its own other, through its relation to its own other, in its relation to its own other its alteration begins. In accordance with Eq. (40), the law of the excluded middle is valid even in a world where p(A_t) = 1. In such a world, the laws of probability theory breaks down or are at least useless, in such a world, the laws of classical logic are needed and useful to explain this world. In this context, the correct and precise definition of inequalities is very important, otherwise we will reach erroneous results. Let us assume that the pure A_t is the unity into which the union of A_t itself with its negative, with its otherness, with its local hidden variable has collapsed at the extreme point of their union with each other, then probability theory has vanished in that unity too, leaving behind nothing but the pure logic.

In so far if p(A_t) = 1 is the point, where probability theory ends, it is equally the point, where classical logic begins and vice versa. If p(A_t) < 1 is the point, where classical logic ends, it is equally the point, where probability theory begins and vice versa.

It may be that there is a world governed either by 0 or by 1 but equally too, there is a world between 0 and 1. In so far, classical logic and probability theory need each other for their existence, the one cannot without the other and vice versa, both are at the end governed by the same laws, both should speak the same language, both should use the same mathematical framework.

The situation is not that much an other if p(A_t) = 0. Even if p(A_t) = 0 then A_t is independent from itself and the laws of classical logic are valid.

$$\mathbf{p(A_t) * p(A_t) = p(A_t \cap A_t)} \quad (41)$$

$$((p(A_t) = 0) * (p(A_t) = 0)) - (p(A_t \cap A_t) = 0) = 0 \quad (42)$$

$$(0 * 0) - 0 = 0 \quad (43)$$

$$0 = 0 \quad (44)$$

The law of the excluded middle is valid even in the case of independence.

The law of excluded middle and the law of independence II.

Let

A_t denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time t,

$p(A_t)$ denote the probability of something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object etc. at the (space) time t. Even if $p(A_t) = 0$, in the case of independence, the law of excluded middle is valid,

then

$$1 - ((1 - p(A_t)) * (1 - p(\text{Not } A_t))) = 1.$$

Proof.

$$\mathbf{p(A_t) = 0} \tag{45}$$

$$p(A_t) = 1 - 1 \tag{46}$$

$$1 - p(A_t) = 1 \tag{47}$$

In accordance with Eq. (26), Col. (3) it is equally true that $\mathbf{p(\text{Not } A_t) = 1}$, if $p(A_t) = 0$. Thus, we obtain the next equation.

$$1 - p(A_t) = p(\text{Not } A_t) \tag{48}$$

$$p(A_t) + p(\text{Not } A_t) = 1 \tag{49}$$

$$p(A_t) + p(\text{Not } A_t) - 0 = 1 \tag{50}$$

If $\mathbf{p(A_t) = 0}$ then $\mathbf{p(\text{Not } A_t) = 1}$ and $\mathbf{((p(A_t) * p(\text{Not } A_t)) = 0).}$ We obtain the next equation.

$$p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \tag{51}$$

$$0 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \tag{52}$$

$$+1 - 1 + p(A_t) + p(\text{Not } A_t) - (p(A_t) * p(\text{Not } A_t)) = 1 \tag{53}$$

$$1 - (1 - p(A_t) - p(\text{Not } A_t) + (p(A_t) * p(\text{Not } A_t))) = 1 \tag{54}$$

$$\mathbf{1 - ((1 - p(A_t))*(1 - p(\text{Not } A_t))) = 1} \tag{55}$$

Q. e. d.

2.1.2. Negation Law. Lex negationis.

The quantum field theory provides the mathematical framework for the Standard Model of particle physics. The Standard Model of particle physics is the theory of fundamental interactions between particles today but it lacks as such **the inclusion of gravity** and is at the end not consistent with both quantum mechanics and special relativity.

Elementary particles that make up all matter, change and develop under certain conditions, even symmetry can spontaneously be broken. Situations where particles may be created and destroyed are governed by natural laws valid in micro- and macrophysics.

The dynamical creation and annihilation of particles which is a crucial aspect of relativity is a natural process. But at the end both processes, creation and annihilation, are based on the most basic processes in nature, on causation and negation.

In so far, if something and its other collide and disappear (a particle and its antiparticle), they don't pass over into nothing, they release at least energy and time. The amount of energy (*E*) produced by negation or annihilation of particles is a special case of negation and has to do with general relativity and Einstein's famous mass-energy relation.

In so far, there should be a path between negation, annihilation, Einstein's relativistic correction and the logical negation.

In mathematics and classical logic, negation is an operation on logical values like 0 and 1 or a natural process that converts true (=1) to false (=0) and false (=0) to true (=1), the one is created, the other is annihilated. The following table of Not A_t (also written as ~ A_t or ¬ A_t) is a proof of the equivalence of **Not A_t = 1 - A_t** .

Negation.

Let

A_t denote something, a Bernoulli random variable, that is either true (=1) or false (=0) at the (space)time t,

Not A_t denote the logical negation of A_t that is either true (=1) or false (=0) at the (space)time t,

t denote the (space)time t,

then

$$(\text{Not } A_t) = 1 - A_t .$$

Proof.

A_t	**(Not A_t)**	**(1 - A_t)**	Equation
(1)	(2)	(3)	
1	0	0	(56)
0	1	1	(57)

Q. e. d.

No matter how the logical negation is notated, in bivalent logic it is equally true that **Not A_t = (1 - A_t)**. It is important to stress that the logical negation converts **either** 0 to 1 **or** 1 to 0, something in its own other, the one is created, the other is annihilated and vice versa. How powerful must negation be to change something in its own other. Negation as such is changing something in an other and must have to do something with causation. The logical negation can be defined in terms of algebra.

Negation and algebra I.

Let

A_t denote something that is either true (=1) or false (=0) at the (space)time t,

Not A_t denote logical negation of A_t that is either true (=1) or false (=0) at the (space)time t,

C_t denote something other at the (space)time t,

t denote the (space) time t.

Let us respect the law of the excluded middle,

then

$$\textbf{Anti } \mathbf{A_t} = \textbf{Not } \mathbf{A_t} = \mathbf{C_t - A_t} .$$

Proof.

	Equation
$\mathbf{+ A_t = + A_t}$	(58)
$- A_t = - A_t$	(59)
$C_t - A_t = C_t - A_t$	(60)

We define $C_t - A_t$ = Anti A_t = Not A_t . Thus, we obtain the next equation.

$\textbf{Anti } \mathbf{A_t} = \textbf{Not } \mathbf{A_t} = \mathbf{C_t - A_t}$	(61)

Q. e. d.

Negation and algebra II.

Let

A_t denote something that is either true (=1) or false (=0) at the (space)time t,

Anti A_t denote the negation of A_t that is either true (=1) or false (=0) at the (space)time t, the otherness of A_t, the local hidden variable of A_t etc. at the (space)time t,

C_t denote something other at the (space)time t,

t denote the (space) time t.

Let us respect the law of the excluded middle,

then

$$\mathbf{A_t + (\textbf{Anti } A_t) = C_t} .$$

Proof. Equation

$$+ \mathbf{A_t} = + \mathbf{A_t} \qquad (62)$$

$$+A_t - A_t = 0 \qquad (63)$$

$$+A_t - A_t = +C_t - C_t \qquad (64)$$

$$+C_t + A_t - A_t = +C_t \qquad (65)$$

$$A_t + C_t - A_t = C_t \qquad (66)$$

Our assumption is that we respect the law of the excluded middle. In so far, in accordance to Eq. (61), we obtain the next equation.

$$\mathbf{A_t + (Anti\ A_t) = C_t} \qquad (67)$$

Q. e. d.

Tertium non datur, there is no third between A_t and Anti A_t. In so far, in accordance with Kolmogorov A_t and Anti A_t "have no element in common" (Kolmogorov 1933, p. 2; p. 6). In so far, according to Kolmogorov's Axiom IV and V it is true that

$$\mathbf{p(C_t = A_t + Anti\ A_t) = p(A_t) + p(Anti\ A_t) = 1.}$$

		p(Anti A_t)		
		0	**1**	
p(A_t)	**1**	**1**	**0**	**p(A_t)**
	0	**0**	**1**	**p(Anti A_t)**
		p(A_t)	**p(Anti A_t)**	**1**

Negation and Einstein's relativistic correction.

Let

X_t denote something existing independently of human mind and consciousness at the (space)time t,

$\Delta(X_t)^2$ denote the inner contradiction of X_t,

Anti X_t denote Anti something existing independently of human mind and consciousness at the (space)time t,

$\Delta(\text{Anti } X_t)^2$ denote the inner contradiction of Anti X_t,

C_t denote the unity of X_t and Anti X_t. Recall, that $\mathbf{X_t + (Anti\ X_t) = C_t}$. Let

v denote the velocity,

Anti v denote the anti velocity,

c denote the speed of the light,

t denote the (space)time t,

then

$$\mathbf{(1 - ((X_t)^2 /(C_t)^2))^{1/2} = (1 - ((X_t)^2 /(C_t)^2))^{1/2}.}$$

Proof.

Equation

$$\mathbf{0} \quad (68)$$

$$\mathbf{-1 + 1 = 0} \quad (69)$$

$$\mathbf{-1 = -1} \quad (70)$$

$$\mathbf{+1 = +1} \quad (71)$$

$$\mathbf{+X_t = +X_t} \quad (72)$$

$$+X_t - X_t = 0 \quad (73)$$

$$+X_t - X_t = +C_t - C_t \quad (74)$$

$$+X_t + C_t - X_t = +C_t \quad (75)$$

$$+X_t + (\text{Anti } X_t) = +C_t \quad (76)$$

$$(+X_t + (\text{Anti } X_t))^2 = (+C_t)^2 \quad (77)$$

$$(+X_t + (\text{Anti } X_t))^2 / (+C_t)^2 = 1 \quad (78)$$

$$((X_t)^2 + (2*(X_t)*(\text{Anti } X_t)) + (\text{Anti } X_t)^2) / (+C_t)^2 = 1 \quad (79)$$

$$((2*(X_t)*(\text{Anti } X_t)) + (\text{Anti } X_t)^2) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (80)$$

$$((\text{Anti } X_t) *(2*(X_t) + (\text{Anti } X_t))) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (81)$$

$$((\text{Anti } X_t) *((X_t) + (X_t) + (\text{Anti } X_t))) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (82)$$

$$((\text{Anti } X_t) *((X_t) + (C_t))) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (83)$$

$$(((C_t) - (X_t)) *((C_t) + (X_t))) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (84)$$

$$((C_t)^2 - (X_t)^2) / (C_t)^2 = 1 - ((X_t)^2 /(C_t)^2) \quad (85)$$

$$1 - ((X_t)^2 /(C_t)^2) = 1 - ((X_t)^2 /(C_t)^2) \quad (86)$$

$$\mathbf{(1 - ((X_t)^2 /(C_t)^2))^{1/2} = (1 - ((X_t)^2 /(C_t)^2))^{1/2}} \quad (87)$$

Q. e. d.

Set $X_t = v$ and $C_t = c$, then $(1 - ((X_t)^2 /(C_t)^2))^{1/2} = (1 - ((v)^2 /(c)^2))^{1/2}$ and we arrived at Einstein's relativistic correction. In so far, Einstein's relativistic correction is based on the identity law too. On the other hand, the same has the ability to change since Anti $X_t = X_0 = X_t * ((1 - ((X_t)^2 /(C_t)^2))^{1/2})$. Let us assume, we have only the pure X_t, in this case it is $X_t = C_t$. We obtain according to Einstein, Barukčić (Barukčić 2006a, pp. 64-65) and the equation above

$$\mathbf{Anti\ X_t = X_0 = ((1 - ((X_t)^2 /(C_t)^2))^{1/2}) * X_t = ((1 - 1)^{1/2}) * X_t = 0.}$$

2.1.3. Law of contradiction. Lex contradictions.

Is it possible at all that one and the same particle is at the same (space)time positive and negative, that it is and equally it is not, that something is equal to itself (1=1) **and** at the same time not equal (1 > 1) to itself? The law of contradiction as one of the basic laws of nature and thus of classical logic too, states that it is not possible that one and the same something (**is and equally is not**) at the same (space) time. The law of contradiction can be expressed in terms of classical logic as:

$$\mathbf{A_t * (Anti\ A_t) = 0}$$

or

$$1 - (A_t * (Anti\ A_t)) = 1$$

or

$$Anti\ (A_t\ and\ (Anti\ A_t)) = 1$$

or

$$Anti\ (A_t \wedge (Anti\ A_t)) = 1.$$

Law of contradiction.

Let

A_t	denote something that is either true (=1) or false (=0) at the (space)time t,
Anti A_t	denote (logical) negation of A_t that is either true (=1) or false (=0) at the (space)time t,
t	denote the (space)time t,

then

$$\mathbf{(A_t * (Anti\ A_t)) = 0\ .}$$

Proof. **Equation**

$$\mathbf{A_t = A_t} \qquad (88)$$

$$A_t - A_t = 0 \qquad (89)$$

Recall that $1^2 = 1$ or $0^2 = 0$. Since A is either 0 or 1 it is equally true that $A^2 = A$. We obtain

$$A_t - (A_t)^2 = 0 \qquad (90)$$

$$A_t - (A_t * A_t) = 0 \qquad (91)$$

$$A_t * (1 - (A_t)) = 0 \qquad (92)$$

Recall, that Anti $\mathbf{A_t = 1 - A_t}$ thus we obtain

$$\mathbf{A_t * (Anti\ A_t) = 0.} \qquad (93)$$

Q. e. d.

The law of contradiction is based on the identity law and can be derived from the same.

The inner contradiction of A and Anti A I.

Let

A_t	denote something at the (space)time t,
$\Delta(A_t)^2$	denote the inner contradiction of A_t,
Anti A_t	denote (logical) negation of A_t at the (space)time t,
$\Delta(\text{Anti } A_t)^2$	denote the inner contradiction of Anti A_t,
C_t	denote the unity of A_t and Anti A_t. Let A_t + (Anti A_t) = C_t . Let
t	denote the (space)time t,

then

$$\mathbf{\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.}$$

Proof.

		Equation
$-0 = -0$	$-0 = -0$	(94)
$+0 = +0$	$+0 = +0$	(95)
$+1 - 1 = +0$	$+1 - 1 = +0$	(96)
$+ 1 = + 1$	$+ 1 = + 1$	(97)
$\mathbf{+A_t = +A_t}$	$\mathbf{+A_t = +A_t}$	(98)
$+A_t - A_t = 0$	$+A_t - A_t = 0$	(99)
$+A_t - A_t = +C_t - C_t$	$+A_t - A_t = +C_t - C_t$	(100)
$+A_t + C_t - A_t = +C_t$	$+A_t + C_t - A_t = +C_t$	(101)
Set Anti $A_t = +C_t - A_t$	Set Anti $A_t = +C_t - A_t$	(102)
$\mathbf{+A_t + (\text{Anti } A_t) = +C_t}$	$\mathbf{+A_t + (\text{Anti } A_t) = +C_t}$	(103)
$+A_t = +C_t - (\text{Anti } A_t)$	$+\text{Anti } A_t = +C_t - (A_t)$	(104)
Let $+A_t \neq 0$.	**Let Anti $A_t \neq 0$.**	
$(+C_t - (\text{Anti } A_t)) / (+A_t) = +1$	$(+C_t - A_t) / (+ \text{Anti } A_t) = +1$	(105)

$$+ 1 = + 1 \qquad (106)$$

$$(C_t - (\text{Anti } A_t)) / (A_t) = 1 = (C_t - A_t) / (\text{Anti } A_t) \qquad (107)$$

$$(\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) / (A_t) = (\text{Anti } A_t)*1 = (C_t - A_t) \qquad (108)$$

$$(\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = \mathbf{(A_t) *(\text{Anti } A_t)} = (A_t)*(C_t - A_t) \qquad (109)$$

$$\text{Define } \Delta(\text{Anti } A_t)^2 = (A_t) *(\text{Anti } A_t). \qquad (110)$$

$$\Delta(\text{Anti } A_t)^2 = (A_t) *(\text{Anti } A_t) = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \qquad (111)$$

$$\text{Define } \Delta(A_t)^2 = \mathbf{(A_t) *(\text{Anti } A_t).} \qquad (112)$$

$$\Delta(A_t)^2 = (A_t) *(\text{Anti } A_t) = (A_t)*(C_t - A_t) \qquad (113)$$

$$\mathbf{\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.} \qquad (114)$$

Q. e. d.

The inner contradiction of A and Anti A II.

Let

A_t	denote something at the (space)time t,
$\Delta(A_t)^2$	denote the inner contradiction of A_t,
Anti A_t	denote (logical) negation of A_t at the (space)time t,
$\Delta(\text{Anti } A_t)^2$	denote the inner contradiction of Anti A_t,
C_t	denote the unity of A_t and Anti A_t. Let $A_t + (\text{Anti } A_t) = C_t$. Let
t	denote the (space)time t,

then

$$\boldsymbol{\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.}$$

Proof.

Equation

$$-0 = -0 \qquad (115)$$

$$+0 = +0 \qquad (116)$$

$$+1 - 1 = +0 \qquad (117)$$

$$+1 = +1 \qquad (118)$$

$$\boldsymbol{+A_t = +A_t} \qquad (119)$$

$$(\text{Anti } A_t) * A_t = (\text{Anti } A_t) * A_t \qquad (120)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * A_t \qquad (121)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \qquad (122)$$

$$(C_t * A_t) - (A_t)^2 = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2 \qquad (123)$$

Recall, $\Delta(\text{Anti } A_t)^2 = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2$. (124)

$$(C_t * A_t) - (A_t)^2 = \Delta(\text{Anti } A_t)^2. \qquad (125)$$

Recall, $\Delta(A_t)^2 = (C_t * A_t) - (A_t)^2 = \boldsymbol{(A_t) * (\text{Anti } A_t)}$**.** (126)

$$\boldsymbol{\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.} \qquad (127)$$

Q. e. d.

It is allowed to multiply something with 0. Thus, according to the proof above and contrary to the previous proof, even if **Anti $\boldsymbol{A_t = 0}$**, we obtain the identity of the inner contradiction of A_t and Anti A_t. In so far, the inner contradiction of A_t and Anti A_t is that what tights both together, is the foundation of identity and the difference of A_t and Anti A_t . The inner contradiction is valid and active in world governed by pure classical logic and equally in a world governed by probability theory too. The variance of something appears in this context not to be necessary.

The inner contradiction and the variance of A and Anti A.

Let

A_t	denote something that is either true (=1) or false (=0) at the (space)time t,
$\Delta(A_t)^2$	denote the inner contradiction of A_t,
Anti A_t	denote (logical) negation of A_t that is either true (=1) or false (=0) at the (space)time t,
$\Delta(\text{Anti } A_t)^2$	denote the inner contradiction of Anti A_t,
C_t	denote the unity of A_t and Anti A_t. Let A_t + (Anti A_t) = C_t , tertium non datur. Let
$\sigma(A_t)^2$	denote the variance A_t,
t	denote the (space)time t,

then

$$\boldsymbol{\sigma(A_t)^2} = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2$$

Proof.

Equation

$$-0 = -0 \quad (128)$$

$$+0 = +0 \quad (129)$$

$$+1 - 1 = +0 \quad (130)$$

$$+1 = +1 \quad (131)$$

$$\boldsymbol{+A_t = +A_t} \quad (132)$$

$$(\text{Anti } A_t) * A_t = (\text{Anti } A_t) * A_t \quad (133)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * A_t \quad (134)$$

$$(C_t - A_t) * A_t = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) \quad (135)$$

$$(C_t * A_t) - (A_t)^2 = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2 \quad (136)$$

Recall, $\Delta(\text{Anti } A_t)^2 = (\text{Anti } A_t) * (C_t - (\text{Anti } A_t)) = (C_t * (\text{Anti } A_t)) - (\text{Anti } A_t)^2$.

$$(C_t * A_t) - (A_t)^2 = \Delta(\text{Anti } A_t)^2. \quad (137)$$

$$\text{Recall, } \Delta(A_t)^2 = (C_t * A_t) - (A_t)^2 = \boldsymbol{(A_t) * (\text{Anti } A_t).} \quad (138)$$

$$\boldsymbol{\Delta(A_t)^2 = \Delta(\text{Anti } A_t)^2.} \quad (139)$$

$$\Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 = ((A_t) * (\text{Anti } A_t)) / (C_t)^2. \quad (140)$$

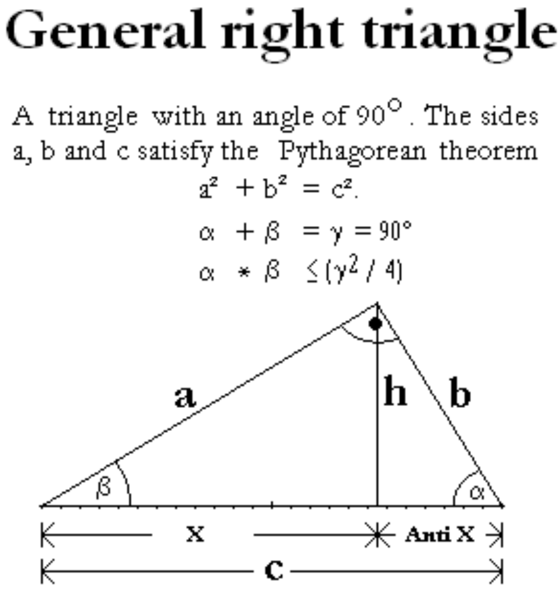
$$\sigma(A_t)^2 = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 = ((A_t) * (\text{Anti } A_t)) / (C_t)^2. \quad (141)$$

$$\sigma(A_t)^2 = \Delta(A_t)^2 / (C_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2 \quad (142)$$

$$\boldsymbol{\sigma(A_t)^2 = ((C_t * A_t) - (A_t)^2) / (C_t)^2} \quad (143)$$

Q. e. d.

The inner contradiction of general right triangle.



Let

X_t	denote length as illustrated above at the (space)time t,
$\Delta(X_t)^2$	denote the inner contradiction of X_t,
Anti X_t	denote Anti length as illustrated above at the (space)time t,
$\Delta(\text{Anti } X_t)^2$	denote the inner contradiction of Anti X_t,
C_t	denote the hypotenuse of the general right triangle above, the unity of X_t and Anti X_t. Recall, that X_t + (Anti X_t) = C_t . Let
a	denote the one side of the general right triangle,
b	denote the other side of the general right triangle,
h	denote height of the right triangle as illustrated above, Recall, $h^2 = X_t$ *(Anti X_t), $a^2 = C^* X_t$, $b^2 = C^*(\text{Anti } X_t)$ as illustrated above. Let
A	denote the area of the general right triangle above. Recall, $A = (C_t{*}h)/2 = (a{*}b)/2$. Let
t	denote the (space)time t,

then

$$\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2 = h^2.$$

Proof.

Equation

$$-0 = -0 \qquad (144)$$

$$+0 = +0 \qquad (145)$$

$$+1 - 1 = +0 \qquad (146)$$

$$+1 = +1 \quad (147)$$

$$\mathbf{+X_t = +X_t} \quad (148)$$

$$(\text{Anti } X_t) * X_t = (\text{Anti } X_t) * X_t \quad (149)$$

$$(C_t - X_t)* X_t = (\text{Anti } X_t) * X_t \quad (150)$$

$$(C_t - X_t)* X_t = (\text{Anti } X_t) * (C_t - (\text{Anti } X_t)) \quad (151)$$

$$(C_t*X_t) - (X_t)^2 = (C_t* (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (152)$$

$$\text{Recall, } \Delta(\text{Anti } X_t)^2 = (\text{Anti } X_t)* (C_t - (\text{Anti } X_t)) = (C_t*(\text{Anti } X_t)) - (\text{Anti } X_t)^2. \quad (153)$$

$$(C_t*X_t) - (X_t)^2 = \Delta(\text{Anti } X_t)^2. \quad (154)$$

$$\text{Recall, } \Delta(X_t)^2 = (C_t*X_t) - (X_t)^2 = \mathbf{(X_t) *(\text{Anti } X_t).} \quad (155)$$

$$\mathbf{\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2.} \quad (156)$$

$$(X_t) *(\text{Anti } X_t) = (C_t*X_t) - (X_t)^2 = (C_t* (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (157)$$

$$\text{Recall, } a^2 = (C_t*X_t) \quad (158)$$

$$(X_t) *(\text{Anti } X_t) = a^2 - (X_t)^2 = (C_t* (\text{Anti } X_t)) - (\text{Anti } X_t)^2 \quad (159)$$

$$\text{Recall, } b^2 = (C_t*(\text{Anti } X_t)) \quad (160)$$

$$(X_t) *(\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (161)$$

$$\text{Recall, } h^2 = (X_t) *(\text{Anti } X_t). \quad (162)$$

$$h^2 = (X_t) *(\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (163)$$

$$\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2 = h^2 = (X_t) *(\text{Anti } X_t) = a^2 - (X_t)^2 = b^2 - (\text{Anti } X_t)^2 \quad (164)$$

$$\mathbf{\Delta(X_t)^2 = \Delta(\text{Anti } X_t)^2 = h^2.} \quad (165)$$

Q. e. d.

The square of the height h of a general right triangle as illustrated above is the measure of the inner contradiction of a general right triangle. If a gravitational or electromagnetic field is organised in the form of a general right triangle, the inner contradiction of the same can be calculated as proofed above. It appears to me, that the triangle is the optical counterpart of logical contradiction. It is the reason, why I proposed the sign **Δ** for **inner contradiction** of something, of a random variable, of a tensor, of ... The inner contradiction of something, of a random variable, of a tensor ... is not absolutely the same like the logical contradiction or the dialectical contradiction.

2.1.4. Law of the excluded middle. Tertium non datur.

The law of the excluded middle as one of the basic laws of nature and thus of classical logic too, states that a third between two opposites is not given, tertium non datur. There is no third between a charged and a not charged. If something is charged, then there is no third between a positive and a negative etc.

Law of the excluded middle.

Let

A_t	denote something at the (space)time t,
Anti A_t	denote (logical) negation of A_t at the (space)time t,
C_t	denote the unity of A_t and Anti A_t,
t	denote the (space)time t,

then

$$\mathbf{+A_t + (Anti\ A_t) = +C_t}$$

Proof. Equation

$$+0 = +0 \qquad (166)$$

$$+1 - 1 = +0 \qquad (167)$$

$$+ 1 = + 1 \qquad (168)$$

$$\mathbf{+A_t = +A_t} \qquad (169)$$

$$+A_t - A_t = 0 \qquad (170)$$

$$+A_t - A_t = +C_t - C_t \qquad (171)$$

$$+A_t + C_t - A_t = +C_t \qquad (172)$$

$$\text{Set Anti } A_t = +C_t - A_t \qquad (173)$$

$$\mathbf{+A_t + (Anti\ A_t) = +C_t} \qquad (174)$$

Q. e. d.

In so far, if it is true that A_t + (Anti A_t) = C_t, it is at the same time equally true, that there is no third between A_t and (Anti A_t). Every equation that is based on tertium non datur states something like A_t + (Anti A_t) = C_t or like (*constant/s* $_1$)*A_t + (*constant/s* $_2$)*(Anti A_t) = (*constant/s* $_3$)*C_t. Einstein's field equation is based on the law of the excluded middle or on **tertium non datur** too. Contrary to Bell, Einstein is respecting the laws of classical logic (Barukčić 2006d).

Tertium non datur.

Let

A_t	denote something at the (space)time t,
Anti A_t	denote (logical) negation of A_t at the (space)time t,
C_t	denote the unity of A_t and Anti A_t. Let A_t + (Anti A_t) = C_t . Let
Tertium	denote a third between A_t and Anti A_t,
t	denote the (space)time t,

then

$$\mathbf{+ Tertium_t = 0.}$$

Proof.

Equation

$$+0 = +0 \quad (175)$$

$$+1 - 1 = +0 \quad (176)$$

$$+1 = +1 \quad (177)$$

$$\mathbf{+A_t = +A_t} \quad (178)$$

$$+A_t - A_t = 0 \quad (179)$$

$$+A_t - A_t = +C_t - C_t \quad (180)$$

$$+A_t + C_t - A_t = +C_t \quad (181)$$

Recall, that Anti A_t = $+C_t - A_t$

$$\mathbf{+A_t + (Anti\ A_t) = +C_t} \quad (182)$$

Let us assume that there is a third denoted by **Tertium**$_t$ between A_t and Anti A_t. We obtain the next equation.

$$+A_t + (Anti\ A_t) + \mathbf{Tertium_t} = +C_t \quad (183)$$

$$+A_t + Tertium_t = +C_t - (Anti\ A_t) \quad (184)$$

$$+A_t + Tertium_t = +A_t \quad (185)$$

$$+Tertium_t = +A_t - A_t \quad (186)$$

$$\mathbf{+ Tertium_t = 0} \quad (187)$$

Q. e. d.

Law of the excluded middle.

Let

A_t	denote something that at the (space)time t,
Anti A_t	denote (logical) negation of A_t that at the (space)time t,
C_t	denote something other at the (space)time t. Let
t	denote the (space)time t,

then

$$\mathbf{(C_t)^2 - ((C_t - A_t) * (C_t - (Anti\ A_t))) = (C_t)^2.}$$

Proof.

Equation

$$\mathbf{A_t = A_t} \quad (188)$$

$$A_t - A_t = 0 \quad (189)$$

$$C_t + A_t - A_t = C_t \quad (190)$$

$$A_t + C_t - A_t = C_t \quad (191)$$

Recall, that **Anti A_t =** C_t **- A_t** thus we obtain

$$A_t + (Anti\ A_t) = C_t \quad (192)$$

$$(C_t)*(A_t) + (C_t)*(Anti\ A_t) = (C_t)^2 \quad (193)$$

$$(C_t)*(A_t) + (C_t)*(Anti\ A_t) - 0 = (C_t)^2 \quad (194)$$

According to the law of contradiction, it is true that
(A_t * (Anti A_t)) = 0. Thus we obtain

$$(C_t)*(A_t) + (C_t)*(Anti\ A_t) - (A_t * (Anti\ A_t)) = (C_t)^2 \quad (195)$$

$$0 + (C_t)*(A_t) + (C_t)*(Anti\ A_t) - (A_t * (Anti\ A_t)) = (C_t)^2 \quad (196)$$

$$(C_t)^2 - (C_t)^2 + (C_t)*(A_t) + (C_t)*(Anti\ A_t) - (A_t*(Anti\ A_t)) = (C_t)^2 \quad (197)$$

$$(C_t)^2 - ((C_t)^2 - (C_t)*(A_t) - (C_t)*(Anti\ A_t) + (A_t*(Anti\ A_t)) = (C_t)^2 \quad (198)$$

$$(C_t)^2 - ((C_t - A_t)*(C_t - Anti\ A_t)) = (C_t)^2 \quad (199)$$

$$\mathbf{(C_t)^2 - ((C_t - A_t) * (C_t - (Anti\ A_t))) = (C_t)^2} \quad (200)$$

Q. e. d.

Set $\mathbf{(C_t=1)^2 = 1^2}$. The law of the excluded middle as one of the basic laws of nature and thus of classical logic too is based on the identity law and can be derived from the same. The identity, the equivalence of

$$\mathbf{(A_t\ v\ (Anti\ A_t)) = 1 = C_t - ((C_t - A_t) * (C_t - (Anti\ A_t)))}$$

is proofed as true (Barukčić 2006c).

Law of the excluded middle.

Let

A_t denote something that at the (space)time t,

Anti A_t denote (logical) negation of A_t that at the (space)time t,

C_t denote something other at the (space)time t. Let

t denote the (space)time t,

then

$$\mathbf{(C_t)^2 - ((C_t)^2 / 4) \geq (3/4)*(C_t)^2.}$$

Proof.

Equation

$$\mathbf{A_t = A_t} \quad (201)$$

$$A_t - A_t = 0 \quad (202)$$

$$C_t + A_t - A_t = C_t \quad (203)$$

$$A_t + C_t - A_t = C_t \quad (204)$$

Recall, that **Anti** $\mathbf{A_t =}$ C_t $\mathbf{- A_t}$ thus we obtain

$$A_t + (\text{Anti } A_t) = C_t \quad (205)$$

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) = (C_t)^2 \quad (206)$$

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - 0 = (C_t)^2 \quad (207)$$

According to the law of contradiction, it is true that (A_t * (Anti A_t)) = 0. Thus we obtain

$$(C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (208)$$

$$0 + (C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t * (\text{Anti } A_t)) = (C_t)^2 \quad (209)$$

$$(C_t)^2 - (C_t)^2 + (C_t)*(A_t) + (C_t)*(\text{Anti } A_t) - (A_t*(\text{Anti } A_t)) = (C_t)^2 \quad (210)$$

$$(C_t)^2 - ((C_t)^2 - (C_t)*(A_t) - (C_t)*(\text{Anti } A_t) + (A_t*(\text{Anti } A_t)) = (C_t)^2 \quad (211)$$

$$(C_t)^2 - ((C_t - A_t)*(C_t - \text{Anti } A_t)) = (C_t)^2 \quad (212)$$

$$(C_t)^2 - ((C_t - A_t)*(C_t - \text{Anti } A_t)) = (C_t)^2 \quad (213)$$

$$(C_t)^2 - ((\text{Anti } A_t)*(C_t - \text{Anti } A_t)) = (C_t)^2 \quad (214)$$

$$(C_t)^2 - ((\text{Anti } A_t)*(A_t)) = (C_t)^2 \quad (215)$$

According to the general contradiction law (Barukčić 2006e), it is true that ((Anti A_t)*(A_t)) $\leq ((C_t)^2 / 4)$. We obtain the next equation according to Barukčić (Barukčić 2006a, pp. 83-86).

$$(C_t)^2 - ((C_t)^2 / 4) \geq (3/4)*(C_t)^2 \quad (216)$$

Q. e. d.

2.2. 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.

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. Scalars have no indices, vectors have exactly one index and matrices have exactly two indices. Tensors are generalisations of scalars, vectors and matrices to an arbitrary number of indices. Tensors with upper indices (so-called "contravariant" tensors) and with lower indices (so-called "covariant" tensors) are distinguished. The distinction between contravariant and covariant indices is made for general tensors although the two are equivalent for tensors in three-dimensional Euclidean space known as Cartesian tensors. A tensor may be of mixed type too, tensors obey certain transformation rules. 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 my purpose in this discussion 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.

Tensors will provide us a natural mathematical framework for formulating and solving problems of logic, probability theory, quantum theory and general relativity with one and the same mathematical framework.

Closely related to tensors is Einstein's general relativity (1916). **Einstein**'s theory of general relativity (1916) 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

$$dx'_\sigma = \left(\sum_v \frac{(\partial x'_\sigma)}{(\partial x_v)} dx_v \right) \quad (217)$$

The $d x'_\sigma$ are expressed as homogeneous and linear functions of the $d x_v$. 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

$$A'^\sigma = \left(\sum_v \frac{(\partial x'_\sigma)}{(\partial x_v)} A^v \right) \quad (218)$$

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

$$\left(\sum_v A_v \; B^v \right) = \text{Invariant} \quad (219)$$

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

$$\left(\sum_\sigma A'_\sigma \; B'^\sigma \right) = \left(\sum_v A_v \; B^v \right) \quad (220)$$

by an expression which is resulting from the inversion of (218),

$$\left(\sum_\sigma \frac{(\partial x_v)}{(\partial x'_\sigma)} B'^\sigma \right) \quad (221)$$

thus we obtain

$$\left(\sum_\sigma B'^\sigma \right) * \left(\sum_v \frac{(\partial x_v)}{(\partial x'_\sigma)} A_v \right) = \sum_\sigma B'^\sigma A'_\sigma \quad (222)$$

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

$$A'_\sigma = \left(\sum_v \frac{(\partial x_v)}{(\partial x'_\sigma)} A_v \right) \quad (223)$$

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

$$A^{\mu v} = A^{\mu} B^{v}. \qquad (224)$$

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

$$A'^{\sigma\tau} = \left(\frac{\partial x'_{\sigma}}{\partial x_{\mu}} \right) * \left(\frac{\partial x'_{\tau}}{\partial x_{\nu}} \right) A^{\mu\nu} \qquad (225)$$

Something satisfying the law of transformation (225) 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 (upper indices) 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

$$A_{\mu v} = A_{\mu} B_{v}. \qquad (226)$$

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

$$A'_{\sigma\tau} = \left(\frac{\partial x_{\mu}}{\partial x'_{\sigma}} \right) * \left(\frac{\partial x_{\nu}}{\partial x'_{\tau}} \right) A_{\mu\nu} \qquad (227)$$

This law of transformation (217) 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

$$A^{v}{}_{\mu} = A_{\mu} B^{v} \quad . \qquad (228)$$

The law of transformation of the mixed tensor is

$$A'^{\tau}_{\sigma} = \left(\frac{\partial x'_{\tau}}{\partial x_{\nu}} \right) * \left(\frac{\partial x_{\mu}}{\partial x'_{\sigma}} \right) A^{\nu}_{\mu} \qquad (229)$$

2.2.2.5 Symmetrical Tensors

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

$$A_{\mu\nu} = A_{\nu\mu} \qquad (230)$$

or respectively,

$$A_{\mu\nu} = A_{\nu\mu} \ . \qquad (231)$$

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

$$A^{\mu\nu} = - A^{\nu\mu} \qquad (232)$$

or respectively,

$$A_{\mu\nu} = - A_{\nu\mu} \qquad (233)$$

or

$$A^{\mu\nu} = - A^{\nu\mu}. \qquad (234)$$

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 there 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.

$$C_{\mu\nu\sigma} = A_{\nu\mu} B_{\sigma} \qquad (235)$$

$$C^{\mu\nu\sigma\tau} = A^{\nu\mu} B^{\sigma\tau} \qquad (236)$$

$$C^{\mu\nu}{}_{\sigma\tau} = A^{\nu\mu} B_{\sigma\tau} \qquad (237)$$

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.

2.2.4 Addition of Tensors

Two tensors A and B with the same rank and the same contravariant and covariant indices can be added in the obvious way.

$$C_{\mu\nu} = A_{\mu\nu} + B_{\mu\nu} \quad (238)$$

$$C^{\mu\nu} = A^{\mu\nu} + B^{\mu\nu} \quad (239)$$

$$C^{\mu}{}_{\nu} = A^{\mu}{}_{\nu} + B^{\mu}{}_{\nu} \quad (240)$$

2.2.4 **Anti-Tensor**

As mentioned above, two tensors A and B with the same rank and the same contravariant and covariant indices can be added in the obvious way. Let us assume that there is no third between two tensors A and Anti A. On this view, we define an **Anti tensor** in the following way.

$$C_{\mu\nu} = A_{\mu\nu} + \text{Anti } A_{\mu\nu} \quad (241)$$

$$C^{\mu\nu} = A^{\mu\nu} + \text{Anti } A^{\mu\nu} \quad (242)$$

$$C^{\mu}{}_{\nu} = A^{\mu}{}_{\nu} + \text{Anti } A^{\mu}{}_{\nu} \quad (243)$$

An **Anti tensor** should be distinguished from an **Anti symmetrical tensor**, both are not the same.

$$\textbf{Set } \mathbf{C_{\mu\nu} = 0.} \quad (244)$$

$$C_{\mu\nu} = 0 = A_{\mu\nu} + \text{Anti } A_{\mu\nu} \quad (245)$$

$$+A_{\mu\nu} = - \text{Anti } A_{\mu\nu} \quad (245)$$

$$-A_{\mu\nu} = + \text{Anti } A_{\mu\nu} \quad (246)$$

$$\textbf{Set } \mathbf{C^{\mu\nu} = 0.} \quad (247)$$

$$C^{\mu\nu} = 0 = A^{\mu\nu} + \text{Anti } A^{\mu\nu} \quad (248)$$

$$+ A^{\mu\nu} = - \text{Anti } A^{\mu\nu} \quad (249)$$

$$- A^{\mu\nu} = + \text{Anti } A^{\mu\nu} \quad (250)$$

$$\textbf{Set } \mathbf{C^{\mu}{}_{\nu} = 0.} \quad (251)$$

$$C^{\mu}{}_{\nu} = 0 = A^{\mu}{}_{\nu} + \text{Anti } A^{\mu}{}_{\nu} \quad (252)$$

$$+ A^{\mu}{}_{\nu} = - \text{Anti } A^{\mu}{}_{\nu} \quad (253)$$

$$- A^{\mu}{}_{\nu} = + \text{Anti } A^{\mu}{}_{\nu} \quad (254)$$

2.2.4 Division of Tensors

Tensor algebra appears to me is not that much developed. To allow something like division operations on tensors, we must go an special way. Let us divide X by X that is to say X / X. The result should be something like 1 or X / X = 1 as long as X ≠ 0. This division can be expressed in another way too. Let us perform an operation on a tenor X that way, that X * d(X) = 1, then we have done equally a division operation too. The problem is, is there an operation like the term * d(X).

Thus, let A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let d(A) denote something like a law of transformation of the (covariant, contravariant, mixed, ...) tensor A or something like another tensor. Whatever d(A) may be, d(A) must obey some special rules. It has to be true that

$$\mathbf{A * d(A) = 1.} \qquad (255)$$

Such an d(A) would enable us to perform division operations on tensors.

2.2.5 Necessity and randomness of a tensor

Let A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let n(A) denote the law of transformation of the (covariant, contravariant, mixed, ...) tensor A or another tensor or something else. Whatever n(A) may be, n(A) must obey some special rules.

Let B denote a another (covariant, contravariant, mixed, ...) tensor B (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

Let n(B) denote the law of transformation of the (covariant, contravariant, mixed, ...) tensor B or another tensor or something else. Whatever n(A) may be, n(B) must obey some special rules.

Let C denote a another (covariant, contravariant, mixed, ...) tensor C (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness.

$$\mathbf{A + B = C.} \qquad (256)$$

There is no third between A and B, tertium non datur!

$$\mathbf{A} = n(A) \mathbf{* C.} \qquad (257)$$

$$\mathbf{B = (1 - n(A)) * C \ ) = n(B) * C .} \qquad (258)$$

$$\mathbf{n(A) + n(B) = 1.} \qquad (259)$$

n denotes something like the necessity of a tensor.

3. Results

3.1. Logic

3.1.1. The constancy of the law of identity (in vacuo)

Let A denote something existing independently of human mind and consciousness, a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc.

As long as A = A (Barukčić 2006a, pp. 55-60, pp. 44-46), A is only itself, A is only simple equality with itself, A is at the end only self-related and equally unrelated to an other, A is distinct from any relation to an other, any relation to an other is removed, any relation to an other has vanished. Consequently, A contains nothing other but only itself, A is thus just the 'pure' A.

In this way, A is somehow the absence of any other determination, A is in its own self only itself and nothing else and identical only with itself.

$$\mathbf{A = A.} \qquad (260)$$

Consequently, A is just itself and not equally the transition into its opposite, A is not opposed to an other, A is not confronted by its other, A is not against an other, the negative of A is not as necessary as A itself. A is thus without any opposition or contradiction.

A is identical only with itself and has passed over into pure equality with itself, it is just the "pure" A. Only it is equally true, that A is the positive A.

$$\mathbf{+A = +A} \qquad (261)$$

Even if A = A it is equally not a negative A it is a positive A. In so far, in the pure positive A, the relation to its other is contained. We obtain the next equation.

$$\mathbf{+A\ - A = 0} \qquad (262)$$

The situation doesn't change if we regard the negative A.

$$\mathbf{-A = -A} \qquad (263)$$

Even if -A = -A it is equally not a positive A it is a negative A. In so far, in the pure negative A, the relation to its other is contained. We obtain the next equation.

$$\mathbf{+A\ - A = 0} \qquad (264)$$

In zero, the positive and negative are united.

Theorem 6. The identity and the difference between X_t and Anti X_t .

Let

X_t	denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object, σ(..) etc. at the (space) time t, X_t be opposed to (Anti X)$_t$,
Anti X_t	denote the other side of X_t, the opposite of X_t, the complementary of X_t, the hidden part of X_t (Barukčić 2006b), a random variable, at the (space) time t, Anti X_t be opposed to X_t,
t	denote the (space) time,
$\mathbf{C_t}$	denote the unity of X_t and (Anti X)$_t$. Let us respect **the law of the excluded middle**. That is to say, there is no third between X_t and Anti X_t at the same (space) time t. In so far, we obtain equally $\mathbf{X_t + (Anti\ X)_t = C_t}$ or $(Anti\ X)_t = C_t - X_t$. Further, let us assume that $\mathbf{C_t} > 0$. Let
$(Anti\ X)_t = (X)_t$	denote our assumption that $(Anti\ X)_t$ is not dominant over $(X)_t$ and vice versa. Equally $(X)_t$ is not dominant over $(Anti\ X)_t$,

then

$$\mathbf{X_t * (Anti\ X)_t = C_t^2 / 4.}$$

Proof.

$$\mathbf{(Anti\ X)_t = X_t} \quad (265)$$

$$(Anti\ X)_t + (Anti\ X)_t = (Anti\ X)_t + X_t \quad (266)$$

$$2 * (Anti\ X)_t = (C_t) \quad (267)$$

$$\mathbf{(Anti\ X)_t = (C_t)/ 2} \quad (268)$$

$$(Anti\ X)_t - ((C_t)/ 2) = 0 \quad (269)$$

$$((Anti\ X)_t - ((C_t)/ 2))^2 = 0^2 \quad (270)$$

$$((Anti\ X)_t)^2 -((Anti\ X)_t *(C_t)) + ((C_t)/2))^2 = 0^2 \quad (271)$$

$$\mathbf{((Anti\ X)_t)^2 -((Anti\ X)_t *(C_t)) = - ((C_t)/2))^2} \quad (272)$$

$$\mathbf{-((Anti\ X)_t)^2 +((Anti\ X)_t *(C_t)) = + ((C_t)/2))^2} \quad (273)$$

$$+((Anti\ X)_t *(C_t)) - ((Anti\ X)_t)^2 = + ((C_t)/2))^2 \quad (274)$$

$$(Anti\ X)_t *(C_t) - (Anti\ X)_t{}^2 = C_t{}^2/4 \quad (275)$$

$$\mathbf{(Anti\ X)_t *(C_t - (Anti\ X)_t) = C_t{}^2/4} \quad (276)$$

$$(C_t - X_t) *(C_t - (C_t - X_t)) = C_t{}^2/4 \quad (277)$$

$$(C_t - X_t) *(C_t - C_t + X_t) = C_t{}^2/4 \quad (278)$$

$$(C_t - X_t) * (0 + X_t)) = C_t^2/4 \quad (279)$$

$$(C_t - X_t) * (+ X_t)) = C_t^2/4 \quad (280)$$

$$X_t * (C_t - X_t) = C_t^2/4 \quad (281)$$

$$\mathbf{X_t * (Anti\ X)_t = C_t^2/4} \quad (282)$$

Q. e. d.

Anti X_t and X_t must not be equal to each other or symmetrical. The one can be dominant over the other. How can this be ruled out in the same relation? On the other hand, why should the one allow the other to be dominant over its own self?

Theorem 7. X_t is dominant over Anti X_t. The opposition between X_t and Anti X_t.

Let

X_t denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object, σ(..) etc. at the (space) time t,
X_t be opposed to $(\text{Anti } X)_t$,

Anti X_t denote the other side of X_t, the opposite of X_t, the complementary of X_t, the hidden part of X_t, a random variable, at the (space) time t,
Anti X_t be opposed to X_t,

t denote the (space) time t,

$\mathbf{C_t}$ denote the unity of X_t and $(\text{Anti } X)_t$,
us respect **the law of the excluded middle**. That is to say, there is no third between X_t and Anti X_t at the same (space) time t. In so far, we obtain equally

$$\mathbf{X_t + (Anti\ X)_t = C_t},$$

or $(\text{Anti } X)_t = C_t - X_t$.

Further, let us assume that $\mathbf{C_t} > 0$. Let

$(X)_t \geq (\text{Anti } X)_t$ denote our assumption that $(X)_t$ is **dominant** over $(\text{Anti } X)_t$ or equally $(\text{Anti } X)_t$ is not dominant over $(X)_t$,

then

$$\mathbf{X_t * (Anti\ X)_t \leq C_t^2 / 4.}$$

Proof.

$$\mathbf{X_t \geq (Anti\ X)_t} \quad (283)$$

$$X_t + X_t \geq X_t + (\text{Anti } X)_t \quad (284)$$

$$2X_t \geq X_t + (\text{Anti } X)_t \quad (285)$$

$$2X_t \geq C_t \quad (286)$$

$$\mathbf{X_t \geq C_t/2} \quad (287)$$

$$(X_t/C_t) \geq 1/2 \quad (288)$$

$$\mathbf{(X_t/C_t) - (1/2) \geq 0} \quad (289)$$

$$\mathbf{((X_t / C_t) - 0.5)^2 \geq 0^2} \quad (290)$$

$$((X_t/C_t)^2 - (X_t/C_t) + (1/4)) \geq 0 \quad (291)$$

$$\mathbf{-(X_t/C_t)^2 + (X_t/C_t) - (1/4) \leq 0} \quad (292)$$

$$-(X_t/C_t)^2 + (X_t/C_t) \leq (1/4) \quad (293)$$

$$(X_t/C_t) - (X_t/C_t)^2 \leq (1/4) \quad (294)$$

$$(X_t/C_t) * (1 - (X_t/C_t)) \leq (1/4) \quad (295)$$

$$(X_t/C_t) * ((C_t/C_t) * - (X_t/C_t)) \leq (1/4) \quad (296)$$

$$((X_t) * (C_t - X_t)) / (C_t * C_t) \leq (1/4) \quad (297)$$

$$((X_t) * (C_t - X_t)) \leq ((C_t * C_t)/4) \quad (298)$$

$$X_t * (C_t - X_t) \leq C_t^2 / 4 \quad (299)$$

$$\mathbf{X_t * (\text{Anti } X)_t \leq C_t^2 / 4} \quad (300)$$

Q. e. d.

On the other hand, Anti X_t could equally be dominant over X_t. This is difficult to rule out in one and the same relation.

Theorem 8. Anti X_t is dominant over X_t. The opposition between X_t and Anti X_t.

Let

X_t	denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object, σ(..) etc. at the (space) time t, X_t be opposed to (Anti X)$_t$,
Anti X_t	denote the other side of X_t, the opposite of X_t, the complementary of X_t, the hidden part of X_t, a random variable, at the (space) time t, Anti X_t be opposed to X_t,
t	denote the (space) time t,
$\mathbf{C_t}$	denote the unity of X_t and (Anti X)$_t$, us respect **the law of the excluded middle**. That is to say, there is no third between X_t and Anti X_t at the same (space) time t. In so far, we obtain equally $\mathbf{X_t + (\text{Anti } X)_t = C_t}$ or $(\text{Anti } X)_t = C_t - X_t$. Further, let us assume that $\mathbf{C_t} > 0$. Let
$(\text{Anti } X)_t \geq (X)_t$	denote our assumption that (Anti X)$_t$ is **dominant** over (X)$_t$ or equally (X)$_t$ is not dominant over (Anti X)$_t$,

then

$$X_t * (\text{Anti } X)_t \leq C_t^2 / 4.$$

Proof.

$$(\text{Anti } X)_t \geq X_t \quad (301)$$

$$(\text{Anti } X)_t + (\text{Anti } X)_t \geq (\text{Anti } X)_t + X_t \quad (302)$$

$$2 * (\text{Anti } X)_t \geq (C_t) \quad (303)$$

$$(\text{Anti } X)_t \geq (C_t)/ 2 \quad (304)$$

$$(\text{Anti } X)_t \geq (C_t)/ 2 \quad (305)$$

$$(\text{Anti } X)_t - ((C_t)/ 2) \geq 0 \quad (306)$$

$$((\text{Anti } X)_t - ((C_t)/ 2))^2 \geq 0^2 \quad (307)$$

$$((\text{Anti } X)_t)^2 -((\text{Anti } X)_t *(C_t)) + ((C_t)/2))^2 \geq 0^2 \quad (308)$$

$$((\text{Anti } X)_t)^2 -((\text{Anti } X)_t *(C_t)) \geq - ((C_t)/2))^2 \quad (309)$$

$$-((\text{Anti } X)_t)^2 +((\text{Anti } X)_t *(C_t)) \leq + ((C_t)/2))^2 \quad (310)$$

$$+((\text{Anti } X)_t *(C_t)) - ((\text{Anti } X)_t)^2 \leq + ((C_t)/2))^2 \quad (311)$$

$$(\text{Anti } X)_t *(C_t) - (\text{Anti } X)_t{}^2 \leq C_t^2/4 \quad (312)$$

$$(\text{Anti } X)_t *(C_t - (\text{Anti } X)_t) \leq C_t^2/4 \quad (313)$$

$$(C_t - X_t) *(C_t - (C_t - X_t)) \leq C_t^2/4 \quad (314)$$

$$(C_t - X_t) *(C_t - C_t + X_t) \leq C_t^2/4 \quad (315)$$

$$(C_t - X_t) *(0 + X_t) \leq C_t^2/4 \quad (316)$$

$$(C_t - X_t) *(+ X_t) \leq C_t^2/4 \quad (317)$$

$$X_t * (C_t - X_t) \leq C_t^2/4 \quad (318)$$

$$X_t * (\text{Anti } X)_t \leq C_t^2 / 4. \quad (319)$$

Q. e. d.

In general, since (=) is part of (≤), we are allowed to state that the relationship between $\mathbf{X_t}$ and (Anti X $)_t$ is governed by the inequality

$$X_t * (\text{Anti } X)_t \leq C_t^2 / 4,$$

which is termed as the **general contradiction law**.

The general contradiction law is very familiar with the logical contradiction law.

Theorem 9. The relation between the logical contradiction law and the general contradiction law.

Let

X_t denote something existing independently of human mind and consciousness, f. e. a measurable random variable, a quantum mechanics object, σ(..) etc. at the (space) time t, which can take only the values **either** 0 **or** 1,
X_t be opposed to (Anti X $)_t$,

Anti X_t denote the other side of X_t, the opposite of X_t, the complementary of X_t, the hidden part of X_t , a random variable, at the (space) time t,
Anti X_t be opposed to X_t,

t denote the (space) time t,

$\mathbf{C}_t$ denote the unity of X_t and (Anti X $)_t$,

us respect **the law of the excluded middle**. That is to say, there is no third between X_t and Anti X_t at the same (space) time t. In so far, we obtain equally

$$\mathbf{X_t + (Anti\ X)_t = C_t}$$

$$\text{or } (Anti\ X)_t = C_t - X_t .$$

Further, let us assume that $\mathbf{C}_t \neq 0$.

Then

$$\mathbf{X_t * (Anti\ X)_t \leq 1 / 4.}$$

Proof.

X_t	$(Anti\ X)_t$	$X_t \cap (Anti\ X)_t$	$C_t = X_t + (Anti\ X)_t$	$(C_t)^2 / 4$	$X_t*(Anti\ X)_t \leq (C_t)^2/ 4$	**Eq.**
(1)	(2)	(3)	(4)	(5)	**(3) ≤ (5)**	
1	0	0	1	$1^2/4$	**True!**	(320)
0	1	0	1	$1^2/4$	**True!**	(321)

Q. e. d.

The things don't change that much in the case of symmetry: $- X_t$ - Anti $X_t = - C_t$. The general contradiction law is the general form of the logical contradiction law.

3.2. Tensors

Possibility
Actuality, possibility and necessity constitute the formal moments of movement, alteration or change. Possibility sublates itself in actuality, possibility passes over into actuality but equally, in actuality possibility returns back into itself. In so far, as a matter of fact, the hour of its own sublation is the hour of its own return back into itself, it is the transition of the one into an other, of a determinate into an indeterminate, and equally it is neither the one nor the other. The gradual passing away of the possibility into its own other, into actuality, its transition into actuality, finds their completion in necessity. Necessity is the unity and the struggle of possibility and actuality. But on the other hand, further and above all, possibility is possibility, it is thus the identity with itself and as such relationless, indeterminate, is not self-contradictory etc.

But possibility as only itself is opposed to actuality, is independent of actuality, lacks actuality, it is only a possible. The possible as independent from its own other simply unites with itself but it is equally determined as against its own other, as against actuality. This identity of the one and its own other, of both, is necessity. Possibility as identical with itself is necessity but equally actuality too. Possibility as qualitative otherness is opposed to actuality and equally the relation of each to the other and thus a contradiction.

A possible as a self-identical in general is thus an actual determined as only possible. But equally, possibility is determinate within itself and as against another and contains thus a negation. In general, possibility passes over into its own opposition, into actuality. Only, opposition is contradiction. In so far, in actuality possibility completes itself. Possibility contains thus two moments, itself and its other, possibility points to an other, to actuality in which it completes itself. X is possible means only that X = X. But the possible contains more than only the law of identity, another and its opposite are independently possible, possibility implies that the opposite of +X too is possible. + X = + X but independently it possible to that - X = - X. It is therefore that because + X = + X, therefore also -X = -X. In the possible +X the possible not +X or -X is also contained. This relation is the one which determines both as possible. Only, in a relation, in which the one possible also contains its own other, is contradicting itself and vanishes into actuality. Possibility as such is not yet all actuality. In so far, how far is possibility actuality?

Actuality
Possibility determined as separated from actuality, is contained in actuality, and the actual as such is at the end determined as only a possible. Actuality is thus the unity of itself and possibility, possibility contained in actuality is sublated possibility. In so far, actuality unites with possibility, something that is actual is equally possible too. Only, such an actuality is equally an actuality as against possibility. But first of all, since an actual and a possible are different, their relation consist in the randomness.

Necessity
The necessary is an actual, is something that under particular conditions and circumstances simply can no longer be otherwise, it must be itself. Something other cannot follow, something other cannot be otherwise. But an actual is determined as against a possible, necessity is thus equally relative necessity, because it has equally its starting point in the contingent. The conversion of necessity into its opposite, into contingency, the conversion of the one into its own other, has its actuality through an other, its opposite has penetrated into it. Contingency as the otherness of actuality and possibility vanishes into necessity and vice versa. The unity of necessity and contingency is thus the contradiction. An actual whose other or opposite independently is too is determined as random. Randomness is the unity of possibility and actuality, a unity in which each immediately turns into its opposite. A possible is thus an actual and equally a random and vice versa. The random is thus an actual as only a possible.

Theorem 10. The identity and the difference between A and Anti A .

Let

A	denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness, A be opposed to (Anti A),
B	denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A, B = Anti A be opposed to A,
C	denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

$$\mathbf{A + (Anti\ \ A) = C}$$

or

$$\mathbf{A + B = C}$$

or

$$\mathbf{B = (Anti\ \ A) = C - A.}$$

Further, let

n(A)	denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.
n(B)	denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$ Let

$\sigma(A)^2$	denote the variance of A. Let $\boldsymbol{\sigma(A)^2 = n(A)*n(B)=n(A)*(1- n(A)) \leq (1/4).}$ Let
(Anti A) = (A)	denote our assumption that (Anti A) is not dominant over (A) and vice versa. Equally (A) is not dominant over (Anti A) ,

then

$$\mathbf{A * (Anti\ \ A) \quad = \quad C^2 / 4.}$$

Proof.

$$\mathbf{(Anti\ A) \quad = \quad A} \qquad (322)$$

$$(Anti\ A) + (Anti\ A) = (Anti\ A) + A \qquad (323)$$

$$2 * (Anti\ A) = (C) \qquad (324)$$

$$\mathbf{(Anti\ A) = (C)/ 2} \qquad (325)$$

$$(Anti\ A) - ((C)/ 2) = 0 \qquad (326)$$

$$((Anti\ A) - ((C)/ 2))^2 = 0^2 \qquad (327)$$

$$((\text{Anti } A))^2 - ((\text{Anti } A) * (C)) + ((C)/2))^2 = 0^2 \quad (328)$$

$$\mathbf{((\text{Anti } A))^2 - ((\text{Anti } A) * (C)) = - ((C)/2))^2} \quad (329)$$

$$\mathbf{-((\text{Anti } A))^2 + ((\text{Anti } A) * (C)) = + ((C)/2))^2} \quad (330)$$

$$+((\text{Anti } A) * (C)) - ((\text{Anti } A))^2 = + ((C)/2))^2 \quad (331)$$

$$(\text{Anti } A) * (C) - (\text{Anti } A)^2 = C^2/4 \quad (332)$$

$$\mathbf{(\text{Anti } A) * (C - (\text{Anti } A)) = C^2/4} \quad (333)$$

$$(C - A) * (C - (C - A)) = C^2/4 \quad (334)$$

$$(C_t - A) * (C - C + A)) = C^2/4 \quad (335)$$

$$(C - A) * (0 + A)) = C^2/4 \quad (336)$$

$$(C - A) * (+ A)) = C^2/4 \quad (337)$$

$$A * (C - A) = C^2/4 \quad (338)$$

$$A * B = C^2/4 \quad (339)$$

$$\mathbf{A * (\text{Anti } A) = C^2/4} \quad (340)$$

Q. e. d.

Anti A and A can be equal to each other but this is not necessary. It is possible that the one is dominant over the other.

Theorem 11. A is dominant over Anti A . The opposition between A and Anti A .

Let

A — denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B — denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C — denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

A + (Anti A) = C

or

A + B = C

or

B = (Anti A) = C - A.

Further, let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$ Let

$\sigma(A)^2$ denote the variance of A. Let **$\sigma(A)^2 = n(A)*n(B)=n(A)*(1- n(A)) \leq (1/4)$.** Let

(A) ≥ (Anti A) denote our assumption that (A) is dominant over (Anti A) and not vice versa. Equally (Anti A) is not dominant over (A) ,

then

$$\mathbf{A * (Anti\ A) \leq C^2 / 4.}$$

Proof.

$$\mathbf{A \geq (Anti\ A)} \quad (341)$$

$$A + A \geq A + (Anti\ A) \quad (342)$$

$$2A \geq A + (Anti\ A) \quad (343)$$

$$2A \geq C \quad (344)$$

$$\mathbf{A \geq C /2} \quad (345)$$

$$(A /C) \geq 1/2 \quad (346)$$

$$\mathbf{(A /C) - (1/2) \geq 0} \quad (347)$$

$$\mathbf{((A / C) - 0.5)^2 \geq 0^2} \quad (348)$$

$$((A /C)^2 - (A /C) + (1/4)) \geq 0 \quad (349)$$

$$\mathbf{-(A /C)^2 + (A /C) - (1/4) \leq 0} \quad (350)$$

$$-(A /C)^2 + (A /C) \leq (1/4) \quad (351)$$

$$(A /C) - (A /C)^2 \leq (1/4) \quad (352)$$

$$(A /C)* (1 - (A /C)) \leq (1/4) \quad (353)$$

$$(A /C)* ((C/C)* - (A /C)) \leq (1/4) \quad (354)$$

$$((A)* (C - A))/ (C * C) \leq (1/4) \quad (355)$$

$$((A)* (C - A)) \leq ((C * C) /4) \quad (356)$$

$$A * (C - A) \leq C^2 / 4 \quad (357)$$

$$A * B = C^2/4 \quad (358)$$

$$\mathbf{A * (Anti\ A) \leq C^2 / 4} \quad (359)$$

Q. e. d.

On the other hand, Anti A could equally be dominant over A . Thus, we obtain the next theorem.

Theorem 12. Anti A is dominant over A . The opposition between A and Anti A .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain

$$\mathbf{A + (Anti\ A) = C}$$

or

$$\mathbf{A + B = C}$$

or

$$\mathbf{B = (Anti\ A) = C - A.}$$

Further, let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1. \text{ Let}$$

$\sigma(A)^2$ denote the variance of A. Let $\boldsymbol{\sigma(A)^2 = n(A)*n(B)=n(A)*(1- n(A)) \le (1/4).}$ Let

(Anti A) ≥ (A) denote our assumption that (Anti A) is dominant over (A) and not vice versa. Equally (A) is not dominant over (Anti A) ,

then

$$\mathbf{A * (Anti\ A) \le C^2 / 4.} \tag{360}$$

Proof.

$$\mathbf{(Anti\ A) \ge A} \tag{361}$$

$$(Anti\ A) + (Anti\ A) \ge (Anti\ A) + A \tag{362}$$

$$2 * (Anti\ A) \ge (C) \tag{363}$$

$$(Anti\ A) \ge (C)/ 2 \tag{364}$$

$$(Anti\ A) \ge (C)/ 2 \tag{365}$$

$$(\text{Anti } A) - ((C)/ 2) \geq 0 \quad (366)$$

$$((\text{Anti } A) - ((C)/ 2))^2 \geq 0^2 \quad (367)$$

$$((\text{Anti } A))^2 -((\text{Anti } A) *(C)) + ((C)/2))^2 \geq 0^2 \quad (368)$$

$$((\text{Anti } A))^2 -((\text{Anti } A) *(C)) \geq - ((C)/2))^2 \quad (369)$$

$$-((\text{Anti } A))^2 +((\text{Anti } A) *(C)) \leq + ((C)/2))^2 \quad (370)$$

$$+((\text{Anti } A) *(C)) - ((\text{Anti } A))^2 \leq + ((C)/2))^2 \quad (371)$$

$$(\text{Anti } A) *(C) - (\text{Anti } A)^2 \leq C^2/4 \quad (372)$$

$$(\text{Anti } A) *(C - (\text{Anti } A)) \leq C^2/4 \quad (373)$$

$$(C - A) *(C - (C - A)) \leq C^2/4 \quad (374)$$

$$(C - A) *(C - C + A)) \leq C^2/4 \quad (375)$$

$$(C - A) *(0 + A)) \leq C^2/4 \quad (376)$$

$$(C - A) *(+ A)) \leq C^2/4 \quad (377)$$

$$A * (C - A) \leq C^2/4 \quad (378)$$

$$\mathbf{A * (\text{Anti } A) \leq C^2 / 4.} \quad (379)$$

Q. e. d.

Set ((-A - B) = - C) < 0, the situation doesn't change at all. It is known, that (=) is part of (≤). In so far, the relationship between **A** and (Anti A) expressed in the language of tensors is governed too by the same inequality

$$\mathbf{A * (\text{Anti } A) \leq C_t^2 / 4,}$$

which was already termed as the general contradiction law. Note, our understanding of an **anti tensor** is not identical with the term **antisymmetrical tensor**. An anti tensor A in our understanding is defined as

Anti A = C - A

while an antisymmetrical tensor is defined something like - A.

3.3. Dialectical tensor logic

The following definitions are based under **the assumption of independence**.

Definition 3.3.1 Conjugation: tensor A is conjugated with the tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

n(A ∩ E) denote the determinatedness, the necessity of conjugation between A and E,

then in the case of independence,

$$n(A \cap E) = ((A * E) / (C * G)) = n(A) * n(E)$$

$$n(A \cap E \cap ... \cap Z) = n(A) * n(E) * ... * n(Z).$$

Definition 3.3.2 Exclusion: Anti conjugation: tensor A excludes tensor E and vice versa.

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**
B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

$\cap$ denote natural process of conjugation of tensors,

n(A $\cap$ E) denote the determinatedness, the necessity of conjugation of tensor A and tensor E,

| denote natural process of exclusion,

n(A | E) denote the determinatedness, the necessity of exclusion of tensor A by tensor E and vice versa, then

$$n(A | E) = 1 - n(A \cap E) = 1 - ((A * E) / (C * G)) = 1 - (n(A) * n(E)).$$

$$n(A | E \ | ... | \ Z) = 1 - (\ (1-(1 - (n(A)))) * \ (1-(1 - n(E))) * ... * \ (1-(1 - n(Z))) \ ) .$$

$$n(A | E \ | ... | \ Z) + n(A \cap E \ \cap ... \cap \ Z) = 1.$$

Definition 3.3.3 Disjunction: Tensor A **or** tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

n(A) + n(B) = 1.

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

n(A ∪ E ...) denote the determinatedness, the necessity of disjunction of tensor A and tensor E,

then

$$n(A \cup E) = 1 - ((1 - n(A)) * (1 - n(E)))$$

$$n(A \cup E \cup ... \cup Z) = 1 - ((1 - n(A)) * (1 - n(E)) * ... * (1 - n(Z))).$$

Definition 3.3.4 Rejection: Anti disjunction: **Neither** tensor A **nor** tensor E.

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**
B = (Anti A) = C - A. Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

Z denote a tensor,

n(Z) denote the determinatedness of Z, the necessity of Z,

$\cup$ denote natural process of disjunction of tensors,

n(A $\cup$ E ...) denote the determinatedness, the necessity of disjunction of tensor A and tensor E,

$\downarrow$ denote natural process of rejection of tensors,

n(A $\downarrow$ E $\downarrow$...) denote the determinatedness, the necessity of rejection of tensor A and tensor E,

then

$$n(A \downarrow E) = ((1 - n(A)) * (1 - n(E)))$$

$$n(A \downarrow E \downarrow ... \downarrow Z) = ((1 - n(A)) * (1 - n(E)) * ... * (1 - n(Z))).$$

$$n(A \downarrow E \downarrow ... \downarrow Z) + n(A \cup E \cup ... \cup Z) = 1.$$

Definition 3.3.5 Identity: The identity of tensor A and tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .
Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

n(A) + n(B) = 1.

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.
Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

↔ denote the natural process of identity,

n(A ↔ E) denote the determinatedness, the necessity of identity of tensor A and tensor E,

then

$$n(A \leftrightarrow E) = (1-((1- n(A)) * (1 - (1 - n(E))))) * (1-((1- n(E)) * (1 - (1 - n(A))))).$$

Definition 3.3.6 Opposition: Anti identity: **Either** tensor A **or** tensor E.

Let

A — denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B — denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C — denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) — denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) — denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

n(A) + n(B) = 1.

Let

E — denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F — denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G — denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) — denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

↔ — denote the natural process of identity,

n(A ↔ E) — denote the determinatedness, the necessity of identity of tensor A and tensor E,

>—< — denote the natural process of opposition,

n(A >—< E) — denote the determinatedness, the necessity of opposition between tensor A and tensor E,

then

n(A >—< E) = 1 - ((1 - ((1-n(A))*n(E)))*(1 - (n(A)*(1-n(E))))).

n(A >—< E) + n(A ↔ E) = 1.

Definition 3.3.7 Conditio-sine-qua non: **Without** tensor A **no** tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

n(A) + n(B) = 1.

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

← denote the natural process called conditio-sine-qua non,

n(A ← E) denote the determinatedness, the necessity of without tensor A no tensor E,

then

n(A ← E) = (1 - ((1 - n(A)) * (1-(1 - n(E))))).

Definition 3.3.8 Anti conditio-sine-qua non: **Not without** tensor A **no** tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**
B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

$\leftarrow$ denote the natural process called conditio-sine-qua non,

n(A $\leftarrow$ E) denote the determinatedness, the necessity of without tensor A no tensor E,

$\multimap$ denote the natural process called anti-conditio-sine-qua non,

n(A $\multimap$ E) denote the determinatedness, the necessity of anti-conditio-sine-qua non between tensor A and tensor E,

then

$$n(A \multimap E) = (n(E)*(1 - n(A))).$$

$$n(A \leftarrow E) + n(A \multimap E) = 1.$$

Definition 3.3.9 Conditio per quam: **When** tensor A **then** tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

n(A) + n(B) = 1.

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

$\rightarrow$ denote the natural process of conditio per quam,

n(A $\rightarrow$ E) denote the determinatedness, the necessity of **when** tensor A **then** tensor E,

then

$$n(A \rightarrow E) = (1 - ((1-(1 - n(A))) * (1 - n(E)))).$$

Definition 3.3.10 Anti conditio per quam: **Not when** tensor A **then** tensor E .

Let

A denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
A be opposed to (Anti A),

B denote the other side of A, the opposite of A, the complementary of A, the hidden part of A, the Anti A,
B = Anti A be opposed to A,

C denote the unity of A and (Anti A) .

Let us respect **the law of the excluded middle**. That is to say, there is no third between A and Anti A. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **A + (Anti A) = C or (A + B = C) or**

B = (Anti A) = C - A.

Let

n(A) denote the determinatedness of A, the necessity of A. Let us assume that the division by C is allowed. Let us define A = n(A) * C.

n(B) denote the randomness, the indeterminatedness of A, the necessity of B. Let us assume that the division by C is allowed. Let us define B = n(B) * C. Let

$$n(A) + n(B) = 1.$$

Let

E denote a (covariant, contravariant, mixed, ...) tensor (of the second or higher or any ranks), a (contravariant, covariant ...) four-vectors etc., something existing independently of human mind and consciousness,
E be opposed to (Anti E),

F denote the other side of E, the opposite of E, the complementary of E, the hidden part of E, the Anti E,
F = Anti E be opposed to E,

G denote the unity of E and (Anti E) Let us assume that the division by G is allowed.

Let us respect **the law of the excluded middle**. That is to say, there is no third between E and Anti E. Further, let the tensor product obey the distributive law (K-theory). In so far, we obtain **E + (Anti E) = G** or **E + F = G,**

n(E) denote the determinatedness of E, the necessity of E. Let us define E = n(E) * G.

$\rightarrow$ denote the natural process of conditio per quam,

$n(A \rightarrow E)$ denote the determinatedness, the necessity of when tensor A then tensor E,

$\succ\!-$ denote the natural process of anti- conditio per quam,

$n(A \succ\!- E)$ denote the determinatedness, the necessity of conditio per quam between tensor A and tensor E,

then

$$n(A \succ\!- E) = n(A)*(1 - n(E)).$$

$$n(A \rightarrow E) + n(A \succ\!- E) = 1.$$

If $(n(A \rightarrow E) * n(C \mid E)) = 1$ or if $(n(A \rightarrow E) * n(C \succ\!-\!\prec E)) = 1$, then tensor C can be used as a measure against tensor A, as a measure to neutralise the effect of tensor A on E.

3.4. Probability theory

The Poisson Distribution as a limiting case of the Binomial Distribution can be used in cases where the number of Bernoulli trials becomes very large and n, the necessity of an even, is very small. The Poisson Distribution, named after the French mathematician Siméon-Denis Poisson (1781-1840), is sometimes called the distribution of rare events and describes a wide range of phenomena. The probability p that there are exactly *k* occurrences out of N Bernoulli trials can be calculated.

$$p(X = k) = ((N * n(Y))^{k} *(e^{-(N * n(Y))})) / k \,!$$

$$\text{for } k = 0,1,2,..., \quad 0 < \lambda = N*n(Y),$$

where

N	denote the number of Bernoulli trials,
k	denote the number of occurrences of a rare event,
p(X = k)	denote the probability that there are exactly *k* occurrences out of N Bernoulli trials,
n(Y)	denote **the necessity** of an event. Let us assume in this case that
n (Y) =	(n(A ← B) * n(B → C)), where
A	denote a tensor A, ...
B	denote a tensor B, ...
n(A ← B)	denote the necessity of the relationship: without annihilation of the particle A no annihilation of the particle B,
C	denote a tensor C, ...
n(B → C)	denote the necessity of the relationship: when annihilation of the particle B then annihilation of the particle C.

4. Discussion

This publication should be read with great care since it is only a trial to unify logic and probability using the language of tensors and depends upon some assumptions that must not hold true. The tensor algebra is not fully developed, the division of tensors is not satisfactory solved.

The attempt to unify quantum mechanics and general relativity could be successful if the same mathematical framework is used. Quantum theory is respecting classical logic and more or less based on probability theory. On the other hand, general relativity is based on tensors and geometry and thus on pure logic. In so far, it appears to be that the both have nothing in common.

Contrary to expectation, logic is that what both have in common, classical logic is the foundation for general relativity and equally for quantum mechanics too. The development of a unique mathematical framework for logic and probability theory that is based on tensors could enable us to develop one theory, the unified field theory, that describes both, quantum mechanics and general relativity, using the same fundamental equations.

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