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March 21th, 2007.

Dark energy: the empty negative.

Gordon Research Conferences

STEM CELLS & CANCER

September 9-14, 2007
Big Sky Resort
Big Sky, MT

Applications for this meeting must be submitted by **August 19, 2007**.

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Contents

Peer Reviewed:

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News

Jever, Germany, March, 2007.

Anti-matter rockets

The **industrial production of antimatter** today is still far away from reallity. Stored antimatter can be used to produce thrust. Antimatter that annihilates with matter converts its mass to energy completely which results in a perfect energy efficiency. Weight of rockets can be spared if antimatter is used as power source.

Jever, Germany, March, 2007.

Industrial

organ factory

Takashi Yokoo et. al. (PNAS, **March 1, 2005,** Vol. 102, No. 9 (2005)3296-3300) used stem cells to generate simple organs. Anatomically complicated organs are a little bit more refractory to stem-cell-based regenerative techniques. The industrial generation of self-organs from autologous stem cells appears to be possible.

General contradiction law and the standard model.

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Abstract

A **triangle** is a basic shape of geometry, there are many types of triangles. In a **scalene triangle** all internal angles are different and all sides have different lengths. A triangle with one internal angle larger than 90° is called an **obtuse triangle.** On the other hand, a triangle with internal angles all smaller than 90° is called an **acute triangle.** In an **equilateral triangle**, all three sides are of equal length. All internal angles of an equilateral triangle are equal—namely, 60°. An equilateral triangle is a special case of an isosceles triangle, but not vice versa. All isosceles triangles are not equilateral triangles. A **isosceles right triangle** is determined by one 90° internal angle, two sides of equal length and two equal internal angles. A **general right-angled triangle** has one 90° internal angle, the right angle. The side opposite to this right angle is called the hypotenuse. The hypotenuse is equally the longest side in a right-angled triangle. The sides a, b and c of such a right-angled triangle satisfy the Pythagorean theorem known as $a^2 + b^2 = c^2$. It was Euclid who presented some elementary facts about triangles. This publication will proof that the Pythagorean theorem is based on General contradiction law which states that

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

Key words: Triangle, Pythagorean theorem, Logic, General Contradiction Law.

1. Background

Pythagoras of Samos (Greek: Πυθαγ•ρας; ~ 570 BC – ~ 490 BC), a Greek mathematician and philosopher, "the father of numbers", is best known for discovering the Pythagorean theorem which by tradition bears his name. But as a matter of fact, the history of the Pythagorean theorem is much more complex. Thales of Miletus who had visited Egypt recommended Pythagoras to go to Egypt too. Pythagoras arrived in Egypt when he was just about 23 years old and stayed in Egypt for about 21 years. It was probably in Egypt where Pythagoras learned geometry from Egyptian priests and the theorem that is now called by his name. On the other hand, Baudhayana, an Indian mathematician seems to have discovered the Pythagorean Theorem about 300 years before Pythagoras, too. The Pythagorean theorem is known in China as the so called "Gougu theorem". According to the Pythagorean theorem, in a right-angled triangle it is true that $c^2 = a^2 + b^2$, where c denote the hypotenuse, the side opposite to the right angle, the triangle's longest side. A generalisation of the Pythagorean theorem is the law of cosines, the Pythagorean theorem is just a special case of the law of cosines. The length of a third side of any triangle, given the size of the angle between them and the lengths of two sides is determined according to the law of cosines as $\mathbf{a^2 - (2*a*b*\cos(\theta)) + b^2 = c^2}$ **.**

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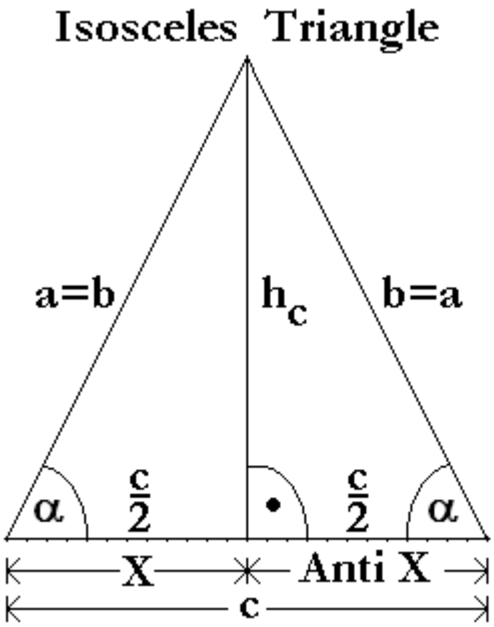
2. Material and Methods

Triangles are helpful to analyse the basic relationship between matter and antimatter, local hidden and local non-hidden variables or in general between X and Anti X. Some of this triangles are the following.

2.1. Isosceles triangle

An **isosceles triangle** has at least two sides of equal length. This triangle also has two equal internal angles. A triangle which has all sides equal is called an equilateral triangle,



where

α	denote the angle between sides *a* and *c*, and between the sides b and c,
a	denote the one side of the triangle, (a =b) > (c/2) ,
b	denote the one side of the triangle, (b = a) > (c/2) ,
c	denote the hypotenuse. Let c = X + (Anti X), thus (c/2) = X = Anti X,
h_c	denote height of the isosceles triangle as illustrated above,
A	denote the area of the isosceles triangle as illustrated above.

The height h_c of the isosceles triangle as illustrated above can be calculated according to the Pythagorean theorem as

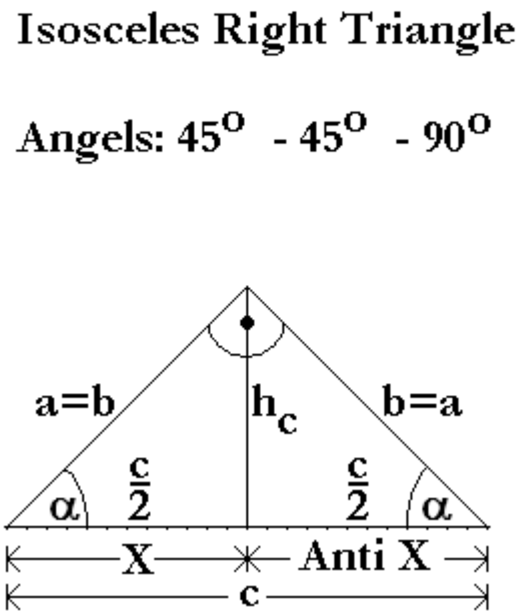
$$h_c = (a^2 - (c / 2)^2)^{1/2} = (a^2 - (X)^2)^{1/2} = (b^2 - (\text{Anti } X)^2)^{1/2}.$$

The area of the isosceles triangle as illustrated above is given by

$$A = (c/2) * h_c = (c/2) * (a^2 - (c / 2)^2)^{1/2} = (c/2) * (a^2 - (X)^2)^{1/2} = (c/2) * (b^2 - (\text{Anti } X)^2)^{1/2} .$$

2.2. Isosceles right triangle

An **isosceles right triangle** has one right angle and two sides of equal length. This triangle also has two equal internal angles of 45^o.



where

α	denote the angle between sides *a* and *c*, and between the sides b and c, $\alpha = 45^o$,
a	denote the one side of the triangle, (a =b) > (c/2) ,
b	denote the one side of the triangle, (b = a) > (c/2) ,
c	denote the hypotenuse. Let c = X + (Anti X), thus (c/2) = X = Anti X,
h_c	denote height of the isosceles right triangle as illustrated above,
A	denote the area of the isosceles right triangle as illustrated above.

The height of the isosceles right triangle as illustrated above can be calculated according to the Pythagorean theorem as

$$h_c = (a^2 - (c / 2)^2)^{1/2} = (a^2 - (X)^2)^{1/2} = (b^2 - (\text{Anti } X)^2)^{1/2} .$$

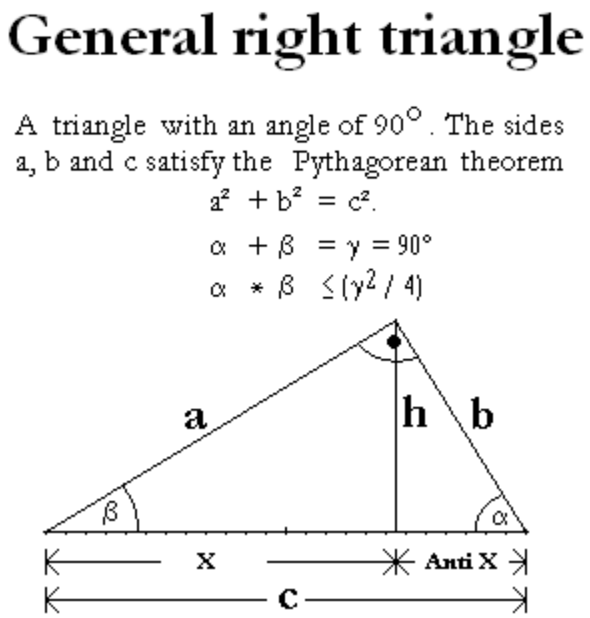
The area of the isosceles right triangle as illustrated above is given by

$$A = (c/2) * h_c = (c/2) * (a^2 - (c / 2)^2)^{1/2} = (c/2) * (a^2 - (X)^2)^{1/2} = (c/2) * (b^2 - (\text{Anti } X)^2)^{1/2} .$$

2.3. General right triangle

A **right triangle** is a triangle with one right angle of 90°. Such a triangle satisfy the Pythagorean theorem which is known as

$$a^2 + b^2 = c^2.$$



where

a	denote the one side of the triangle,
b	denote the other side of the triangle,
c	denote the hypotenuse. Let c = X + (Anti X),
h	denote height of the right triangle as illustrated above,
A	denote the area of the right triangle as illustrated above.

Some **properties** of the right triangle.

$$\mathbf{X + (Anti\ X) = c}. \quad (1)$$

In a right triangle, there is no third between X and Anti X, **tertium non datur**!

$$a^2 + b^2 = c^2 \quad (2)$$

$$a^2 = c * X \quad (3)$$

$$a^2 / c^2 = X / c \quad (4)$$

$$b^2 = c * (Anti\ X) \quad (5)$$

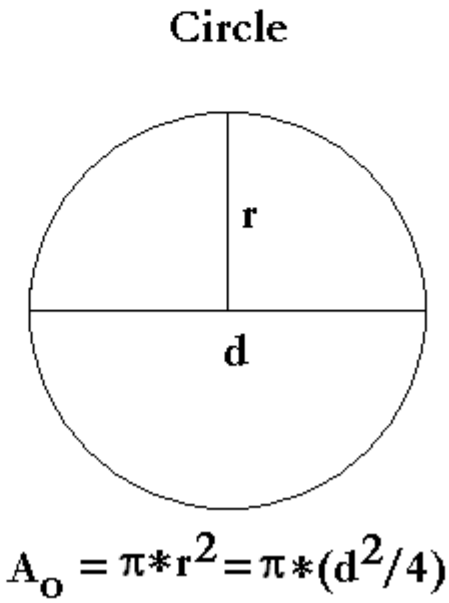
$$b^2 / c^2 = (Anti\ X) / c \quad (6)$$

$$h^2 = (X * Anti\ X) \quad (7)$$

$$A = (1/2) * a * b \quad (8)$$

2.4. Circle

A circle as the unity and the struggle of radius and anti-radius finds its completion by the power of π in the area of the circle. A unit circle is a circle with a unit radius r, i.e., a circle whose radius r =1.



where

d	denote the diameter of a circle. Let d = 2 * r = r + r,
r	denote the radius of a circle,
π	denote the mathematical constant π, also known as **Archimedes' constant,**
U	denote the length of a circle's circumference,
A_o	denote the area enclosed by a circle illustrated above.

Some **properties** of a circle.

$$A_o = \pi * r^2 \quad (9)$$

$$A_o = \pi * (d^2 / 4) \quad (10)$$

$$r^2 = (d^2 / 4) \quad (11)$$

$$d = 2 * (A / \pi)^{1/2} \quad (12)$$

$$U = 2 * \pi * r \quad (13)$$

3. Results

3.1. Pythagorean theorem is based on the general contradiction law

The foundation of the Pythagorean theorem.

a denote the one side of the right triangle,

b denote the other side of the right triangle,

c denote the hypotenuse of the right triangle. Recall, c = X + (Anti X),

X denote X, the local non-hidden variable,

Anti X denote Anti X, the local hidden variable, the otherness of X,

then

$$\mathbf{a^2 + b^2 = c^2.}$$

Proof

$$\mathbf{+X = +X} \quad (14)$$

$$X + (\text{Anti } X) = X + (\text{Anti } X) \quad (15)$$

$$\mathbf{X + (\text{Anti } X) = c} \quad (16)$$

$$X{*}c + (\text{Anti } X){*}c = c{*}c \quad (17)$$

In accordance with Eq. (4) it is true that $b^2 = c*(\text{Anti } X)$. We obtain the next equation.

$$X{*}c + b^2 = c^2 \quad (18)$$

In accordance with Eq. (3) it is true that $a^2 = (c* X)$. We obtain the next equation.

$$\mathbf{a^2 + b^2 = c^2.} \quad (19)$$

Q. e. d.

3.1.1. Pythagorean theorem and the area of a square in Euclidean geometry

In Euclidean geometry, a **square** has four equal sides, four right angles, and parallel opposite sides.

Pythagorean theorem and the area of a square.

a	denote the length of each of the four equal sides of a square **A** in plane (Euclidean) geometry,
b	denote the length of each of the four equal sides of a square **B** in plane (Euclidean) geometry,
c	denote the length of each of the four equal sides of a square **C** in plane (Euclidean) geometry,
A(□)	denote the area of a square A in plane (Euclidean) geometry, where A(□) = a^2,
B(□)	denote the area of a square B in plane (Euclidean) geometry, where B(□) = b^2,
C(□)	denote the area of a square C in plane (Euclidean) geometry, where C(□) = c^2,

then

A(□) + B(□) = C(□).

Proof

Our starting point is the Pythagorean theorem.

$$\mathbf{a^2 + b^2 = c^2} \quad (20)$$

Recall.

$$A(\square) = a^2. \quad (21)$$

$$B(\square) = b^2. \quad (22)$$

$$C(\square) = c^2. \quad (23)$$

We obtain the next equation.

$$\mathbf{A(\square) + B(\square) = C(\square).} \quad (24)$$

Q. e. d.

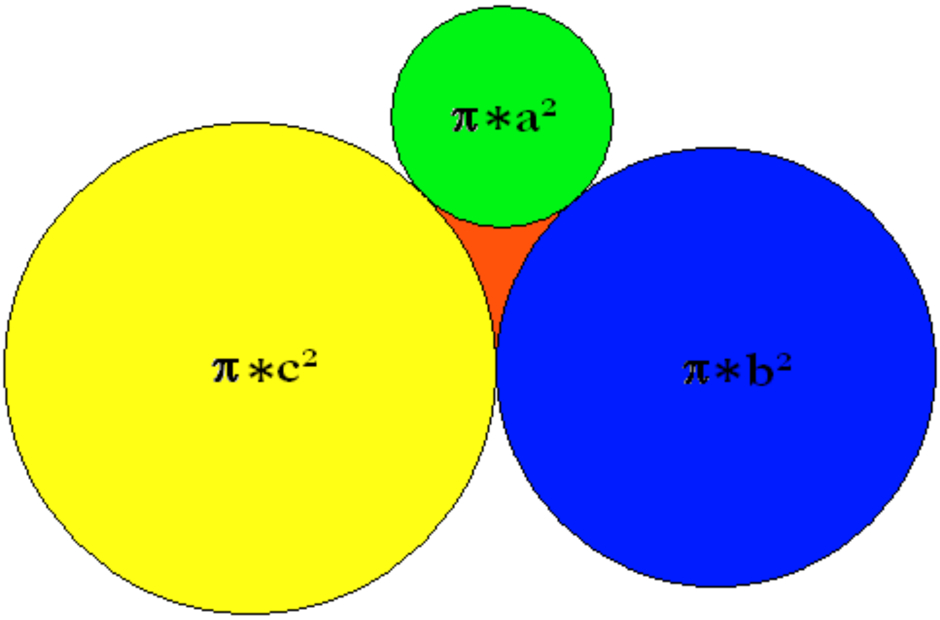
Tertium non datur, the law of the excluded middle and thus classical logic is the foundation of Pythagoras theorem. There is no third area between the area A(□) of a square A and the area B(□) of an other square B if it is true that A(□) + B(□) = C(□). Pythagoras theorem is only a translation of the law of the excluded middle into geometry. In so far, logic is valid for fields too. But be careful, the area A(□) can be unequal to B(□) and vice versa, which leads to the general contradiction law.

The foundation of the Pythagorean theorem III.

a	denote the one side of the right triangle,
b	denote the other side of the right triangle,
c	denote the hypotenuse of the right triangle. Let c = X + (Anti X),
X	denote X, the local non-hidden variable,
Anti X	denote Anti X, the local hidden variable, the otherness of X,
A(O)	denote the area of the circle A,
B(O)	denote the area of the circle B,
C(O)	denote the area of the circle C,

then

$$A(O) + B(O) = C(O).$$



Proof

$$+\mathbf{X} = +\mathbf{X} \qquad (25)$$

$$X + (\text{Anti } X) = X + (\text{Anti } X) \qquad (26)$$

$$\mathbf{X + (\text{Anti } X) = c} \qquad (27)$$

$$X*c + (\text{Anti } X)*c = c*c \qquad (28)$$

In accordance with Eq. (4) it is true that $b^2 = c*(\text{Anti } X)$. We obtain the next equation.

$$X*c + b^2 = c^2 \qquad (29)$$

In accordance with Eq. (3) it is true that $a^2 = (c^* X)$. We obtain the next equation.

$$a^2 + b^2 = c^2 \qquad (30)$$

Let us assume that a, b, c denotes the radius a circle A, B, C too.
The area of a square can be converted into the area of a circle.

$$\pi^* a^2 + \pi^* b^2 = \pi^* c^2 \qquad (31)$$

Set A(○) =π*a². B(○) = π*b². C(○) = π*c². (32)

A(○) + B(○) = C(○). (33)

Q. e. d.

Pythagoras theorem is valid for a circle too and is based on the law of the excluded middle. If we reduce the area of a sphere to the area of a square, we can see, that the same is based on the Pythagorean theorem too.

The foundation of the Pythagorean theorem IV.

a	denote the one side of the right triangle, here: the radius of the sphere A too,
b	denote the other side of the right triangle, here: the radius of the sphere B too,
c	denote the hypotenuse of the right triangle. here: the radius of the sphere C too. Let c = X + (Anti X),
X	denote X, the local non-hidden variable,
Anti X	denote Anti X, the local hidden variable, the otherness of X,
A(🌍)	denote the area of the sphere A,
B(🌍)	denote the area of the sphere B,
C(🌍)	denote the area of the sphere C,
then	

A(🌍) + B(🌍) = C(🌍).

Proof

+X = +X (34)

X + (Anti X) = X + (Anti X) (35)

X + (Anti X) = c (36)

$$X*c + (\text{ Anti } X)*c = c*c \qquad (37)$$

In accordance with Eq. (4) it is true that $b^2 = c*(\text{ Anti } X)$. We obtain the next equation.

$$X*c + b^2 = c^2 \qquad (38)$$

In accordance with Eq. (3) it is true that $a^2 = (c* X)$. We obtain the next equation.

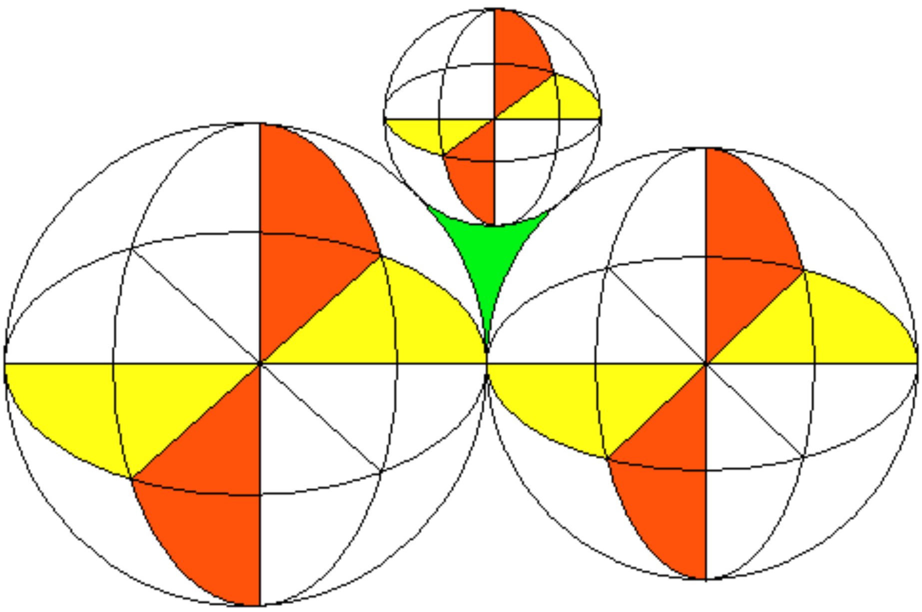
$$a^2 + b^2 = c^2 \qquad (39)$$

Recall that a, b, c denote the radius of a sphere A, B, C too.
The area of a square can thus be converted into the area of a sphere and vice versa.

$$4*\pi*a^2 + 4*\pi*b^2 = 4*\pi*c^2 \qquad (40)$$

Set A(🌍) $=4*\pi*a^2$. B(🌍) $= 4*\pi*b^2$. C(🌍) $= 4*\pi*c^2$. (41)

A(🌍) + B(🌍) = C(🌍). (42)



Q. e. d.

Pythagoras theorem is valid for the area of a sphere too and is based on the law of the excluded middle.

3.1.2. Pythagorean theorem the general contradiction law

The Pythagorean theorem is based on classical logic and thus on the general contradiction law (Barukčić, 2006e) too.

Pythagorean theorem and the general contradiction law I.

a	denote the length of each of the four equal sides of a square **A** in plane (Euclidean) geometry,
b	denote the length of each of the four equal sides of a square **B** in plane (Euclidean) geometry,
c	denote the length of each of the four equal sides of a square **C** in plane (Euclidean) geometry,
A(□)	denote the area of a square A in plane (Euclidean) geometry, where A(□) = a²,
Anti A(□)	denote the Anti area of a square Anti A in plane (Euclidean) geometry, where Anti A(□) = B(□) = C(□) - A(□),
B(□)	denote the area of a square B in plane (Euclidean) geometry, where B(□) = b²,
C(□)	denote the area of a square C in plane (Euclidean) geometry, where C(□) = c²,
	let A(□) ≥ B(□),

then

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

Proof

$$A(\square) \geq B(\square) \quad (43)$$

$$A(\square) + A(\square) \geq B(\square) + A(\square) \quad (44)$$

$$2 * A(\square) \geq C(\square) \quad (45)$$

$$A(\square) \geq C(\square)/2 \quad (46)$$

$$A(\square) - (C(\square)/2) \geq 0 \quad (47)$$

$$(A(\square) - (C(\square)/2))^2 \geq 0^2 \quad (48)$$

$$A(\square)^2 - (A(\square) * C(\square)) + (C(\square)^2/4) \geq 0^2 \quad (49)$$

$$A(\square)^2 - (A(\square) * C(\square)) \geq -(C(\square)^2/4) \quad (50)$$

$$-A(\square)^2 + (A(\square) * C(\square)) \leq (C(\square)^2/4) \quad (51)$$

$$+(A(\square) * C(\square)) - A(\square)^2 \leq (C(\square)^2/4) \quad (52)$$

$$A(\square) * (C(\square) - A(\square)) \leq (C(\square)^2/4) \quad (53)$$

$$A(\square) * B(\square) \leq (C(\square)^2/4) \quad (54)$$

Recall. Anti A(□) = B(□) = C(□) - A(□).

$$\mathbf{A(\square) * (\text{Anti } A(\square)) \leq C(\square)^2 / 4} \quad (55)$$

Q. e. d.

Binding energy and the general contradiction law.

According to the general contradiction law, a whole that is constituted out of parts, out of X and Anti X, seems to be at lower energy level than its unbound constituents, than its constituent parts. This seems to be one of the most basic laws of nature.

According to Einstein's equivalence of mass and energy or **energy = mass***c², the mass m_H of a whole that is constituted out of X and Anti X should be equally less then the mass m_S of its unbound constituents. This "lost" mass after binding X and Anti X together may be small, but there should be one. The missing mass does not vanish into nothing.

$$E_B = \Delta m * c^2 = (m_S - m_H) * c^2 = E_S - E_H ,$$

where

Δm	denote the mass defect of X and Anti X,
E_B	denote the binding energy between X and Anti X,
m_H	denote the mass of a whole that is constituted out of parts, out of X and Anti X,
E_H	denote the energy of a whole that is constituted out of parts, out of X and Anti X,
m_S	denote the mass of separated X and Anti X,
E_S	denote the energy of separated X and Anti X,
u	denote the atomic mass unit (1.000000 **u**), where 1 u is define as 1/12 of the mass of a ^{12}C atom. Set
A(□)	= E_H ,
Anti A(□)	= E_B = B(□) = C(□) - A(□) = $E_S - E_H$,
B(□)	= E_B ,
C(□)	= $E_S = E_B + E_H$.

According to the general contradiction law it is equally true that

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

Energy is need to separate a whole into separate parts, to separate X from Anti X. An atom can be disassembled into free electrons and a nucleus. A nucleus can be disassembled into free protons and neutrons etc. The deuteron is constituted out of one proton and one neutron. The rest-energy of deuteron is known to be A(□) = 1875,63 MeV. The rest energy of proton is known to be 938.28 MeV. The rest energy of neutron is known to be 939.57 MeV. Recall, 1875,63 MeV < (938.28 MeV + 939.57 MeV) . The difference is about Anti A(□) = 2.22 MeV which is the binding energy of the deuteron nucleus. The energy required to disassemble a whole that is constituted out of X and Anti X into its unbound constituents, a nucleus into free unbound parts like protons and neutrons, can be calculated according to the general contradiction law according to Eq. (55) as

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

$$\text{Anti } A(\square) \leq (938.28 \text{ MeV} + 939.57 \text{ MeV})^2 / (4 * 1875,63 \text{ MeV}).$$

$$\text{Anti } A(\square) \leq ((938.28 + 939.57) * (938.28 + 939.57) / (4 * 1875.63) = 470,018156899282 \text{ MeV}.$$

The result is correct, since Anti A(□) = 2.22 MeV which is less then 470,018156899282 MeV.

Pythagorean theorem and the general contradiction law II.

a	denote the length of each of the four equal sides of a square **A** in plane (Euclidean) geometry,
b	denote the length of each of the four equal sides of a square **B** in plane (Euclidean) geometry,
c	denote the length of each of the four equal sides of a square **C** in plane (Euclidean) geometry,
A(□)	denote the area of a square A in plane (Euclidean) geometry, where A(□) = a^2,
Anti A(□)	denote the Anti area of a square Anti A in plane (Euclidean) geometry, where Anti A(□) = C(□) - B(□),
B(□)	denote the area of a square B in plane (Euclidean) geometry, where B(□) = b^2,
C(□)	denote the area of a square C in plane (Euclidean) geometry, where C(□) = c^2,
	let B(□) ≥ A(□),

then

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

Proof

$$B(\square) \geq A(\square) \quad (56)$$

$$B(\square) + B(\square) \geq A(\square) + B(\square) \quad (57)$$

$$2 * B(\square) \geq C(\square) \quad (58)$$

$$B(\square) \geq C(\square)/2 \quad (59)$$

$$B(\square) - (C(\square)/2) \geq 0 \quad (60)$$

$$(B(\square) - (C(\square)/2))^2 \geq 0^2 \quad (61)$$

$$B(\square)^2 - (B(\square) * C(\square)) + (C(\square)^2/4) \geq 0^2 \quad (62)$$

$$B(\square)^2 - (B(\square) * C(\square)) \geq -(C(\square)^2/4) \quad (63)$$

$$-B(\square)^2 + (B(\square) * C(\square)) \leq (C(\square)^2/4) \quad (64)$$

$$+(B(\square) * C(\square)) - B(\square)^2 \leq (C(\square)^2/4) \quad (65)$$

$$B(\square) * (C(\square) - B(\square)) \leq (C(\square)^2/4) \quad (66)$$

$$B(\square) * (\quad A(\square) \quad) \leq (C(\square)^2/4) \quad (67)$$

$$(B(\square) = b^2) * (A(\square) = \mathbf{a^2}) \leq (C(\square) = c^2)^2 / 4 \quad (68)$$

$$b^2 * a^2 \leq (c^2)^2 / 4 \quad (69)$$

Recall. B(□) = C(□) - A(□).

$$(C(\square) - A(\square)) * A(\square) \leq (C(\square)^2/4) \quad (70)$$

Recall. Anti A(□) = B(□) = C(□) - A(□).

$$(Anti\ A(\square)) * A(\square) \leq (C(\square)^2/4) \quad (71)$$

$$\mathbf{A(\square) * (Anti\ A(\square)) \leq C(\square)^2 / 4} \quad (72)$$

Q. e. d.

3.2. The inner contradiction of the right triangle

The inner contradiction of the right triangle I.

Let

a	denote the one side of the right triangle,
b	denote the other side of the right triangle,
c	denote the hypotenuse of the right triangle. Let c = X + (Anti X),
h	denote height of the right triangle as illustrated above,
Δ(Anti X) ^{2}	denote the inner contradiction Δ(Anti X)^2 of the right triangle,

then

$$\mathbf{\Delta(Anti\ X)^2 = h^2 = (a^2 * b^2)/c^2.}$$

Proof

$$\mathbf{a^2 = c * X} \qquad (73)$$

which is in accordance with Eq. (3).

$$a^2/c^2 = c*X/c^2 \qquad (74)$$

$$a^2/c^2 = X/c \qquad (75)$$

$$a^2 = c * (c - (Anti\ X)) \qquad (76)$$

$$a^2 / c = (c - (Anti\ X)) \qquad (77)$$

$$((Anti\ X) * a^2) / c = (Anti\ X) *(c - (Anti\ X)) \qquad (78)$$

((Anti X) / c) = (b^2/c^2) which in accordance with Eq. (6). We obtain the next equation.

$$(b^2 * a^2)/c^2 = (Anti\ X) *(c - (Anti\ X)) \qquad (79)$$

The inner contradiction Δ(Anti X)^2 is defined in accordance with Barukčić (Barukčić 2007d, p. 26, Eq. (66)) as

$$\Delta(Anti\ X)^2 =(Anti\ X) *(c - (Anti\ X)).$$

We obtain the next equation as the inner contradiction Δ(Anti X)^2 of the right triangle.

$$\Delta(Anti\ X)^2 = h^2 = (a^2 * b^2) / c^2 = (Anti\ X) *(c - (Anti\ X)). \qquad (80)$$

Q. e. d.

The inner contradiction of the right triangle II.

Let

a	denote the one side of the right triangle,
b	denote the other side of the right triangle,
c	denote the hypotenuse of the right triangle. Let c = X + (Anti X),
h	denote the height of the right triangle as illustrated above,
$\Delta(X)^2$	denote the inner contradiction $\Delta(X)^2$ of the right triangle,

then

$$\mathbf{\Delta(X)^2 = (a^2 * b^2) / c^2 = h^2 = X *(c - X).}$$

Proof

$$\mathbf{b^2 = c * (Anti\ X)} \quad (81)$$

which is in accordance with Eq. (3).

$$b^2/c^2 = c*(Anti\ X)/c^2 \quad (82)$$
$$b^2/c^2 = (Anti\ X)/c \quad (83)$$

$$b^2 = c * (c - X) \quad (84)$$

$$b^2 / c = (c - X) \quad (85)$$

$$(X * b^2) / c = X *(c - X) \quad (86)$$

$(X / c) = (a^2/c^2)$ which in accordance with Eq. (4). We obtain the next equation.

$$(a^2 * b^2)/c^2 = X *(c - X) \quad (87)$$

The inner contradiction $\Delta(X)^2$ is defined in accordance with Barukčić (Barukčić 2007d, p. 26, Eq. (66)) as

$$\Delta(X)^2 = X *(c - X).$$

We obtain the next equation as the inner contradiction $\Delta(X)^2$ of the right triangle.

$$\Delta(X)^2 = h^2 = (a^2 * b^2) / c^2 = X *(c - X) \quad (88)$$

Q. e. d.

It is a remarkable fact, that the inner contradiction of X is equal to the inner contradiction of its own Anti-X or $\Delta(X)^2 = (a^2 * b^2) / c^2 = \Delta(Anti\ X)^2$. Recall, set c = 0 then $\Delta(X)^2 = - X^2$!

3.3. The variance of the right triangle

The variance of the right triangle I.

Let

a denote the one side of the right triangle,

b denote the other side of the right triangle,

c denote the hypotenuse of the right triangle. Let c = X + (Anti X),

h denote height of the right triangle as illustrated above,

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

$\sigma(\text{Anti } X)^2$ denote the variance $\sigma(\text{Anti } X)^2$ of the right triangle,

then

$$\boldsymbol{\sigma(\text{Anti } X)^2 = \Delta(\text{Anti } X)^2 / c^2 = h^2 / c^2 = (a^2 * b^2)/(c^4).}$$

Proof

$$\mathbf{a^2 = c * X} \quad (89)$$

$$a^2/c^2 = c*X/c^2 \quad (90)$$

$$a^2/c^2 = X/c \quad (91)$$

$$a^2 = c * (c - (\text{Anti } X)) \quad (92)$$

$$a^2 / c = (c - (\text{Anti } X)) \quad (93)$$

$$((\text{Anti } X) * a^2) / c = (\text{Anti } X) *(c - (\text{Anti } X)) \quad (94)$$

Recall. That ((Anti X) / c) = (b^2/c^2). We obtain the next equation.

$$(b^2 * a^2)/c^2 = (\text{Anti } X) *(c - (\text{Anti } X)) \quad (95)$$

The inner contradiction $\Delta(\text{Anti } X)^2$ is defined in accordance with Barukčić (Barukčić 2007d, p. 26, Eq. (66)) as

$$\Delta(\text{Anti } X)^2 =(\text{Anti } X) *(c - (\text{Anti } X)).$$

We obtain the next equation as the inner contradiction $\Delta(\text{Anti } X)^2$ of the right triangle.

$$\Delta(\text{Anti } X)^2 = (a^2 * b^2) / c^2 = (\text{Anti } X) *(c - (\text{Anti } X)) \quad (96)$$

The variance of Anti X denoted as $\sigma(\text{Anti } X)^2$ is defined as

$\sigma(\text{Anti } X)^2 = \Delta(\text{Anti } X)^2 / c^2 = (\text{Anti } X)*(c - (\text{Anti } X))/c^2$

in accordance with Barukčić (Barukčić 2007d, p. 27, Eq. (77) and Eq. (78)).

We obtain the next equation.

$$\sigma(\text{Anti } X)^2 = \Delta(\text{Anti } X)^2 / c^2 = (a^2 * b^2)/(c^4) = h^2 / c^2 = (\text{Anti } X)*(c - (\text{Anti } X))/c^2 \quad (97)$$

Q. e. d.

Recall, set **c = 0** then $\Delta(\text{Anti } X)^2 = -(\text{Anti } X)^2$!

The variance of the right triangle II.

Let

a	denote the one side of the right triangle,
b	denote the other side of the right triangle,
c	denote the hypotenuse of the right triangle. Let c = X + (Anti X). Let
h	denote height of the right triangle as illustrated above,
$\Delta(X)^2$	denote the inner contradiction $\Delta(X)^2$ of the right triangle,
$\sigma(X)^2$	denote the variance $\sigma(X)^2$ of the right triangle,

then

$$\boldsymbol{\sigma(X)^2 = \Delta(X)^2 / c^2 = (a^2 * b^2)/(c^4) = h^2 / c^2 = X*(c - X)/c^2 .}$$

Proof

$$\mathbf{b^2 = c * (Anti\ X)} \quad (98)$$

which is in accordance with Eq. (3).

$$b^2/c^2 = c*(Anti\ X)/c^2 \quad (99)$$

$$b^2/c^2 = (Anti\ X)/c \quad (100)$$

$$b^2 = c * (c - X) \quad (101)$$

$$b^2 / c = (c - X) \quad (102)$$

$$(X * b^2) / c = X *(c - X) \quad (103)$$

$(X / c) = (a^2/c^2)$ which in accordance with Eq. (4). We obtain the next equation.

$$(a^2 * b^2)/c^2 = X *(c - X) \quad (104)$$

The inner contradiction $\Delta(X)^2$ is defined in accordance with Barukčić (Barukčić 2007d, p. 26, Eq. (66)) as

$$\Delta(X)^2 = X *(c - X).$$

We obtain the next equation as the inner contradiction $\Delta(X)^2$ of the right triangle.

$$\Delta(X)^2 = (a^2 * b^2) / c^2 = h^2 = X *(c -X) \quad (105)$$

The variance of X denoted as $\sigma(X)^2$ is defined as $\sigma(X)^2 = \Delta(X)^2 / c^2 = X*(c - X)/c^2$ in accordance with Barukčić (Barukčić 2007d, p. 27, Eq. (77) and Eq. (78)).
We obtain the next equation.

$$\boldsymbol{\sigma(X)^2 = \Delta(X)^2 / c^2 = (a^2 * b^2)/(c^4) = h^2 / c^2 = X*(c - X)/c^2} \quad (106)$$

Q. e. d.

3.4. The area of the right triangle

3.4.1. The unity and the struggle of X and Anti X.

The unity and the struggle of X and Anti X.

Let

a denote the one side of the right triangle,

b denote the other side of the right triangle,

c denote the hypotenuse of the right triangle. Let c = X + (Anti X) ≠ 0. Let

h denote height of the right triangle as illustrated above,

X X denote the local non-hidden part of c of the right triangle,

Anti X denote the local hidden part of c of the right triangle,

A (Δ) denote the area of the right triangle,

then

$$4 * A (\Delta)^2 = (c^2 * X * (\text{Anti } X)) = (a^2 * b^2).$$

Proof

$$\mathbf{\Delta(X)^2 = X * (Anti\ X) = (a^2 * b^2)/(c^2)} \qquad (107)$$

which is in accordance with Eq. (88).

$$c^2 * X * (\text{Anti } X) = (a^2 * b^2) \qquad (108)$$

$$(c^2 * X * (\text{Anti } X))^{1/2} = (a * b) \qquad (109)$$

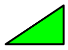
$$A (\Delta) = (c^2 * X * (\text{Anti } X))^{1/2} / 2 = (a * b)/2 \qquad (110)$$

$$4 * A (\Delta)^2 = (c^2 * X * (\text{Anti } X)) = (a^2 * b^2) \qquad (111)$$

Q. e. d.

3.4.2. The covariance and the general right triangle.

Let us take a view on the Pythagorean theorem by the 2 by 2 table.

		c		
		Anti X	X	
c	X	 (X * Anti X)	$(X)^2$	a^2
	Anti X	$(\text{Anti } X)^2$	(X * Anti X)	Anti a^2
		b^2	Anti b^2	c^2

Recall:

$$b^2 = c*(\text{Anti } X) \quad (112)$$

$$b^2 = (X + (\text{Anti } X))*(\text{Anti } X) \quad (113)$$

$$b^2 = (X *(\text{Anti } X)) + (\text{Anti } X)^2 \quad (114)$$

Recall:

$$a^2 = c*(X) \quad (115)$$

$$a^2 = (X + (\text{Anti } X))*(X) \quad (116)$$

$$a^2 = (X *(\text{Anti } X)) + (X)^2 \quad (117)$$

Recall:

$$(X + \text{Anti } X) = C \quad (118)$$

$$(X + \text{Anti } X)^2 = C^2 \quad (119)$$

$$\mathbf{(X)^2 + (2*((X *(\text{Anti } X)))) + (\text{Anti } X)^2 = C^2} \quad (120)$$

$$(2*((X *(\text{Anti } X)))) = C^2 - (X)^2 - (\text{Anti } X)^2 \quad (121)$$

$$(X *(\text{Anti } X)) = \mathbf{(C^2 - (X)^2 - (\text{Anti } X)^2) / 2 \leq (C^2/4)} \quad (122)$$

$$\mathbf{(X)^2 + (\text{Anti } X)^2 \geq C^2/2} \quad (122a)$$

$$C^2*(X (\text{Anti } X)) = C^2*(C^2 - (X)^2 - (\text{Anti } X)^2) / 2 \quad (123)$$

$$C^2*(X (\text{Anti } X)) = C^2*(C^2 - (X)^2 - (\text{Anti } X)^2) / 2 = a^2 * b^2 \quad (124)$$

$$4 * A (\Delta)^2 = C^2*(X (\text{Anti } X)) = C^2*(C^2 - (X)^2 - (\text{Anti } X)^2) / 2 = a^2 * b^2 \quad (125)$$

$$A (\Delta)^2 / (X (\text{Anti } X)) = C^2 / 4 \quad (126)$$

The covariance and the general right triangle.

Let

a	denote the one side of the right triangle,
b	denote the other side of the right triangle,
c	denote the hypotenuse of the right triangle. Let c = X + (Anti X) ≠ 0. Let
X	X denote the local non-hidden part of c of the right triangle,
Anti X	denote the local hidden part of c of the right triangle,
A (Δ)	denote the area of the right triangle,
σ (X, Anti X)	denote the covariance of X and Anti X,

then

$$\boldsymbol{\sigma (X , Anti\ X)} = (c^2 * X * (Anti\ X) - (a^2 * b^2)) / (c^2 * c^2) = 0.$$

Proof

$$a = a \quad (127)$$

$$a^2 = a^2 \quad (128)$$

$$a^2 * 1 = a^2 \quad (129)$$

Set $b^2 \neq 0$. Thus, $b^2/b^2 = 1$.

$$a^2 * (b^2/b^2) = a^2 \quad (130)$$

$$a^2 * b^2 = a^2 * b^2 \quad (131)$$

According to Eq. (111) it is true that $c^2*(X*(Anti\ X)) = a^2*b^2$. We obtain the next equation.

$$c^2 * (X * (Anti\ X)) = a^2 * b^2 \quad (132)$$

$$(c^2 * (X * (Anti\ X))) / (c^2 * c^2) = (a^2 * b^2) / (c^2 * c^2) \quad (133)$$

$$(c^2 * (X * (Anti\ X))) / (c^2 * c^2) - (a^2 * b^2) / (c^2 * c^2) = 0 \quad (134)$$

$$(c^2 * X * (Anti\ X) - (a^2 * b^2)) / (c^2 * c^2) = 0 \quad (135)$$

$$\boldsymbol{\sigma (X , Anti\ X)} = (c^2 * X * (Anti\ X) - (a^2 * b^2)) / (c^2 * c^2) = 0. \quad (136)$$

which is in accordance with Eq. (88).

It should be easy to calculate that

$$| \sigma(X, Anti\ X) / (\sigma(X) * \sigma (Anti\ X)) | = 1.$$

3.5. The circle as the unity and the struggle of radius and Anti radius.

The foundation of a circle.

Let

r	denote the radius of a circle, the local non-hidden radius of a circle,
Anti r	denote the Anti radius of a circle, the local hidden radius of a circle, the otherness of the radius of a circle,
d	denote the diameter of a circle. Let d = r + Anti r. Thus, Anti r = d - r. Let

$$\mathbf{r = Anti\ r},$$

then

$$\mathbf{r * (Anti\ r) = d^2 /4.}$$

Proof

$$\mathbf{r = Anti\ r} \qquad (137)$$

$$r + r = r + (Anti\ r) \qquad (138)$$

$$2*r = r + (Anti\ r) = d \qquad (139)$$

$$r = (d / 2) \qquad (140)$$

$$(r - (d / 2))^2 = 0^2 \qquad (141)$$

$$r^2 - (r*d) + (d^2 / 4) = 0 \qquad (142)$$

$$r^2 - (r*d) = - (d^2 / 4) \qquad (143)$$

$$(r * d) - r^2 = (d^2 / 4) \qquad (144)$$

$$r* (d - r) = d^2 /4 \qquad (145)$$

Since d - r = r we obtain the next equation.

$$\mathbf{r^2 = d^2 /4} \qquad (146)$$

Since d - r = Anti r too we obtain the next equation.

$$\mathbf{r * (Anti\ r) = d^2 /4} \qquad (147)$$

Q. e. d.

A circle is not only a simple and closed curve, it is the unity of radius (X) and Anti radius (Anti X), a unity of two that are different and equal to each other, a unity of opposites. The one is not dominant over its own other and vice versa. If r > Anti r or if Anti r > r then the circle will pass over into an inequality and we obtain equally **$r * (Anti\ r) \le d^2 /4$**. The circle is determined by the relationship between r and Anti r. π has the power to unite r and Anti r into a circle, without π, r and Anti r would not able unite within a circle.

3.6. Relativistic energy-momentum.

Relativistic energy-momentum and Pythagorean theorem.

Let

$E_t = (m_r*c^2)$	denote the total energy of an object in motion. Recall, the total energy of a moving body can be calculated according to Einstein through the formula $E_t = (m_o / (1 - (v^2/c^2))^{1/2}) * c^2)$,	(148)
m_r	denote the relativistic mass, a mass depending on one's frame of reference, a mass that may vary depending on the observer's inertial frame,	
$E_o = (m_o*c^2)$	denote the rest energy, the **non-zero energy** of an object at rest ($v = 0$ and $\gamma= (1- (v^2/c^2))^{1/2} = 1$),	(149)
m_o	denote the rest mass (invariant mass), a mass which does not change with the observer, a mass that does not change with a change of the reference system,	
$E_k = (p_r * c)$	denote the kinetic energy of an object in motion. Recall, the energy momentum relation of an object that is massless (e.g., photon) reduces to $E_t = p_r * c$.	(150)
p_r	denote the relativistic momentum. Recall, the momentum of a body in its rest frame is zero. Let	
c	denote the speed of light in a vacuum,	
v	denote the relative velocity between the observer and the object,	
$\gamma = (1- (v^2/c^2))^{1/2}$	denote the Lorentz factor,	(151)
$(E_t)^2 = (p_r*c)^2 + (m_o*c^2)^2$	denote the relativistic energy and momentum. The relativistic energy and momentum can be calculated according to the formula $(E_t)^2 – (p_r*c)^2 = (m_o*c^2)^2$. The total energy of an object in motion $(E_t)^2$ and the relativistic momentum (p_r) vary from frame to frame and are observer dependent. In opposite to this, $(m_o*c^2)^2$ is observer independent.	(152)
A	denote one side of a general right triangle,	
B	denote one side of a general right triangle,	
C	denote the hypotenuse of a general right triangle. Recall, that $C = X + (Anti X) \neq 0$. Let	
$(E_t)^2 = (m_t*c^2)^2 = C^2$	according to Eq. (148),	(153)
$(E_k)^2 = (p_r * c)^2 = A^2$	according to Eq. (150),	(154)
$(E_o)^2 = (m_o*c^2)^2 = B^2$	according to Eq. (149),	(155)
X	denote the local non-hidden part of the hypotenuse C of a general right triangle, or the local non-hidden part of the relativistic energy–momentum relation,	
Anti X	denote the local hidden part of the hypotenuse C of a general right triangle, or the local hidden part of the relativistic energy–momentum relation,	

$A^2 = C*X$ according to Eq. (3), (156)

$B^2 = C*(Anti X)$ according to Eq. (5), (157)

$\Delta(X)^2$ denote the inner contradiction of a general right triangle or of the relativistic energy–momentum relation,

$\sigma(X)^2$ denote the variance of the relativistic energy–momentum relation. Recall, according to Eq. (106),

$$\sigma(X)^2 = \Delta(X)^2 / C^2 = (A^2 * B^2)/(C^4) = (X*(Anti X))/C^2 \qquad (158)$$

then

$$\boldsymbol{\sigma(X)^2 = (v^2 *(c^2 - v^2)) / c^4}$$

Proof

$$\mathbf{X = X} \qquad (159)$$

$$X + (Anti X) = X + (Anti X) \qquad (160)$$

$$X + (Anti X) = C \qquad (161)$$

$$C*X + C*(Anti X) = C \qquad (162)$$

$$A^2 + B^2 = C^2 \qquad (163)$$

$$(p_r*c)^2 + (m_o*c^2)^2 = (E_t)^2 \qquad (164)$$

(1)	(2)	
$A^2 = C*X = (p_r*c)^2$	$B^2 = C*(Anti X)=(m_o*c^2)^2$	(165)
$X = (p_r*c)^2 / C$	$(Anti X) = (m_o*c^2)^2 / C$	(166)

$$\sigma(X)^2 = \Delta(X)^2 / C^2 = (A^2 * B^2)/(C^4) = (X*(Anti X))/C^2 \qquad (167)$$

$$\sigma(X)^2 = X*(Anti X)/C^2 \qquad (168)$$

$$\sigma(X)^2 *C^2 = X*(Anti X) \qquad (169)$$

$$\sigma(X)^2 *C^2 = ((p_r*c)^2 / C)*(Anti X) \qquad (170)$$

$$\sigma(X)^2 *C^2 = ((p_r*c)^2 / C)*((m_o*c^2)^2 / C) \qquad (171)$$

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$$\sigma(X)^2 *C^2*C^2 = (p_r*c)^2 *(m_o)^2*c^2 *c^2 \quad (172)$$

$$\sigma(X)^2 *C^2*C^2 = (p_r*c)^2 *(m_o)^2*c^2 *c^2 \quad (173)$$

$$\sigma(X)^2 *C^2*C^2 = ((v*m_o)/ (1- (v^2/c^2))^{1/2})*c)^2 *(m_o)^2*c^2 *c^2 \quad (174)$$

$$\sigma(X)^2 *C^2*C^2 = ((m_o)^2 * (m_o)^2 * (v^2* c^2 * c^2 *c^2)) / ((c^2- v^2)/c^2) \quad (175)$$

$$\sigma(X)^2 *C^2*C^2 = ((m_o)^2 * (m_o)^2 * (v^2* c^2 * c^2 *c^2 *c^2)) / (c^2- v^2) \quad (176)$$

$$\sigma(X)^2 *(c^2- v^2) * C^2*C^2 = ((m_o)^2 * (m_o)^2 * (v^2* c^2 * c^2 * c^2 *c^2)) \quad (177)$$

$$\sigma(X)^2 *(c^2- v^2) * ((m_o *c^2)/(1-(v^2/c^2))^{1/2})^2*C^2 = ((m_o)^2*(m_o)^2*(v^2*c^2*c^2*c^2*c^2)) \quad (178)$$

$$\sigma(X)^2 *(c^2- v^2) * (((m_o)^2*(c^2)^2)/(1-(v^2/c^2)))*C^2 = ((m_o)^2*(m_o)^2*(v^2*c^2*c^2*c^2*c^2)) \quad (179)$$

$$\sigma(X)^2 *(c^2- v^2) * (((m_o)^2*(c^2)^2)/((c^2-v^2)/c^2)))*C^2 = ((m_o)^2*(m_o)^2*(v^2*c^2*c^2*c^2*c^2)) \quad (180)$$

$$(\sigma(X)^2 *\mathbf{C^2}*(c^2- v^2)) /((c^2-v^2)/c^2) = ((m_o)^2*(v^2 * c^2*c^2)) \quad (181)$$

$$(\sigma(X)^2*c^2 *\mathbf{C^2}*(c^2- v^2)) /(c^2-v^2) = ((m_o)^2*(v^2 * c^2*c^2)) \quad (182)$$

$$(\sigma(X)^2*\mathbf{C^2}) = ((m_o)^2*(v^2 *c^2)) \quad (183)$$

$$(\sigma(X)^2* (m_o)^2* (c^2)^2) /(1-(v^2/c^2)) = ((m_o)^2*(v^2 *c^2)) \quad (184)$$

$$(\sigma(X)^2* (c^2)) /((c^2 - v^2)/c^2) = (v^2) \quad (185)$$

$$(\sigma(X)^2* (c^2)^2) /(c^2 - v^2) = (v^2) \quad (186)$$

$$(\sigma(X)^2* (c^2)^2) = (v^2)*(c^2 - v^2) \quad (187)$$

$$\sigma(X)^2 = (v^2 / c^2) * ((1 - (v^2 / c^2)) \quad (188)$$

Q. e. d.

Set v = c then $\sigma(X)^2 = (v^2 / c^2) * ((1 - (v^2 / c^2)) = 0$. The inner contradiction of the relativistic energy–momentum relation can be calculated as

$$\Delta(X)^2 = v^2 * ((c^2 - v^2) /c^2) = v^2 * \gamma^2 .$$

4. Discussion

A process in the Standard Model called charge-parity (CP) violation is claimed to be responsible for the difference between matter and antimatter in our universe. CP violation in the Standard Model can be explained to some extent in terms of a triangle. The amount of violation in this sense is proportional to the area of the triangle. The physicists need to calculate the area of such triangles to better test their model.

Triangles have to do more or less with the Pythagorean theorem. This publication has proofed that Pythagorean theorem is nothing special, the same is based on pure classical logic, especially on the law of the excluded middle and on the general contradiction law too. The new relationship found in this publication will help to analyse the most basic relationships in nature, especially the inner contradiction of a general right triangle. In so far, classical logic can must enter Standard model too.

On the other hand, if v reaches the speed of light or if v = c, we have the pure v, the v without its own other, a v without its own Anti v. In this case we obtain

$$\sigma(X)^2 = 0$$

according to Barukčić (Barukčić, 2006c). In this case, we obtain equally the inner contradiction of X as

$$\Delta(X)^2 = v^2 * ((c^2 - v^2) /c^2) = (v=c)^2 * (1- ((v=c)^2/c^2)) = 1^2 - (1-1^2) = 0.$$

In so far, as long as $v < c$, a local hidden variable (Einstein et. al., 1935) is active. If v reaches the speed of light or if v = c, we obtain according to the law of contradiction of classical logic

$$\Delta(X)^2 = X * \text{Not } X = 0.$$

According to Barukčić (Barukčić 2006a, p. 354) Einstein's relativistic correction and the (logical) negation are very familiar with each other and at the end identical to some extent.

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The constancy of the speed of light in vacuo.

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Abstract

All electromagnetic radiation including the visible light moves at a constant velocity in vacuum. The velocity of electromagnetic radiation in a vacuum does not depend on the velocity of the object that is emitting the radiation. The velocity of electromagnetic radiation in a vacuum is a physical constant and commonly known as the speed of light. The speed of light is denoted as *c* (Latin: celeritas).

The constancy of the speed of light in a vacuum has consequences. This publication will proof, that Heisenberg's uncertainty principle is determined by

the constancy of the as the speed of light in a vacuum.

Key words: Anti h, Planck's constant h, General Contradiction Law, Barukčić.

1. Background

According to the theory of special relativity the velocity of light in a vacuum will be measured by all observers as being the same, regardless of the reference frame of the observer or the velocity of the source emitting the light. The speed of light in a vacuum is by definition and not by measurement exactly 299,792,458 metres per second. The metre has been defined as the distance light travels in a vacuum in 1/299,792,458 of a second.

Light can be slowed to less than *c* by passing through materials. Further, times and distances are dilated at large velocities in accordance with the Lorentz transforms in such a way that the speed of light remains constant.

Something that could travel faster than *c* in one reference frame could be observed in some other reference frames before it happened. In so far, an effect as the other side of a cause that is observed in time before its cause would violate causality since it would presuppose something that is faster than *c*. It is worth noting that such a violation of causality in our world has not been observed so far.

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2. Material and Methods

The constancy of the velocity of light in a vacuum is part of Einstein's field equation too, the one cannot without its own other. In so far, may be, the velocity of light in a vacuum can be defined by Einstein's basic field equation too.

2.1. Einstein's field equation.

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

Einstein's basic field equation (EFE).

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

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

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

$$\pi \approx \mathbf{3.14159\ 26535\ 89793\ 23846\ 26433\ 83279\ 50288\ 41971\ 69399\ 37510},$$

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

$$c = \mathbf{299\ 792\ 458\ [m / s]},$$

γ denote Newton's gravitational 'constant', where

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

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

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

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

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

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

3. Results

3.1. Planck's constant h and Heisenberg's uncertainty principle

Planck's constant h and Heisenberg's uncertainty principle.

Let

E denote the kinetic energy,

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

t denote the time,

T denote the period, **the time** for one complete cycle for an oscillation of a wave, the time between two consecutive occurrences of an event. Let $t_2 > t_1$. Thus, let $T = \Delta t = t_2 - t_1$.

f denote the frequency (of a wave),

1 = f * T, thus T = 1 / f. Let

λ denote the wave length (of a electromagnetic wave),

p denote the momentum,

ω denote the angular frequency,

ω = 2 * π * f,

ω = ((2 * π) / T),

h = λ * p,

then

$$\mathbf{h = (E_{kin}) * T = constant.}$$

Proof.

$$\omega = 2 * \pi * f \qquad (1)$$

$$h * \omega = 2 * \pi * f * h \qquad (2)$$

$$h * \omega = 2 * \pi * E_{kin} \qquad (3)$$

$$h = (2 * \pi * E_{kin}) / \omega \qquad (4)$$

$$h / (2 * \pi) = (E_{kin}) / \omega \qquad (5)$$

$$h / (4 * \pi) = (E_{kin}) / (2 * \omega) \qquad (6)$$

$$\text{Recall, } f * T = 1.\ \omega = (2 * \pi) / T. \qquad (7)$$

$$h / (4 * \pi) = (E_{kin}) / (2 * ((2 * \pi) / T)) \qquad (8)$$

$$h / (4 * \pi) = (E_{kin}) * T / (4 * \pi) \qquad (9)$$

$$h = (E_{kin}) * T = \text{constant}. \qquad (10)$$

Q. e. d.

Planck's constant h as an area of a square in plane (Euclidean) geometry.

Let us assume that **Planck's constant h** is organised as an area of a square A in plane (Euclidean) geometry.

Let

E denote the uncertainty of measurement of energy,

t denote the uncertainty of the simultaneous measurement of time,

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

π denote the mathematical constant π, also known as **Archimedes' constant,**

r denote the radius of a circle/sphere in plane (Euclidean) geometry,

(Anti r) denote the anti radius of a circle/sphere in plane (Euclidean) geometry,

d denote the diameter of a circle in plane (Euclidean) geometry. Let d = r + (Anti r).

Let

A(□) denote the area of a square A in plane (Euclidean) geometry,

A(□) = E * t = r * (Anti r),

A_o denote the area enclosed by a circle in plane (Euclidean) geometry,

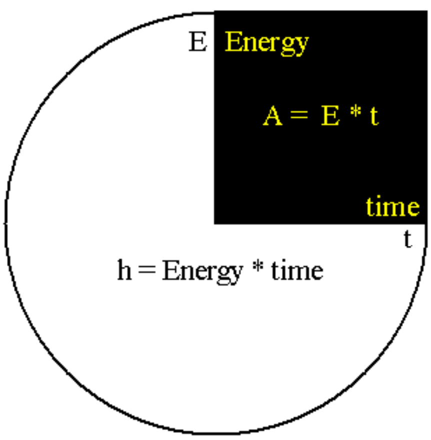
A_o = $\pi * r^2$,

A_{Sphere} denote the area of a sphere in plane (Euclidean) geometry,

A_{Sphere} = $4 * \pi * r^2$,

then

$$\textbf{Energy * time = E * t = h = A(□).} \quad (11)$$



Planck's constant h as an area of a sphere in plane (Euclidean) geometry.

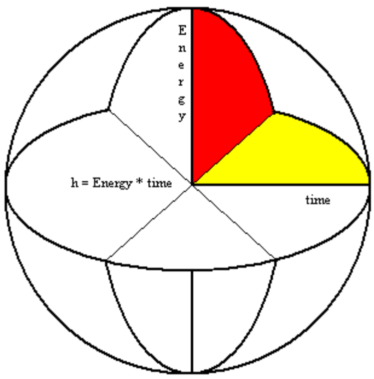
Let us assume that **Planck's constant h** is organised as an area of a sphere in plane (Euclidean) geometry.

Let

E	denote the uncertainty of measurement of energy,
t	denote the uncertainty of the simultaneous measurement of time,
h	denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10 $^{-34}$ [J * s],**
π	denote the mathematical constant π, also known as **Archimedes' constant,**
r	denote the radius of a circle/sphere in plane (Euclidean) geometry,
(Anti r)	denote the anti radius of a circle/sphere in plane (Euclidean) geometry,
d	denote the diameter of a circle in plane (Euclidean) geometry. Let d = 2 * r = r + r,
A(□)	denote the area of a square A in plane (Euclidean) geometry,
A(□) =	E * t,
A_o	denote the area enclosed by a circle in plane (Euclidean) geometry,
A_o =	π * r²,
A_{Sphere}	denote the area of a sphere in plane (Euclidean) geometry,
A_{Sphere} =	4 * π * r²,

Then

$$\textbf{Energy * time = E * t = h} = 4 * \pi * r^2 = A_{Sphere} . \qquad (12)$$



The variance of X.

Let

X denote something existing independently of human mind and consciousness,

Anti X denote the otherness of X that is existing independently of human mind and consciousness, the negation of X, the local hidden variable of X,

C = X + (Anti X),

$\sigma(X)^2$ denote the variance of X,

$\sigma(X)^2 = ((C * X) - (X)^2)/C^2$,

then

$$X*(\text{Anti } X) = (C * X) - (X^2).$$

Proof.

$$\mathbf{+ X = + X} \tag{13}$$

$$+ X + (\text{Anti } X) = + X + (\text{Anti } X) \tag{14}$$

$$\mathbf{+ X + (\text{Anti } X) = + C} \tag{15}$$

$$+ X = + C - (\text{Anti } X) \tag{16}$$

$$+ X * X = + X * (C - (\text{Anti } X)) \tag{17}$$

$$+ X^2 = + (C*X) - (X*(\text{Anti } X)) \tag{18}$$

$$\mathbf{(X*(\text{Anti } X)) = + (C * X) - (X)^2} \tag{19}$$

Let us assume that **X = (Anti X)**. According to the general contradiction law (Barukčić 2006e) it is equally true that $(X*(\text{Anti } X)) = C^2/4$. We obtain the next Equation.

$$(X*(\text{Anti } X)) = C^2/4 \qquad + (C * X) - (X)^2 = C^2 /4 \tag{20}$$

Let us assume that the division by C is allowed and possible.

$$(X*(\text{Anti } X)) / C^2 = 1/4 \qquad (+ (C * X) - (X)^2)/C^2 = 1/4 \tag{21}$$

It is not that much possible to analyse a world where (C = 0) with the tools of a variance, since we are not allowed to divide by 0. We obtain the next equation.

$$(\sigma(X)^2 = (X*(\text{Anti } X)) / C^2) = 1/4 \qquad (\sigma(X)^2 = ((C * X) - (X)^2)/C^2) = 1/4 \tag{22}$$

Let us assume that $X \neq (\text{Anti } X)$. According to the general contradiction law (Barukčić 2006e) it is equally true that $(X*(\text{Anti } X)) \leq C^2/4$. We obtain the next equation.

$$(\sigma(X)^2 = (X*(\text{Anti } X)) / C^2) \leq 1/4 \qquad (\sigma(X)^2 = ((C * X) - (X)^2)/C^2) \leq 1/4 \tag{23}$$

Q. e. d.

Let us assume according to classical logic that C = 1 and that $\mathbf{(X*(\text{Anti } X)) = 0}$. In a world that is governed only by the laws of classical logic has to be equally that $\mathbf{(C * X) - (X)^2} = 0$. At the end it has to be that $(C*X) = (X)^2$ or that C = X or that C = X + 0 or that C = X + ((Anti X) = 0). In so far, every time when we find that $\mathbf{(X*(\text{Anti } X)) = (C * X) - (X)^2 = 0}$, we have found equally that there is no local hidden variable, there is no Anti X inside an X, we have only the pure X. On the other hand, every time when (C * X) – (X)² ≠ 0 we have equally found that **(X*(Anti X)) ≠** 0, X is itself and equally X is another too. According to classical logic, it is not possible that **(X*(Anti X)) ≠** 0. In so far, the variance of X is more then only a statistical measure. The variance of X denotes the interior struggle within C between X and Anti X. "***The variance** in this sense **is a measure of the inner contradictions of a random variable, of changes, of struggle within this random variable itself.*** Thus, ***the greater σ²(X) of a random variable X, the greater the inner contradictions of this random variable***." (Barukčić 2006a1, p. 57).

The variance of a radius.

Let

r		denote the radius of a circle in Euclidean geometry,
Anti r		denote the otherness of the radius, the anti radius of a circle in Euclidean geometry,
d		denote the diameter of a circle in Euclidean geometry,
d	=	r + (Anti r),
C		denote the circumference of a circle in Euclidean geometry,
C	=	π * d,
σ(r)²		denote the variance of the radius of a circle in Euclidean geometry,
σ(r)²	=	((d * r) – (r)²) / d²,

then

$$r*(\text{Anti } r) = (d * r) - (r^2).$$

Proof.

$$\mathbf{+r = +r} \quad (24)$$

$$+r + (\text{Anti } r) = +r + (\text{Anti } r) \quad (25)$$

$$\mathbf{+r + (\text{Anti } r) = +d} \quad (26)$$

$$+r = +d - (\text{Anti } r) \quad (27)$$

$$+r * r = +r * (d - (\text{Anti } r)) \quad (28)$$

$$+r^2 = +(d*r) - (r*(\text{Anti } r)) \quad (29)$$

$$\mathbf{(r*(\text{Anti } r)) = +(d * r) - (d)^2} \quad (30)$$

According to the general contradiction law (Barukčić 2006e) it is equally true that (r*(Anti r)) = d²/4, if r = anti r. We obtain the next Equation.

$$(r*(\text{Anti } r)) = d^2/4 \qquad +(d * r) - (r)^2 = d^2/4 \quad (31)$$

$$(r*(\text{Anti } r)) / d^2 = 1/4 \qquad (+(d * r) - (r)^2)/d^2 = 1/4 \quad (32)$$

$$(\sigma(r)^2 = (r*(\text{Anti } r)) / d^2) = 1/4 \qquad (\sigma(r)^2 = ((d * r) - (r)^2)/d^2) = 1/4 \quad (33)$$

Q. e. d.

As long as r = Anti r it is equally true that σ(r)² = (1/4).

3.2. The constancy of the speed of light and Heisenberg's uncertainty principle

Werner Heisenberg discovered 1927 a basic relationship between energy and time. **Heisenberg uncertainty principle** states in general that the simultaneous determination of X and its other, the Anti X, the local hidden variable of X if you like, has an unavoidable uncertainty. Under certain experimental conditions something can exhibit **X-like** behaviour (e. g. electrons can exhibit **particle**-like **(= X)** behaviour such as **scattering**). Under other conditions, the same something can exhibit **Anti X-like** behaviour (e. g. electrons can exhibit **wave**-like **(= Anti X)** behaviour such as **interference**). We can observe only either X or Anti X at a time, never both at the same time, although the same something has both X and Anti X nature. A fundamental consequence of the basic relationship between X and Anti X is in accordance with Heisenberg's uncertainty principle that increasing the accuracy of the measurement of X (e. g. energy) increases the uncertainty of the simultaneous measurement of its Anti X, its complement, its negation (e. g. time).

Heisenberg's uncertainty principle is based on $(\text{Variance}(X) * \text{Variance}(\text{Anti } X))^{1/2}$, the basic relationship between X and Anti X, too. The first mathematically exact derivation of Heisenberg's uncertainty principle was provided by Kennard (Kennard 1930) as

$$h / (4 * \pi) \leq (\Delta_{\Psi} X) * (\Delta_{\Psi} (\text{Anti } X)) \tag{34}$$

where

$\Delta_{\Psi} X$	denote the standard deviation of X (e. g. position) in the state vector $\mid \Psi >$,
Δ_{Ψ} (Anti X)	denote the standard deviation of Anti X (e. g. momentum) in the state vector $\mid \Psi >$,
$\mid \Psi >$	denote a normalised state vector,
h	denote Planck's constant, $h \approx$ **(6.626 0693 (11)) * 10^{-34} [J * s],**
π	denote the mathematical constant π.

Heisenberg's uncertainty principle is known to be according to the proof provided by Kennard (Kennard 1930)

$$\mathbf{E * t \geq h / (4 * \pi),} \tag{35}$$

where E denotes energy, t denotes time. Heisenberg's uncertainty principle has thus two absolutely equivalent meanings/sides.

Either

$$(E * t) > h / (4 * \pi) \tag{36}$$

or

$$E * t = h / (4 * \pi), \tag{37}$$

but not both at the same space-time.

What are the consequences if $E * t = h / (4 * \pi)$?

Heisenberg's uncertainty relation.

Let

$E_{Kinetic}$	denote the kinetic energy. Recall, $E_{Kinetic} = h * f$. Let
t	denote the uncertainty of the simultaneous measurement of time,
h	denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**
c	denote the speed of light in vacuum,
f	denote the frequency,
λ	denote the wave length. Recall, c = λ * f . Let
π	denote the mathematical constant π,

E*t = h/(4 * π),

then

$$\pi = (1 / 4).$$

Proof.

$$E * t = h / (4 * \pi) \quad (38)$$

$$\text{Recall, } (E * t) = h \quad (39)$$

$$h = h / (4 * \pi) \quad (40)$$

$$1 = 1 / (4 * \pi) \quad (41)$$

$$\pi = (1 / 4) \quad (42)$$

Q. e. d.

Only we know that π is not (1 / 4). In so far, there is a problem. Heisenberg's uncertainty relation appears to be correct and is already experimentally confirmed. Thus, it appears to me that it doesn't make sense to try to refuted the same. In so far, **either** the formula **Energy*time = h** is not correct **or π** as such is not a constant, π must have the ability to change and the minimum value of π according to Heisenberg's uncertainty relation has to be (1 / 4). In so far, based on Einstein's field equation and according to Barukčić (Barukčić 2007b) π as a natural process is not a constant and can be defined as

$$\pi = (c^4)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * T_{ab}), \quad (43)$$

where R_{ab} denote the Ricci tensor, R denote the Ricci scalar, g_{ab} denote the metric tensor, T_{ab} denote the stress-energy tensor, c denote the speed of all electromagnetic radiation in a vacuum, γ denote Newton's gravitational 'constant' (assumed that the division by T_{ab} is allowed). Thus, if Heisenberg's uncertainty principle is correct and as long as the equation **energy * time = h** is true, it has equally to be true that

$$\pi = ((c^4)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * T_{ab})) \geq (1 / 4), \quad (44)$$

$$\mathbf{h}*((c^4)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * \boldsymbol{\pi} * T_{ab})) \geq (\mathbf{h} / (4 * \boldsymbol{\pi})). \quad (45)$$

$$\text{Recall, } c = \lambda * f.\ E_{Kinetic} = h * f. \quad (46)$$

$$h*(f*\lambda *(c^3)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * \pi * T_{ab})) \geq (h / (4 * \pi)) \quad (47)$$

$$E_{Kinetic} * (\lambda *(c^3)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * \pi * T_{ab})) \geq (h / (4 * \pi)) \quad (48)$$

$$\text{Set time = Period} = (\lambda *(c^3)*((R_{ab}) - ((R* g_{ab}) / 2)) / (4 * 2 * \gamma * \pi * T_{ab})) \quad (49)$$

$$\mathbf{E_{Kinetic} * time \geq (h / (4 * \pi))} \quad (50)$$

It appears to me that Heisenberg's uncertainty relation can be expressed in terms of tensors too.

It is claimed that Planck's constant h is a constant but equally it appears to be that Planck's constant h is something that is full of life, Planck's constant h is changing too, it is changing at least its shape. If the energy content of Planck's constant h is not changing while Planck's constant h is changing at least in shape, there are some questions that have to be answered. Let us assume that h can change from an area of a square A in plane (Euclidean) geometry to an area of a sphere in plane (Euclidean) geometry and vice versa. Further, let us assume, that the **energy*time** content of Planck's constant h doesn't change as such. Thus, let it be true that **energy*time = h**. What would be the consequences?

Planck's constant h changes and is a constant too.

Let

E	denote the uncertainty of measurement of energy,
t	denote the uncertainty of the simultaneous measurement of time,
h	denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**
π	denote the mathematical constant π, also known as **Archimedes' constant,**
r	denote the radius of a circle/sphere in plane (Euclidean) geometry,
(Anti r)	denote the anti radius of a circle/sphere in plane (Euclidean) geometry,
d	denote the diameter of a circle in plane (Euclidean) geometry. Let d = 2 * r = r + r,
A_{Square}	denote the area of a square A in plane (Euclidean) geometry,
A_{Square} =	E * t = r * (Anti r) = r^2. Let **r = Anti r**. Let **energy = time**. Let
A_{Sphere}	denote the area of a sphere in plane (Euclidean) geometry,
A_{Sphere} =	$4 * \pi * r^2$,

then

$$\pi = (1 / 4).$$

Proof

$$\textbf{Energy * time = E * t = h} = 4 * \pi * r^2 = A_{Sphere} = A_{Square} . \quad (51)$$

$$A_{Sphere} = A_{Square} \quad (52)$$

$$4 * \pi * r^2 = = A_{Square} \quad (53)$$

$$4 * \pi * r^2 = h \quad (54)$$

$$r^2 = h / (4 * \pi) \quad (55)$$

$$(E * t) = h / (4 * \pi) \quad (56)$$

$$h = h / (4 * \pi) \quad (57)$$

$$1 = 1 / (4 * \pi) \quad (58)$$

$$\pi = (1 / 4) \quad (59)$$

Q. e. d.

If Planck's constant h has the ability too change in shape, is energy needed for this change or is the shape of Planck's constant h nothing other then energy that is on the way to its own self, energy trying to catch the other of itself, to become the other of itself, energy on the way too united with the other of itself? Is space that in what energy and time are united by Planck's constant h, where the opposition, the unity and the struggle between energy and time finds its own solution?

Heisenberg's uncertainty relation and the velocity of light.

Let

$\sigma(s)$	denote the standard deviation of the measurement of the position of something existing independently of human mind and consciousness,
$\sigma(p)$	denote the standard deviation of the measurement of the momentum of something existing independently of human mind and consciousness. Let $\sigma(p) = m * v$. Let
$\sigma(E)$	denote the standard deviation of the measurement of the energy of something existing independently of human mind and consciousness. Let $\sigma(E) / m = c^2$. Let
$\sigma(t)$	denote the standard deviation of the measurement of the time of something existing independently of human mind and consciousness,
t	denote the (space) time.
m	denote the mass,
v	denote the velocity. Let $v = \sigma(s) / \sigma(t)$,
h	denote Planck's constant, h **≈ (6.626 0693 (11)) * 10^{-34} [J * s],**
π	denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about **π ≈ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,**
$\hbar = h/(2 * \pi)$	denote **Dirac's constant,** the reduced Planck constant, pronounced "h-bar",

then

$$\mathbf{v^2 \leq c^2.}$$

Proof.

$$h / (4 * \pi) \leq \sigma(E) * \sigma(t) \tag{60}$$

$$\sigma(p) * \sigma(s) \leq \sigma(E) * \sigma(t) \tag{61}$$

$$m * v * \sigma(s) \leq \sigma(E) * \sigma(t) \tag{62}$$

$$m * (\sigma(s) / \sigma(t)) * \sigma(s) \leq \sigma(E) * \sigma(t) \tag{63}$$

$$m * (\sigma(s) / \sigma(t)) * (\sigma(s) / \sigma(t)) \leq \sigma(E) \tag{64}$$

$$m * (\sigma(s) / \sigma(t)) * (\sigma(s) / \sigma(t)) \leq \sigma(E) \tag{65}$$

$$m * v * v \leq \sigma(E) \tag{66}$$

$$v^2 \leq \sigma(E) / m \tag{67}$$

$$\mathbf{v^2 \leq c^2} \tag{68}$$

Q. e. d.

As long as Heisenberg's uncertainty principle is valid, it is equally assured that there is no velocity greater in value then the speed of the light. On the other hand, it is equally true that Heisenberg's uncertainty principle is one consequence of the special relativity and the fact that

$$\mathbf{v^2 \le c^2.}$$

The velocity of the interaction between X and Anti X inside something may happen at large velocities, thus even if this relationship between X and Anti X inside something is somehow manipulated, this cannot happen , move, ... faster than light.

This is the foundation of Heisenberg's uncertainty principle. In so far, the proof above can be reversed.

Heisenberg uncertainty principle and microphysics.

Let

$\sigma(s)$	denote the standard deviation of the measurement of the position of something existing independently of human mind and consciousness,
$\sigma(p)$	denote the standard deviation of the measurement of the momentum of something existing independently of human mind and consciousness. Let $\sigma(p) = m * v$. Let
$\sigma(E)$	denote the standard deviation of the measurement of the energy of something existing independently of human mind and consciousness. Let $\sigma(E) / m = c^2$. Let
$\sigma(t)$	denote the standard deviation of the measurement of the time of something existing independently of human mind and consciousness,
t	denote the (space) time.
m	denote the mass,
v	denote the velocity. Let $v = \sigma(s) / \sigma(t)$,
h	denote Planck's constant, $h \approx \mathbf{(6.626\ 0693\ (11)) * 10^{-34}\ [J * s]}$,
π	denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about $\pi \approx$ **3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,**
$\hbar = h/(2 * \pi)$	denote **Dirac's constant,** the reduced Planck constant, pronounced "h-bar",

then

$$h / (4 * \pi) \le \sigma(E) * \sigma(t).$$

Proof.

$$\mathbf{v^2 \le c^2} \quad (69)$$

$$v^2 \le \sigma(E) / m \quad (70)$$

$$m * v * v \le \sigma(E) \quad (71)$$

$$m * (\sigma(s) / \sigma(t)) * (\sigma(s) / \sigma(t)) \le \sigma(E) \quad (72)$$

$$m * (\sigma(s) / \sigma(t)) * (\sigma(s) / \sigma(t)) \leq \sigma(E) \qquad (73)$$

$$m * (\sigma(s) / \sigma(t)) * \sigma(s) \leq \sigma(E) * \sigma(t) \qquad (74)$$

$$m * v * \sigma(s) \leq \sigma(E) * \sigma(t) \qquad (75)$$

$$\sigma(p) * \sigma(s) \leq \sigma(E) * \sigma(t) \qquad (76)$$

$$\mathbf{h / (4 * \pi) \leq \sigma(E) * \sigma(t)} \qquad (77)$$

Q. e. d.

We started with the position **$v^2 \leq c^2$** and were able to derive Heisenberg uncertainty principle! If Heisenberg's uncertainty principle is based on the relationship **$v^2 \leq c^2$** then the same should be valid in macrophysics to.

Heisenberg uncertainty principle and the path to macrophysics.

Let

Δs	denote the change in position of something existing independently of human mind and consciousness. Let $\Delta s = s_2 - s_1$. Let
Δp	denote the change in momentum of something existing independently of human mind and consciousness. Let $\Delta p = p_2 - p_1$. Let $\Delta p = \Delta m * v$. Let
ΔE	denote the change in energy of something existing independently of human mind and consciousness. Let $\Delta E = E_2 - E_1$. Let. Let $\Delta E / \Delta m = c^2$. Let
Δt	denote the change in time of something existing independently of human mind and consciousness. Let $\Delta t = t_2 - t_1$. Let
t	denote the (space) time.
Δm	denote change in mass,
v	denote the velocity. Let $v = \Delta s / \Delta t$,
h	denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**
π	denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about **$\pi \approx$ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,**
$\hbar = h/(2 * \pi)$	denote **Dirac's constant,** the reduced Planck constant, pronounced "h-bar",

then

$$h / (4 * \pi) \leq \Delta E * \Delta t .$$

Proof.

$$\mathbf{v^2 \leq c^2} \qquad (78)$$

$$v^2 \leq \Delta E / \Delta m \quad (79)$$

$$\Delta m * v * v \leq \Delta E \quad (80)$$

$$\Delta m * (\Delta s / \Delta t) * (\Delta s / \Delta t) \leq \Delta E \quad (81)$$

$$\Delta m * (\Delta s / \Delta t) * (\Delta s) \leq \Delta E * \Delta t \quad (82)$$

$$\Delta m * (v) * (\Delta s) \leq \Delta E * \Delta t \quad (83)$$

$$\Delta p * \Delta s \leq \Delta E * \Delta t \quad (84)$$

Let it be true that according to Heisenberg it is $(\Delta p * \Delta s) \geq (h / (4 * \pi))$. (85)

$$h / (4 * \pi) \leq \Delta E * \Delta t. \quad (86)$$

Q. e. d.

We started with the position $\mathbf{v^2 \leq c^2}$ in macrophysics and were able to derive Heisenberg uncertainty principle! The same is valid in macrophysics too.

3.2. The constancy of the speed of light and Einstein's field equation

The constancy of the speed of light determined by Einstein's field equation.

Let

R_{ab} denote the Ricci tensor,

R denote the Ricci scalar,

g_{ab} denote the metric tensor,

T_{ab} denote the stress-energy tensor,

G_{ab} denote the Einstein tensor, where $G_{ab} = (R_{ab} - ((R*g_{ab})/2))$,

Λ denote the cosmological constant,

ρ_{Vac} denote the vacuum energy,

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

$$\pi \approx \mathbf{3.14159\ 26535\ 89793\ 23846\ 26433\ 83279\ 50288\ 41971\ 69399\ 37510\ ...},$$

Anti π denote the negation of π,

γ denote Newton's gravitational 'constant', where

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

Anti γ denote the negation of γ,

f denote the frequency (of a wave),

ω denote the angular frequency, where $\omega = 2 * \pi * f$,

λ denote the wavelength (of a electromagnetic wave),

μ_0 denote the permeability constant, the magnetic constant, the permeability of free space or of vacuum,

ε_0 denote the permittivity of vacuum, the electric constant. Recall, $(\mu_0 * \varepsilon_0 * (c^2)) = 1$.

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

$$c = \lambda * f = \mathbf{299\ 792\ 458\ [m / s]},$$

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

$$\underbrace{(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4))}_{\textbf{Energy/matter content}\text{ of space-time}} = \underbrace{(R_{ab}) - ((R* g_{ab}) / 2)).}_{\textbf{Curvature}\text{ of space-time.}}$$

Energy/matter content of space-time = **Curvature** of space-time.

Recall,

$$+ T_{ab}^{(Vac)} = - (\Lambda / (8 \pi)) * g_{ab}$$

$$\rho_{Vac} = (\Lambda / (8 \pi)).$$

Then

$$c = ((4 * \pi * 2 * \gamma) * (T_{ab} / ((R_{ab}) - ((R* g_{ab}) / 2))))^{1/4}. \quad (87)$$

Proof.

$$(((4*2*\pi*\gamma)*T_{ab})/(c^4)) + ((R*g_{ab})/2) = (R_{ab}). \quad (88)$$

$$(((4*2*\pi*\gamma)*T_{ab})/(c^4)) = ((R_{ab}) - ((R*g_{ab})/2)) \quad (89)$$

$$(((4*2*\pi*\gamma)*T_{ab})) = (c^4)*((R_{ab}) - ((R*g_{ab})/2)) \quad (90)$$

Let us assume that it is allowed to divide by $((R_{ab}) - ((R*g_{ab})/2))$.

Otherwise set $((R_{ab}) - ((R*g_{ab})/2)) = 1$.

$$(c^4) = (((4*2*\pi*\gamma)*T_{ab}))/((R_{ab}) - ((R*g_{ab})/2)) \quad (91)$$

$$(c^4) = (4*\pi*2*\gamma)*(T_{ab}/((R_{ab}) - ((R*g_{ab})/2))) \quad (92)$$

$$\mathbf{c} = ((4*\pi*2*\gamma)*(T_{ab}/((R_{ab}) - ((R*g_{ab})/2))))^{1/4} = \textbf{constant!} \quad (93)$$

Q. e. d.

Since $c^2*\varepsilon*\mu = 1$ = constant we obtain $((4*2*\pi*\gamma*\varepsilon^2*\mu^2)*(T_{ab}/((R_{ab})-((R*g_{ab})/2))))^{1/4} = 1$, which denotes the universe according to George Boole. It is $((4*\pi*2*\gamma)*(T_{ab}/((R_{ab})-((R*g_{ab})/2))))^{1/4}$ = constant but does this mean that every part this equation is everywhere around us and in space-time constant too?

3.2.1. The constancy of the speed of the light c under the condition that π and γ are constant

Under the condition that γ = constant and that π = constant and that c, the speed of the light is constant too (assumed that it is allowed to divide by $((R_{ab}) - ((R*g_{ab})/2))$), we obtain

$\mathbf{c}$ = constant 1 = $((\text{constant } 2)*(T_{ab}/((R_{ab}) - ((R*g_{ab})/2))))^{1/4}$ = **constant or**
$(c^4) = (\text{constant } 1)^4 = (\text{constant } 2)*(T_{ab}/((R_{ab}) - ((R*g_{ab})/2)))$ or
$(c^4) = (\text{constant } 1)^4/(\text{constant } 2) = (T_{ab}/((R_{ab}) - ((R*g_{ab})/2)))$ = constant.

Under this circumstances (γ = constant, π = constant and c = constant)

$$(T_{ab}/((R_{ab}) - ((R*g_{ab})/2))) = (\text{constant } 3) \text{ too.}$$

In this case, it has to be (G_{ab} is known to denote Einstein's tensor) that

$T_{ab} = (\text{constant } 3)*((R_{ab}) - ((R*g_{ab})/2))$ or

$T_{ab} = (\text{constant } 3)*G_{ab}$.

In this case (**constant 3**) = $c^4/(4*2*\pi*\gamma) = ((\text{Anti } \gamma)*c^2)/2*\pi$.

Only, π is not a constant. A constant value of π is still not known.

3.2.2. The constancy of the speed of the light c under the condition that $R_{ab} = 0$.

Exact solutions of Einstein's field equations are useful for the investigation of different models of evolution of our universe too. Let us investigate the constancy of light under the condition that $R_{ab} = 0$. Recall, manifolds with a vanishing Ricci tensor or $R_{ab} = 0$ are referred to as Ricci-flat manifolds. The Ricci tensor, a key term in Einstein's field equation, is more or less a measure of *volume distortion*.

The constancy of the speed of the light under the condition that $R_{ab} = 0$.

Let

R_{ab}	denote the Ricci tensor,
R	denote the Ricci scalar,
g_{ab}	denote the metric tensor,
T_{ab}	denote the stress-energy tensor,
G_{ab}	denote the Einstein tensor, where $G_{ab} = (R_{ab} - ((R*g_{ab})/2))$,
Λ	denote the cosmological constant,
ρ_{Vac}	denote the vacuum energy,
π	denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about **$\pi \approx$ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510 ... ,**
Anti π	denote the negation of π,
γ	denote Newton's gravitational 'constant', where **$\gamma \approx (6.6742 ... \pm 0.0010) * 10^{-11} [m^3 / (s^2 * kg)]$,**
Anti γ	denote the negation of γ,
c	denote the speed of all electromagnetic radiation in a vacuum, the speed of light, where **$c =$ 299 792 458 [m / s],**

then

$$T_{ab} = - ((\text{Anti } \pi)* (\text{Anti } \gamma)* R) * g_{ab} . \qquad (94)$$

Proof

$$c = ((4 * \pi * 2 * \gamma) * (T_{ab} / ((R_{ab}) - ((R* g_{ab}) / 2))))^{1/4} = \text{constant!} \qquad (95)$$

$$(c^4)* ((R_{ab}) - ((R* g_{ab}) / 2)) = ((4 * \pi * 2 * \gamma) * (T_{ab})) \qquad (96)$$

Let us assume that $(R_{ab}) = 0$. Let us assume that T_{ab} and $R*g_{ab}$ doesn't vanish. (97)

$$(c^4)* ((0) - ((R* g_{ab}) / 2)) = ((4 * \pi * 2 * \gamma) * (T_{ab})) \qquad (98)$$

$$(c^4)* (- ((R* g_{ab}) / 2)) = (4 * \pi * 2 * \gamma) * (T_{ab}) \qquad (99)$$

$$(- ((R* g_{ab}) / 2)) = ((4 * \pi * 2 * \gamma) /(c^4)) * (T_{ab}) \qquad (100)$$

$$- (R^* g_{ab}) = ((4 * \pi * 2 * 2 * \gamma) /(c^{4})) * (T_{ab}) \quad (101)$$

$$- (R^* g_{ab}) = ((4 * \pi / c^2) * (2 * 2 * \gamma / c^2)) * (T_{ab}) \quad (102)$$

$$- (R^* g_{ab}) = (1 / (\text{Anti } \pi)) * (2 * 2 * \gamma / c^2)) * (T_{ab}) \quad (103)$$

$$- (R^* g_{ab}) = (1 / (\text{Anti } \pi)) * (1 / (\text{Anti } \gamma)) * (T_{ab}) \quad (104)$$

$$- ((\text{Anti } \pi)* (\text{Anti } \gamma))*(R^* g_{ab}) = (T_{ab}) \quad (105)$$

$$T_{ab} = - ((\text{Anti } \pi)* (\text{Anti } \gamma))*(R^* g_{ab}) \quad (106)$$

$$+ T_{ab} = - ((\text{Anti } \pi)* (\text{Anti } \gamma)* R) * g_{ab} \quad (107)$$

Q. e. d.

Einstein's introduced the term cosmological constant as an independent parameter in the field equation to allow a static universe. Observations of distant galaxies by Hubble confirmed that our universe is not static but expanding. Where is the energy needed for this expansion of our universe taken from? Recent astronomical observations have found that the existence of a cosmological constant denote the existence of a non-zero vacuum energy.

Dark energy as a hypothetical form of energy has strong negative pressure and permeates all of space (Peebles 2003). Recent observations of the type Ia supernovae as the best known standard candles for cosmological observation provide very strong evidence for dark energy. The expansion of the universe is accelerating (Riess *et al.* 1998, Permutter *et al.* 1999). Where is the energy for the expansion of the universe taken from? Is dark energy the empty negative, the nothing philosophers are talking from, is it the energy density of empty vacuum?

4. Discussion

Heisenberg's uncertainty principle is based on the relationship between X and Anti X and is determined by Einstein's constancy of the light in vacuum and the fact that there is nothing that is faster then light. It appears possible, that the same can be expressed in terms of tensors too.

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