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Anti h - Negation of Planck's constant h.

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Abstract

Planck's constant (denoted *h*) named after Max Planck, one of the founders of quantum theory, is a physical constant that plays a central role in the theory of quantum mechanics. The value of Planck's constant is known to be about 6.626 0693(11) * 10^{-34} [J*s], where the two digits between the parentheses denote the uncertainty in the measurement (standard deviation). It is a remarkable fact, that Planck's constant has dimensions of energy multiplied by time. In so far, even under the most optimistic conditions, it is not possible to calculate an exact value of Planck's constant h, an exact value of h is still not known. The question naturally arises, is Planck's constant h at the end not a constant? This publication will proof, that Planck's constant h is not a constant, Planck's constant h as a basic relationship between energy (denoted E) and time (denoted t) is changing all the time and is determined by the relation

$$h * (\text{Anti } h) \leq c^2 / 4.$$

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

1. Background

Natural processes are continuously changing but the change from one state to the other seems to be discontinuous or discrete. **Natura facit saltus** or nature seems to prefer to make jumps from one state to the other.

According to the German physicist Max Planck energy is quantized, the energy of waves could be described as consisting of small packets or quanta. The physical constant discovered by Planck is referred to by the letter h in mathematical formulae. Max Planck's constant h is one of the pillars of modern physic.

Albert Einstein used Planck's discovery in his explanation of the photoelectric effect. Einstein suggested that lightwaves were quantized. He proposed that light consist of little particles, or **quanta**, called **photons**, each with an energy of Planck's constant times its frequency. Einstein was honoured with the Nobel Prize for his work on the photoelectric effect.

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2. Material and Methods

The emission and the absorption of energy is rather discontinuous then continuous. The energy of any wave can be calculated as the frequency multiplied by Planck's constant h. In accordance with the de Broglie hypothesis, all matter and not just light, has a wave-like nature. Louis-Victor de Broglie related Planck's constant h, the wavelength λ (lambda) and momentum p as **h = λ * p**. George Paget Thomson (University of Aberdeen) was the first who confirmed de Broglie's formula. In so far, Planck's constant h has to do with matter and energy too. Thus, there could be a path to 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, $h \approx \mathbf{(6.626\ 0693\ (11)) * 10^{-34} [J * s]}$,

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

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

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

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

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

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

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

According to general relativity, the metric of spacetime is determined by the matter and energy content of spacetime. The Ricci scalar/metric tensor completely determines the curvature of spacetime 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 is "not" a constant

Theorem 1. Planck's constant h and energy and time.

Let

E	denote the quantized energy,
h	denote Planck's constant, h **≈ (6.626 0693 (11)) $* 10^{-34}$ [J * s],**
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),
p	denote the momentum. Recall, according to the **de Broglie hypothesis** it is $h = \lambda * p$,
t	denote the time,
T	denote the period, **the time** between two consecutive occurrences of an event. Let $t_2 > t_1$. Thus, let $T = \Delta t = t_2 - t_1$. Recall, $(T * f) = (\Delta t * f) = 1$.
m	denote the mass,
c	denote the speed of the light in a vacuum, where $c = \lambda * f$ or ***c* = 299 792 458 [m / s],**
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, $(\mu_0 * \varepsilon_0 * (c^2)) = 1$.

Then

$$(\Delta E) * (\Delta t) = h.$$

Proof.

$$1 = 1 \quad (1)$$

$$1 = (\mu_0 * \varepsilon_0 * (c^2)) \quad (2)$$

$$T * f = (\mu_0 * \varepsilon_0 * (c^2)) \quad (3)$$

$$\Delta t * f = (\mu_0 * \varepsilon_0 * (c^2)) \quad (4)$$

$$\Delta t * f = (\mu_0 * \varepsilon_0) * (\Delta E / \Delta m) \quad (5)$$

$$\Delta m * \Delta t * f = (\mu_0 * \varepsilon_0) * \Delta E \quad (6)$$

$$\Delta m * \Delta t = (\mu_0 * \varepsilon_0) * (\Delta E / f) \quad (7)$$

$$\Delta m * \Delta t = (\mu_0 * \varepsilon_0) * h \quad (8)$$

$$(\Delta E / c^2) * \Delta t = (\mu_0 * \varepsilon_0) * h \quad (9)$$

$$(\Delta E) * (\Delta t) = (c^2 * \mu_0 * \varepsilon_0) * h \quad (10)$$

$$(\Delta E) * (\Delta t) = (1) * h \quad (11)$$

$$(\Delta E) * (\Delta t) = h. \quad (12)$$

Q. e. d.

In the first place, the quantization as a natural process has to be distinguished from Planck's constant h. Quantization as a natural process is the unity of continuity and discreteness. In continuity, the moment of discreteness can be found and vice versa. It is the nature of quantization as the simple unity of discreteness and continuity that gives rise to the conflict energy, time and space. Quantization is determined by the unity and the struggle between energy and time. Planck's constant h is used to describe the process of quantization, a basic natural process and is not the basic process as such. But the same Planck's constant h is not only a constant, an indifferent determinateness which as yet contains no determinateness. Planck's constant h as discreteness has collapsed into the form of self-identity where the one is not connected by its own other and possesses thus the moment of continuity too. Planck's constant h is determinated by energy and time and unites within itself the otherness of otherness. The nature of alteration inside Planck's constant h is determined by the two opposed sides energy and time. Energy and time inside of Planck's constant h as magnitudes can be increased or diminished. There are numerous consequences from Eq. (12). Let us assume, that h according to Eq. (12) is only a constant, something not changing at all. In this case there seems to be a problem. Energy E is not a constant and t is not a constant too. Only, if E changes then t must change to and vice versa and much more then this. The changes of E are not possible without the changes of t. Consequently, we must conclude that time has the ability to pass over into energy and vice versa. Energy is able to vanish into time and vice versa. Further, it appears reasonable to me that h is not a constant. Planck's constant h is something like the covariance of energy and time or something like $h = \sigma(\Delta E, \Delta t)$. Thus, if h deals about the unity and struggle of energy and time, it should hold true that $\sigma(\Delta E, \Delta t) \leq \sigma(\Delta E) * \sigma(\Delta t)$. In so far, we should obtain something like

$$\sigma(\Delta E, \Delta t) / (\sigma(\Delta E) * \sigma(\Delta t)) \leq 1 \quad \text{or}$$

$$h / (\sigma(\Delta E) * \sigma(\Delta t)) \leq 1.$$

Planck's constant h is not a dead thing, Planck's constant h is full of life. Energy thirsty for time is hunting the same and vice versa. Time, thirsty for its own other, the energy, is searching for the same, the one is suffering for its own other and equally excluding the same out of itself.

3.2. Heisenberg's uncertainty principle

Planck's constant is part of Heisenberg's uncertainty principle to. **Heisenberg uncertainty principle** was discovered by Werner Heisenberg in 1927 and states in general that increasing the accuracy of the measurement of one quantity (f. e. the energy) increases the uncertainty of the simultaneous measurement of its other quantity, its complement, its negation (the time). In general, Heisenberg's uncertainty principle can be formulated mathematically as

$$\sigma(X_t) * \sigma(\text{Anti } X_t) \geq h / (4 * \pi). \qquad (13)$$

where

X_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, f. e. the momentum,
$\sigma(X_t)$	denote the standard deviation of X_t,
Anti X_t	denote the complementary part of something existing independently of human mind and consciousness, f. e. of a random variable or of a quantum mechanics object X_t etc. at the (space) time t, the hidden part of X_t, f. e. the position,
$\sigma($ Anti $X_t)$	denote the standard deviation of Anti X_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

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

$\hbar = h/(2 * \pi)$ denote **Dirac's constant,** the reduced Planck constant, pronounced "h-bar",

t denote the (space) time.

According to Eq. (12), it is $(\Delta E) * (\Delta t) = h$. If we multiply $(\Delta E) * (\Delta t)$ with $(4 * \pi)$ we obtain $(4 * \pi) *(\Delta E) * (\Delta t) = h$, which is not true. But it is true, that

$$\mathbf{(4 * \pi) *(\Delta E) * (\Delta t) > h}$$

or that

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

On the one hand, Heisenberg uncertainty principle allows that $(\Delta E) * (\Delta t) = h/(4 * \pi)$ too. On the other hand we have to respect Eq. (12). This can be achieved, if π changes in value, which is already proofed as correct (Barukčić 2007b). If Heisenberg's uncertainty principle is correct, then π must change in value and π has a minimum value of $\pi = 1/4$. If $\pi = 1/4$ we obtain

$$(\Delta E) * (\Delta t) = h/(4 *(1/4))$$
$$(\Delta E) * (\Delta t) = 4*h/(4)$$
$$(\Delta E) * (\Delta t) = h$$

which is correct, according to Eq. (12). In so far, if Eq. (12) is true and if Heisenberg's uncertainty principle is correct, , then π must change in value and has a minimum value of $\pi = 1/4$. Under this circumstances, there is no contradiction between Heisenberg's uncertainty principle

$$\boldsymbol{\sigma}\mathbf{(X_t) * }\boldsymbol{\sigma}\mathbf{(Anti\ X_t) \geq h / (4 * \pi)}$$

and the Eq. (12) which states that

$$\mathbf{(\Delta E) * (\Delta t) = h.}$$

On the other hand, if Heisenberg's uncertainty principle is correct then it is equally true that

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

Using Heisenberg's uncertainty principle, Planck's constant cannot be defined as something constant. Planck's constant is defined as being either equal or less then $(4 * \pi) *(\Delta E) * (\Delta t)$. Planck's constant is located somewhere, but not at an fix and absoulte value. According to the Eq. $h \leq (4*\pi)*(\Delta E)*(\Delta t)$ and Eq. (12) it immediately follows that

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

In this case, it is equally true, that

$$\gamma * (Anti\ \gamma) * \varepsilon_o * \mu_o \leq \pi ,$$

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, The mathematical constant π, also known as **Archimedes' constant,** is determined as

$$\pi \geq h / (4 * \sigma(X_t) * \sigma(\text{Anti } X_t)) \quad (14)$$

according to Heisenberg's uncertainty principle, as long as $\sigma(X_t) > 0$ and $\sigma(\text{Anti } X_t) > 0$.

3.3. Anti h - the otherness of Planck's constant h

Theorem 2. **Anti h - the otherness of Planck's constant h.**

Let

R_{ab}	denote the Ricci tensor,
R	denote the Ricci scalar,
g_{ab}	denote the metric tensor,
T_{ab}	denote the stress-energy tensor,
h	denote Planck's constant, h ≈ **(6.626 0693 (11)) * 10^{-34} [J * s],**
Anti h	denote the otherness of Planck's constant,
π	denote the mathematical constant π, also known as **Archimedes' constant.** The numerical value of π truncated to 50 decimal places is known to be about **π ≈ 3.14159 26535 89793 23846 26433 83279 50288 41971 69399 37510,**
c	denote the speed of all electromagnetic radiation in a vacuum, the speed of light, where ***c* = 299 792 458 [m / s],**
γ	denote Newton's gravitational 'constant', where **γ ≈ (6.6742 ± 0.0010) * 10^{-11} [m^3 / (s^2 * kg)],**
X_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, f. e. the momentum,
$\sigma(X_t)$	denote the standard deviation of X_t,
Anti X_t	denote the complementary part of something existing independently of human mind and consciousness, f. e. of a random variable or of a quantum mechanics object X_t etc. at the (space) time t, the hidden part of X_t, f. e. the position,
$\sigma(\text{Anti } X_t)$	denote the standard deviation of Anti X_t,

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

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

The unified field equation (Barukčić 2006f) is known to be

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

thus

$$\mathbf{h * (\text{Anti } h) \leq (c^2) / 4}$$

or

$$\textbf{Anti h} \leq (\gamma / (\sigma(X_t) * \sigma(\text{Anti } X_t) * c^2)) * ((T_{ab} * R * g_{ab}) / ((R_{ab})*(R_{ab}))).$$

Proof. Eq.

$$(((4 * 2 * \pi * \gamma) * T_{ab}) / (c^4)) * ((R * g_{ab}) / 2)) \leq ((R_{ab})*(R_{ab})) / 4 \quad (15)$$

$$(4 * 2 * \pi * \gamma * (T_{ab} * R * g_{ab})) / (2 * (c^2) * ((R_{ab})*(R_{ab}))) \leq c^2 / 4 \quad (16)$$

Let us assume that the division by $((R_{ab})*(R_{ab}))$ is possible and allowed.

Set $((R_{ab})*(R_{ab})) = 1$ if the division by $((R_{ab})*(R_{ab}))$ is not possible or allowed.

$$(\pi * ((4 * \gamma) / (c^2)) * ((T_{ab} * R * g_{ab}) / ((R_{ab})*(R_{ab}))) \leq c^2 / 4 \quad (17)$$

According to Eq. (14) it is

$$\pi \geq \textbf{h} / (4 * \sigma(X_t) * \sigma(\text{Anti } X_t))$$

as long as $\sigma(X_t) > 0$ **and** $\sigma(\text{Anti } X_t) > 0$. We obtain Eq. (18).

$$((h / (4 * \sigma(X_t) * \sigma(\text{Anti } X_t)) * ((4 * \gamma) / (c^2)) * ((T_{ab} * R * g_{ab}) / ((R_{ab})*(R_{ab}))) \leq c^2 / 4 \quad (18)$$

$$(h * (\gamma / (\sigma(X_t) * \sigma(\text{Anti } X_t) * c^2)) * ((T_{ab} * R * g_{ab}) / ((R_{ab})*(R_{ab}))) \leq c^2 / 4 \quad (19)$$

We define **Anti h** $\leq (\gamma / (\sigma(X_t) * \sigma(\text{Anti } X_t) * c^2)) * ((T_{ab} * R * g_{ab}) / ((R_{ab})*(R_{ab})))$ and obtain Eq. (20).

$$\textbf{h * Anti h} \leq c^2 / 4. \quad (20)$$

Q. e. d.

The value of Anti h, the otherness of h, can be calculated as

Anti h $\leq (c^2 / (4 * h))$,

Anti h $\leq 3.39097848619751 * 10^{+49}$.

3.4. Euler's number e and Planck's constant h

Euler's Number e, sometimes called simply Euler's constant (Euler's *Mechanica,*1736), is a very important number in mathematics. The numerical value of Euler's constant e truncated to 35 decimal places is about

e ~ 2.71828 18284 59045 23536 02874 71352 66249

It was Jacob Bernoulli, who tried to find the value of the expression

$$\lim_{n \to +\infty} \left(1 + \frac{1}{n} \right)^{n} . \qquad (21)$$

Is Euler's Number e only a mathematical 'constant' or rather a fundamental process of nature which is determined by a specified distribution of matter and energy?

Theorem 3. Euler's number e and Planck's constant h.

Let

E denote the quantized energy,

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

n denote natural number, let n ≥ 1,

e denote Euler's number e,

lim denote the limes,

t denote the time,

Recall, (ΔE) * (Δt) = h. Thus h / ((ΔE) * (Δt)) = 1.

Then

$$e \approx \lim_{n \to +\infty} \left(1 + \left(\frac{\Delta E * \Delta t}{n * h} \right) \right)^{\left(\frac{n * h}{\Delta E * \Delta t} \right)} .$$

Proof.

$$e \approx \lim_{n \to +\infty} \left(1 + \frac{1}{n} \right)^{n} \qquad (22)$$

According to Eq. (12) it is true that (ΔE) * (Δt) = h. Thus h / ((ΔE) * (Δt)) = 1.
We obtain Eq. (23).

$$e \approx \underset{(1+1+...) \to +\infty}{\text{limes}} \left(1 + \frac{1}{(1+1+1+....)} \right)^{(1+1+1+....)} \qquad (23)$$

Recall, that (1+1+1+...) = n * 1 = n. We obtain Eq. (24).

$$e \approx \lim_{n \to +\infty} \left(1 + \frac{1}{n * 1} \right)^{n*1} \qquad (24)$$

$$e \approx \lim_{n \to +\infty} \left(1 + \frac{1}{n * \left(\frac{h}{\Delta E * \Delta t} \right)} \right)^{n * \left(\frac{h}{\Delta E * \Delta t} \right)} \qquad (25)$$

$$e \approx \lim_{n \to +\infty} \left(1 + \frac{1}{\left(\frac{n * h}{\Delta E * \Delta t} \right)} \right)^{\left(\frac{n * h}{\Delta E * \Delta t} \right)} \qquad (26)$$

$$e \approx \lim_{n \to +\infty} \left(1 + \left(\frac{\Delta E * \Delta t}{n * h} \right) \right)^{\left(\frac{n * h}{\Delta E * \Delta t} \right)} \qquad (27)$$

Q. e. d.

Every random variable seems to posses its individual Euler's number e. Can e be measured?

4. Discussion

This publication has proofed that Planck's constant h is "not" a constant, a "dead thing". This "constant" is the mirror of the unity and the struggle of energy and time and is determined by its own counterpart Anti h. The relationship between Planck's constant h and Anti h is based on the general contradiction law. According to the unified field equation and based on the general contradiction law, we were able to derive the relationship between h and Anti h as

$$\mathbf{h * (Anti\ h) \leq (c^2) / 4.}$$

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Particle-wave dualism.

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Abstract

According to the French physicist and Nobel Prize laureate Louis-Victor-Pierre-Raymond Broglie (August 15, 1892 – March 19, 1987), 7th duc de Broglie, generally known as Louis de Broglie, any moving particle has an associated wave. The greater the energy of a particle, the larger the frequency and the shorter the wavelength. Thus, everything that is, seems to be composed either out of particles or out of waves. But, in a particle wave/s can be found and vice versa. In a wave particle/s can be found. Only, the one excludes its own other. A wave is not a particle and vice versa, a particle is not a wave. Can both exist each without its own other or is the wave the local hidden variable of the particle and vice versa. Is the particle the local hidden variable of the wave. This publication will proof that the basic relationship between particles and waves is based on Einstein's basic field equation and can be expressed by the equation

$$\left(\left[\frac{(Energy*R_{ab})}{(c*c)}-\left(\frac{(4*2*\pi*\gamma*T_{ab})*(R*g_{ab})}{(c*c*c*c)\quad*\quad 2}\right)\right]*\left[\frac{(Energy*R_{ab})}{(c*c)}-\left(\frac{(4*2*\pi*\gamma*T_{ab})*(R*g_{ab})}{(c*c*c*c)\quad*\quad 2}\right)\right]\right)$$

$$=(\kappa*\kappa)*\left(\left[\left(\frac{(R_{ab}*(4*2*\pi*\gamma*T_{ab}))}{(c*c*c*c)}\right)-\left(\frac{(4*2*\pi*\gamma*T_{ab})*(4*2*\pi*\gamma*T_{ab})}{(c*c*c*c)*(c*c*c*c)}\right)\right]*\left[\left(\left(\frac{R_{ab}*(R*g_{ab})}{2}\right)-\left(\frac{(R*g_{ab})*(R*g_{ab})}{2*2}\right)\right)\right]\right)$$

Key words: Corpuscle, Wave, Relativistic quantum theory, General relativity, Einstein, Barukčić.

1. Background

According to Louis-Victor de Broglie's hypothesis all matter and not just only light has a wave-like nature, matter is neither particle nor wave, but has certain properties of both and is equally never simultaneously both. Under certain experimental conditions, microscopic objects like electrons exhibit wave-like behaviour, such as interference. Under other conditions, the same type of microscopic objects exhibit particle-like behaviour, such as scattering. But, we can observe only one type of property at the same time or simultaneously. A stronger manifestation of the wave nature leads to a weaker manifestation of the particle nature and vice versa. According to Einstein et al. "**the wave function does not provide a complete description of the physical reality**" (Einstein et al. 1935, p. 780). In so far, we will not use Schrödinger equation, the Klein-Gordon equation or the Dirac equation to solve the problem of corpuscle and wave. We will use Einstein's basic field equation (Einstein 1916) and the General contradiction law (Barukčić 2006) to solve the problem of corpuscle and wave. Our intention on this view is to enable a fully relativistic quantum theory.

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