

## Ether in physics is a necessity:

Whether there is a so-called ether or so-called “background” in science has always been one of Albert Einstein his most troublesome problems: First he was convinced that there could be no ether in his “simple” straightforward theory of Special Relativity. However, during the time he was solving his equations of General Relativity, he gradually came to the conclusion that there must be a general relativistic background. In his mind he described this mysterious “background” with the word “Aether”. According to General Relativity, space must be endowed with physical qualities; like the General Relativity metric-tensor  $g_{\mu\nu}$ , therefore, there exists an ether as Einstein explained explicitly in Leiden in 1920.

Whenever one describes acceleration, for example rotation around a point, a suitable reference-frame is needed to describe this acceleration correctly. One can only choose “everything” surrounding the rotating object itself and choose the inertial-frame with the same speed as the average mass-speed of this “everything” build from the only 26 different elementary particles of our 3 families of fermions universe.

Our “Aether” came to life with the Big Bang of our universe. This background is expanding with speeds up to the light-speed for massless particles, i.e. the only two elementary bosons, the spin1 photon of the EM-field and the (EM-invisible, i.e. orthogonal) spin2 graviton. This is the main reason why most energy of our universe is invisible: It must be invisible gravitational energy.

Since July 4<sup>th</sup> 2012, when the discovery of the Higgs-boson was announced at CERN near Geneva, people are also imagining a so-called Higgs-ether. This Higgs-ether is assumed to result into drag of all masses and is, for example explained *as-a-mystery* by Brian Greene on the following Facebook post:

<https://www.facebook.com/BrianGreenePhysicist/posts/533665953325656>

It is also assumed that the elementary property “speed” cannot be connected to the “Aether” and can also not be described for the so-called Higgs-ether. However, the assumed spinless elementary Higgs-boson with a “rest”-energy of slightly more than 125 GeV, must have a constant mass independent of the speed of this “non-relativistic” Higgs-ether. So, the relativistic property usually called “rest-”, i.e. not-moving, cannot be described/explained for the assumed present Higgs-boson. In this way the Higgs-mechanism described by a spinless very massive boson with an average decay-time of the order of  $10^{-22}$  seconds (i.e. the square-root of the Planck-time!) cannot be consistent with the theories of relativity of Albert Einstein!

And there is a second reason why the assumed Higgs-mechanism fails: The Higgs-mechanism is not compliant to Albert Einstein his CAP, a mathematical requirement to also include the gravitational-field in any fundamental research. And including the gravitational-field demands including mathematically described curvature of the only possible 4D-spacetime analyses as a result of a variable metric. **N.B.** The mathematical fact that knots are only possible in 3D-space, i.e. 4D-spacetime, was *not understood* at Einstein's time! A mathematical analysis is an easy imaginable linear analysis using an orthogonal, i.e. perpendicular, inertial-frame with 3 space-like straight 1D-coordinate axes. In relativity, 3D-space and 1D-time are not completely independent (Lorentz-contraction, Time-dilation). In a real description of the 4D-spacetime coordinates there is a difference between covariant  $x_{\mu} = (ct, -x, -y, -z)$  and contravariant 4-vectors  $x^{\mu} = (ct, x, y, z)$ . Relativistic in-variants from 4-tensors of any degree are obtained by contractions of all covariant components by contravariant components and vice-verse. For example the so-called squared length of 4-vector  $x^{\mu}$  is  $x^{\mu}x_{\mu} = (c^2t^2 - x^2 - y^2 - z^2)$  and this must be a scalar, i.e. a relativistic constant independent of any 4D-spacetime indices, i.e. a relativistic invariant.

The co- and contravariant 4-vectors can only be given symmetrical on mathematical grounds with the square-root of minus one, i.e.  $i = \sqrt{-1}$ :  $x^{\mu} = x_{\mu} = (ct, ix, iy, iz)$ . In this way the co- and contravariant vectors are identical and all contractions can be described completely symmetrical as required by any correct description. This appears to be the main reason why QM has to be solved in complex 4D-spacetime.

This symmetrical description of spacetime components of 4-vectors explains why the orthogonal 3D-space coordinates are all orthogonal to the time-coordinate  $ct$  as a result of the appearing “complex”  $i$ .

This is why time and 3D-space are mathematical orthogonal, even though they are not actually independent as a result of the not-infinite light-speed  $0 \ll c (< 3 \times 10^8 \text{ [m/s]}) \ll \infty$ .

A change of speed of an observer with respect to an analyzed object shows that space and time are indeed dependent. Light-speed is just massless-speed, i.e. the speed of the only two massless elementary particles (spin1 [photon](#) and [EM-invisible spin2 graviton](#)).

Compliance to the [CAP](#) implies a mathematical analysis in all possible orthogonal 4D-spacetime coordinates with “microscopic” curvature described in the 2D-plane orthogonal to the described direction of motion. When choosing the direction of motion in the positive  $z$ -axis, the direction of the orthogonal time-coordinate may be imagined in the same direction, even though the time-coordinate is orthogonal to the  $z$ -axis as a result of being real when the 3D-spacelike coordinates are chosen pure complex. The complex-plane also just is a simple 2D-plane in which the dual “macroscopic” character of mathematical quantities can be analyzed.

When curvature, with its required doubling of degrees of freedom is being analyzed, one at once observes two different effects as a result of the “dual” characteristic of the spin2 character of the responsible mass- and charge-less elementary [graviton](#). The first effect is in the complex 2D-time- $z$ -axis plane and is a result of curvature of spacetime resulting from variable distribution of mass and mass-speed of elementary particles surrounding the described paths of analyzed objects. This was for the first time described by [Karl Schwarzschild](#) when he used [Albert Einstein](#) his equations of [GR](#) to solve the paths of the planets around the sun of our solar-system. The second effect of curvature must be in the 2D-plane orthogonal to the first effect: This spin2 “dual” effect of “curvature” requires the paths of elementary particles to be described as harmonic oscillating waves in the 2D- $(x, y)$ -plane orthogonal to the 2D-timespace- $(z, ct)$  directions of motion. The fact that all elementary particles possess so-called “intrinsic” energy proportional to a frequency must also be a result of compliance to the [CAP](#) of the analysis. On mathematical grounds the [CAP](#) requires a non-zero extensiveness of elementary particles in the 2D-plane orthogonal to the direction of motion, even if the particle is at rest with respect to the chosen descriptive inertial-frame the always used word “intrinsic” should actually be omitted in [QM](#)! After all, [QM](#) as it's now commonly used does not comply to the [CAP](#)!

When analyzing any physical problem mathematically it is mostly assumed that spacetime is 4D because this is the space-time we experience in our daily life. But [string theorists](#) require a higher dimensional spacetime, i.e. 10D-spacetime and even 11D-spacetime in [M-theory](#). However, the so-called [Super-String](#) theories, have up to this very day still not been verified experimentally in *any possible* way! So, the question one might ask is, are [String-theories](#) **mathematically actually correct!?!** The answer is **NO**, because this *not understood* mathematical analysis is incorrect because it cannot describe mathematical knots (i.e. can **NOT** describe always massive [fermions](#)) and also doesn't allow a mathematical imaginable view on our own existence!

In [QM](#) the wave-function has a symmetry related to the carried spin of the wave-function. Choose the direction of motion of the particle represented by the wave-function in the positive  $z$ -axis and use cylindrical coordinates  $(c\tau, \rho, \varphi, z)$ . From the inertial-frame moving with origin at the average position of the particle moving with the particle along the  $z$ -axis we have the following spin related symmetry:

$$\Delta\varphi = 2\pi/s, \text{ with } s \text{ the (half-)integer spin of the described (} \text{fermion} \text{ or } \text{boson} \text{).} \quad (1)$$

As a result the wave-function of a spin2 graviton repeats itself twice during a complete rotation of  $2\pi$  radians, i.e. spin2 particles possess a mathematical “*dual*” character. On the other hand, spin $\frac{1}{2}$  electrons and other [leptons](#) have to be rotated two complete circles to obtain the same wave-function again. This is a well-known fact to all theoretical physicists.

[Elementary particles](#), possess a “dual” character (1) as a result of compliance to the spin2 [CAP](#). [Elementary particles](#) must be described “microscopic” as harmonic oscillating waves in the 2D-plane perpendicular to the direction of motion. I.e. this explicitly explains the particle-wave duality of [elementary particles](#). This oscillation is easily described with “linear” mathematical tools. Cylindrical-coordinates  $(c\tau, \rho, \varphi, z)$  seem the best coordinates to solve the [Differential Equations](#) exactly.

The time  $\tau$  is the time described from the origin of the inertial-frame moving with the particle, i.e. it's the proper-time as used in the SM. Choose the positive z-axis as the direction of motion (even if the speed is actually zero in this chosen inertial-frame). The harmonic oscillation in the 2D-plane requires acceleration, i.e. two consecutive first-order time derivative DE with respect to  $\tau$ . The resulting DE are to a higher order in  $\rho$  than the maximum order that permits mathematically exact solutions.

However, the DE for  $\rho$  can be rewritten exactly for  $x = \rho^2$ , to end up with DE for  $x$  which can be solved exactly. And because  $\rho > 0$ , the solution of  $x$  also results into a complete solution of  $\rho$ .

The 2<sup>nd</sup> order DE of  $x(\tau)$  require two integration constants to end up with complete solutions. The first constant is the well-known Planck-length  $l_h$  and the second constant appears to be the Golden Ratio  $\phi = \frac{1}{2}(\sqrt{5} + 1) = 1 + 1/\phi$ . As a result of circular symmetry resulting from harmonic oscillation in a circular motion around the z-axis, i.e. the chosen direction of motion, the DE yield 2 orthogonal kinds of solutions, i.e. are "spin2 dual": One kind of solutions has to be solved with closed Boundary Conditions and the second kind of solutions has to be solved with open-BC. Closed-BC describe elementary particles of which only one kind for every possible symmetry-group exists, while open-BC allow more so-called "families" of elementary particles with only different rest-masses.

The harmonic oscillating mathematical described point complies to symmetry-laws with resulting constants of motion. All solutions of the DE must possess a non-zero constant angular-momentum to describe the harmonic oscillation as a constant without any "losses". This constant describes the spin of the described elementary particle explicitly: A description of elementary particles in compliance with the CAP explains all aspects of spin completely. For example, of elementary massless particles only the helicity is conserved. The average extensiveness of elementary particles in the 2D-plane orthogonal to the direction of motion can be given mathematically from the inertial-frame with origin at the average position of the oscillating point-particle with the following expression:

$$\text{Constant average extensiveness} = 2\langle\rho\rangle = \rho_{\max} + \rho_{\min} = 1\frac{1}{2}\rho_{\max} = 3\rho_{\min} = \underline{s} \times \phi \times l_h \quad (2)$$

With  $\underline{s}$  the half-integer spin of elementary fermions or positive integer spin of bosons.

**This explains why no spinless elementary particles have ever been observed in any experiment!**

N.B. In July 2012 it was assumed that a spinless Higgs-boson was discovered at an invariant rest-energy of about 125.6 GeV in the first run of the LHC. However, the average decay-time of this detected Higgs-boson is of the order of  $10^{-22}$  seconds. So, even if this Higgs-boson travels with the lightspeed  $c$  it can't reach the surrounding electron of an hydrogen atom.

Right now it is assumed that the Higgs-field is a field in the background which slows down the speed of masses as a result of interaction with the masses of elementary particles. But the rest-mass of the (very unstable) Higgs-boson is of the order of 5/7 of the mass of the heaviest elementary particle, the top-quark. As a result different speeds with respect to the Higgs-field should result in deviations in the experienced rest-masses of elementary particles. In other words, a so-called Higgs-"background" is experimentally proven incorrect because in this case invariant rest-mass would not be a constant anymore.

So, a very massive elementary spinless Higgs-boson resulting in an EXTREME unstable so-called Higgs-field assumed to be present in the "background" is not possible according to Albert Einstein his 100% correct beautiful Theories Of Relativity because this spinless boson does not comply to Einstein's CAP!

In 2004 Grigori Perelman, under guidance of Prof. Dr. Richard Hamilton at the Stony Brook university in New York, had shown that mathematical knots are only possible in 3D-space, i.e. relativistic 4D-spacetime. He did this in his investigation of Ricci-flow as developed, among others, by Richard Hamilton. Always massive fermions described as harmonic oscillating waves in the 2D-plane orthogonal to the direction of motion allow knots in their traveled paths. As a result of this "simple" mathematical fact, only 4D-spacetime is possible to describe fermions, the primary sources of all possible force, i.e. boson,-fields.

As a direct result of Perelman's discovery, all correct analysis of physics can only be correct using an easy imaginable 4D-spacetime analysis.

Because all primary sources of forces are [fermions](#), which have to be described with open-[BC](#) and as a result of that must all possess non-zero masses. And as a result of that curvature to comply to the [CAP](#) can **ONLY** be analyzed in this easy imaginable 4D-spacetime!

And this is just the well-known easy-imaginable space-time used in SR. All possible GR invariant expressions are so-called (4<sup>n</sup>-Dimensional) tensors of any non-negative integer degree n. For example a scalar has degree 0, a 4-vector has degree 1, a transformation-tensor has degree 2 and the [Riemann-Christoffel](#) tensor has degree 4. Remember that not all matrices of any degree n > 1 are also GR tensors!

All Einstein his final results of GR where 4D-spacetime expressions because the higher dimensional Riemann-space did not seem imaginable. However, it now appears that the additional Riemann-degrees of freedom to describe “curvature” can only be described in the easy imaginable complex 4D-spacetime itself.

The **only possible mathematical** treatment, with **VERY easy** (i.e. **LINEAR**) mathematical tools, to analyze still assumed difficult “**PHYSICS**”, i.e. [QM](#), **MUST** be analyzed with the

## **ONLY ALLOWED 4D-SpaceTime**

analysis! And these easy imaginable **ONLY** allowed mathematical Space-Time analyses can “mathematically” ONLY be solved with an easy [SR](#), that is **linear**, 4D-spacetime analysis!

**With this knowledge, we are now able to derive a complete non-reducible TOE:**

In 4D-spacetime all kinds of 4-vectors and higher dimensional matrices and, of-course, invariant tensors may be transformed at [SR](#), i.e. infinitesimal, level with an easy to understand mathematical 4 x 4 = 16 degrees of freedom transformation-tensor (i.e. not an arbitrary 4 x 4 matrix to yield GR-transformation invariant expressions). The most general expression of this transformation-tensor is a 4 x 4 = 16 independent degrees of freedom tensor and this tensor  $T_{\mu\nu}$  can be written in just one unique way as the sum of a symmetrical  $S_{\mu\nu}$  transformation-tensor and an orthogonal anti-symmetrical  $A_{\mu\nu}$  transformation-tensor:

$$T_{\mu\nu} = S_{\mu\nu} + A_{\mu\nu} \tag{3}$$

Besides (4D-)Space-Time symmetries we of-course also have complementary reciprocal-(i.e. Momentum-Energy) symmetries and other necessary  $\leq$  4D-symmetries, like the 4D-**complete non-reducible** well-known **beautiful but still generally NOT understood**, [U\(1\) x SU\(2\) x SU\(3\)](#) gauge-symmetry of the [SR SM](#).

The [CAP](#) demanded extensiveness of [elementary particles](#) results into mathematical interpretative [SR](#) representations of [spin](#), i.e. spin-representations. This is why we are able to represent all possible 4D-spacetime transformations (3) with extended mathematical spin-representations.

The symmetrical tensor  $S_{\mu\nu}$  can, according to the [CAP](#) mathematically also be represented by spin2 x spin $\frac{1}{2}$ . The spin2 action represents the symmetrical gravitational-field and the spin $\frac{1}{2}$  represent all the masses of compound ([baryon](#)) and elementary ([lepton](#)) particles. All masses of [elementary particles](#) depend on arbitrary mass-averages in (the only possible) 4D-spacetime. As a result of this mathematical fact masses of [elementary particles](#) cannot be related to one-another on mathematical grounds. However, the masses of particles and anti-particles must ALWAYS be exactly the same, because the spin2 and the spin1 actions are mathematically completely orthogonal. The [fermions](#) must be [CAP](#) described as harmonic oscillating waves in the 2D-plane orthogonal to the observed direction of motion. Their [DE](#) have to be solved with open-[BC](#) and as a result of this mathematical fact only [fermions](#) allow more so-called “families” with only different rest-masses.

As a direct result of this fact the masses of [fermion](#) “families” must also be mathematically related, i.e. depend on each other on “**easy**” mathematical grounds.

The anti-symmetrical tensor  $A_{\mu\nu}$  is in the same way mathematically uniquely representable by  $\text{spin}1 \times \text{spin}\frac{1}{2}$ . The  $\text{spin}1$  action represents the anti-symmetrical [EM-field](#) and the  $\text{spin}\frac{1}{2}$  represent the sources, that is the charges of compound ([meson](#), [baryon](#)) and elementary ([lepton](#)) “stable” particles all in integer amounts  $\{-1, 0, 1\}$  of the so-called “stable” electron-charge  $e$ . Only “intrinsic” unstable particles can possess other non-integer charges, such as the “*still NOT understood*” [QM SU\(3\) quarks](#), which experimentally always appear in couples of 2 quarks ([mesons](#) including [gluons](#)) or 3 quarks ([baryons](#)) in a so-called quark-sea. A straight forward analysis of the [SU\(3\)](#)-symmetry-group shows that [quarks](#) are “intrinsic” unstable  $\text{spin}1\frac{1}{2}$  [fermions](#) without so-called [iso-spin](#). Formula (3) shows that only the spin-values  $\{\frac{1}{2}, 1, 2\}$  are able to represent our reality, so [quarks](#) can only exist in sets of at least two quarks.

Gravitation, i.e. compliance to the [CAP](#), mathematically implies *a duplication of degrees of freedom*, because it is a “*dual*”  $\text{spin}2$  characteristic. This characteristic can of-course only be described in the only possible analyzable **4D-spacetime to mathematically allow knots!**

As a direct consequence, the “*dual*” character resulting from required curvature **must** be described in

## *Very easily imaginable 4D-spacetime!*

Again, choose the direction of motion of an analyzed [elementary particle](#) in the positive z-axis. When the space-like-axes are chosen real, the time-axis is pure complex (i.e.  $ic\tau$ ), but can figurative still be imagined in the same positive z-axis direction of motion. Curvature in this complex 2D-plane is a so-called “macroscopic” effect of curvature and a direct result of mass-space and mass-speed distribution surrounding the described [elementary particle](#). As a result of mathematical enforced averaging among countless [elementary particles](#) this mathematical description results into easy [Gaussian-like uncertainty](#). The “macroscopic” first effect of curvature was for the first time described in a logical approximation by [Karl Schwarzschild](#) to describe the orbits of the planets of our solar-system around the (approximated non-rotating point-like) sun. The second effect of curvature **must** be analyzed “microscopic”, i.e. describing the paths of [elementary particles](#) as harmonic oscillating waves in the 2D-plane orthogonal to described direction of motion. This at once explains why all [elementary particles](#) must possess so-called “*i.e. non-intrinsic*” energy proportional to an imaginable frequency. Actually, this explains why this energy is not “intrinsic”, but that all possible [elementary particles](#) must possess a non-zero (always-assumed incorrect) “intrinsic”-size! The word “intrinsic” only reminds the reader of the fact that this size is too small to be observed in any possible experiment. When reading formula (2), it is at-once clear that “**spinless**” [elementary particles](#) are **NOT** extended in the mathematical completely analyzable 2D-plane orthogonal to the direction of motion, so can't carry energy proportional to a frequency. Such particles have been proven incorrect experimentally in all experiments up to this very day, because all detected [elementary particles](#) possess energy proportional to a not-always ([graviton](#)) detectable energy-frequency of accelerated circular oscillating motion. When describing physics in compliance with the [CAP](#) one can only use a *symmetrical-complex* (SR) 4D-spacetime analysis (*to be able to also describe knots mathematically*)! In this analysis all [elementary particles](#) must be described as perfect harmonic-oscillators in the 2D-plane orthogonal to the direction of motion. Circular symmetry around the axis of propagation implies that [fermions](#) must be described with open-[BC](#) (masses  $> 0$  and possibly more, our universe has 3 different, “[fermion](#)”-families) and force-particles, i.e. [bosons](#), with mathematical necessary closed-[BC](#). Only uncharged elementary particles may be massless and this explains completely why only the “invisible”  $\text{spin}2$  graviton and always [EM-“visible” spin1 photon](#) force-carrier [bosons](#) are and also **must** be massless.

Please also visit my website (all mathematical equations are only explained in language because I do **NOT** want to end up as a frustrated [Grigori Perelman](#))!?!)

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