

## Expanded Field Theory. New Axioms, Laws and Consequences.

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**Abstract**

The present study attempts to expand the Classic Field Theory to a more general theory of the field. This more general field theory is named Expanded Field Theory. This new theory contains 2 new axioms and 8 laws. It predicts to include the gravitational field and other unknown and unexplored fields.

As it is well known the Classic Field Theory is described mostly by Theory of Electromagnetic Field. The Electromagnetic Field is described by Maxwell's laws (1864). The Maxwell's laws are certified by a single axiom which claims that the movement of a vector  $E$  in a closed loop ( $\text{div rot } E = 0$ ) is evenly.

The author replaces this axiom with a new one, according to which the movement of a vector  $E$  in an open loop ( $\text{div rot } E \neq 0$ ) or an open vortex ( $\text{div Vor } E \neq 0$ ) is unevenly. If the vortex is in plane (2D), it is named a cross vortex. If the vortex is in volume (3D), it is named a longitudinal vortex. Something more- each vortex can be decelerating ( $\text{div (Vor}E) < 0$ ) or accelerating ( $\text{div (Vor}E) > 0$ ).

After the first axiom are obtained immediately 4 types of movements – cross vortex, which can be accelerating or decelerating and longitudinal vortex, which can also be accelerating or decelerating.

The following results are obtained: evenly movement is replaced with unevenly movement (decelerating or accelerating); movement in a closed loop is replaced with movement in an open loop or vortex; a cross vortex in 2D generates a longitudinal vortex in 3D through a special transformation and vice versa- the longitudinal vortex in 3D through another special transformation generates a cross vortex in 2D; the decelerating vortex emits primary vortices to environment, but the accelerating vortex sucks into the same primary vortices from environment; the accelerating longitudinal vortices are attracted to one another, as the faster is inserted into the slower and thus form a funnel- this is the model of gravity funnel.

It should be noted, in particular, the results of the second axiom. It claims that two complex (cross- longitudinal) vortex objects in 3D that work in one direction as one complementary pair, are existed simultaneously. This way they are obtained 2 pairs of complementary objects in both directions.

As a final result are received many models with similar shapes and content. For example, the pair in one direction of complex complementary vortex objects is a model of the electron-proton chain, and in the opposite direction is an antiproton-positron chain model.

**Introduction****The essence of Axiom 1****The Classic Axiom**

The classic axiom in the Theory of the Electromagnetic Field certifies Maxwell's laws (1864). It postulates that the movement of an electric vector  $E$  in a closed loop is evenly:

$$\text{div}(\text{rot } E) = 0,$$

where  $(\text{rot } E)$  is the movement of the vector  $E$  in a closed loop;  $\text{div}(\text{rot } E)$  is the divergence (the variation in increase or decrease) of the

vector  $E$  during its movement in a closed loop ( $\text{rot } E$ ); the movement of the vector  $E$  in a closed loop ( $\text{rot } E$ ) with zero divergence (variation) of the vector  $E$  is equivalent to evenly movement or to movement with constant velocity  $V$  [1]. The defect of the classic axiom (1) is that it does not describe movements in an open loop or a vortex, or movements with a non-constant or variable velocity  $V$ .

**1. The New Axiom for rotor**

For the purpose of describing a larger range of movements, it is obviously necessary to expand the foundation of service theory. This means that such an axiom must be used which can certify wider set

of movements. The main motivation for altering the classic axiom (1) follows after the need to describe the *causative relationships* in uneven movements in open systems. It turns out that open vortices are the cause of closed vortices, which means that open vortices are more fundamental than closed ones [2]. So it is the necessity to change the existing axiom of the Classic Field Theory for close loop to axioms of Expanded Field Theory for open loops [3]. In order to expand the concepts, the notion (1) of movement of vector E in a closed loop ( $\text{div}(\text{rot } E) = 0$ ) in 2D (Figure 1A, a) is replaced by the notion (2) of movement in an open loop ( $\text{div}(\text{rot } E) \neq 0$  in 2D (Figure 1A, b).

The new axiom describes an open loop movement:

$$\text{div}(\text{rot } E) \neq 0, \quad 2.$$

**The extension of the term of vortex (vor) from Classic Fluid Theory**

Unreal term of vortex: *evenly vortex (vor)* is used in Classic Theory: The term vortex (vor) is used in fluid dynamics and defined as “an area in fluids, where the flow rotates evenly along a spiral around an axis line, which can be straight or curved” [4]. Fluid movement is uniform (evenly) in 3D. To begin with, we can use this classic definition, having in mind that here the term (vortex, vor) is for a uniform vortex in the classical sense.

Real term of vortex: *unevenly vortex (Vor)* means that the velocity (V) is variable and as a result –the steps are not constant. For the purposes of the present study the term must extend to both 3D and 2D and modified for an unevenly vortex or a vortex with uneven movement. In fact, in nature it does not exist evenly vortex with the constant steps between the rotations. If a movement is evenly, it forms a closed circle rather than an open vortex. There is an unevenly vortex in nature, and because it is uneven it is not centered, but it is eccentric. Thus the designation of an evenly vortex “vortex, vor” is replaced with a designation for an uneven vortex “Vortex, Vor” with a capital letter. So the description of an “evenly vortex”, that cannot exist in nature:  $\text{div}(\text{vor}E) > 0$ ;  $\text{div}(\text{vor}E) < 0$  will replace of description of an unevenly (natural) vortex that exists in nature:

$$\text{div}(\text{Vor}E) > 0; \text{div}(\text{Vor}E) < 0$$

**Definition:** The monotone accelerated or decelerating vortex (VorE) of the vector En is called a natural vortex (vorE) for which:

$$\text{div}(\text{Vor}E) > 0; \text{div}(\text{Vor}E) < 0.$$

**Definition:** An unevenly cross vortex ( $E_{2D}$ ) is an unevenly vortex (E) spinning transversally in a 2D plain. The cross open vortex in 2D is designated as Vortex  $E_{2D}$  or simply Vor  $E_{2D}$  (Figure 1A, b).

**Definition:** An unevenly longitudinal vortex ( $H_{3D}$ ) is an unevenly vortex (H) spinning in the volume of 3D. The longitudinal open vortex in 3D is designated as Vortex  $H_{3D}$  or simply Vor  $H_{3D}$  (Figure 1A, d). Both definitions for natural unevenly vortices ignore the thickness of the vortex itself, be it cross or longitudinal. Differences in geometry reflect the difference in distance between the coils and the diameter of the coils.

**The New Axiom for rotor and vortex**

It exists a vortex  $\text{div}(\text{Vot}E) \neq 0$  as an open loop ( $\text{div}(\text{rot}E) \neq 0$ ) in 2D and 3D or:

$$\text{div}(\text{Vot}E) \neq 0 \quad 3.$$

The existence of an open loop means that it can exist a decelerating or an accelerating vortex:

$$\text{div}(\text{Vor}E) < 0; \text{div}(\text{Vor}E) > 0; \quad 4.$$

**Axiom 1. The motion of vector along the vortex:  $\text{div}(\text{Vor}E_{2D}) \neq 0$ ,  $\text{div}(\text{Vor}H_{3D}) \neq 0$  is done at monotone-decreasing or monotone-increasing velocity in 2D or 3D for which:  $\text{div}(\text{Vor}E_{2D}) < 0$ ,  $\text{div}(\text{Vor}E_{2D}) > 0$ ;  $\text{div}(\text{Vor}H_{3D}) < 0$ ,  $\text{div}(\text{Vor}H_{3D}) > 0$ .** 5.

We immediately received 4 types of movements - cross, which can be accelerated or decelerating and longitudinal, which can also be accelerated or decelerating.

**Consequence** (of visual perception):

It is known that light is spreading crosswise.

- Therefore, the cross vortex will reflect the light rays, and an external observer will perceive the image of the cross vortex.
- But the thread of the longitudinal vortex does not reflect the light. The light crosses the thread of longitudinal vortex, surrounds the thread, and continues its path without reflecting the longitudinal vortex. So it forms diffraction. Therefore, the longitudinal vortex is invisible to an external observer. The Classic axiom uses the definition of a closed loop ( $\text{div}(\text{rot } E) = 0$ ) (1) [1]. The new Axiom 1(5) postulates that the movement of vector E in an open loop is always unevenly and uses a new definition (2) with an open loop ( $\text{div}(\text{rot } E) \neq 0$ ) (Figure 1A, b). [2, crp 233- 241], [3].

**Consequence** (of difference in derivative):

The main difference is that the longitudinal vortex ( $H_{3D}$ ) stands higher in the hierarchy compared to the cross vortex ( $E_{2D}$ ). For example the longitudinal vortex ( $H_{3D}$ ) (Figure 1A, d) is a higher derivative of the cross vortex ( $E_{2D}$ ) (Figure 1A,c).

**Consequence** (of variation of moving):

The main result of Axiom 1 is that there have been four types of vortices: a cross vortex in 2D ( $E_{2D}$ ) that can be accelerated ( $E_{2D+}$ ) or decelerated ( $E_{2D-}$ ) and a longitudinal vortex in 3D ( $H_{3D}$ ) that can also be accelerated ( $H_{3D+}$ ) or decelerated ( $H_{3D-}$ ), (Figure 1A, and c, d).

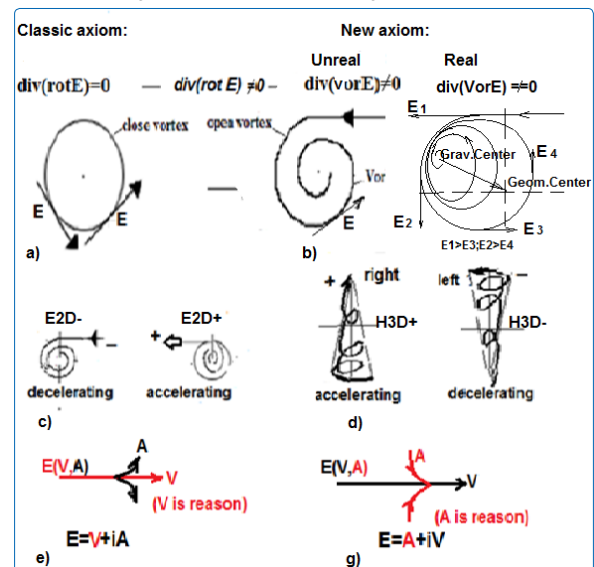


Figure 1A: The classical axiom is replaced by a new axiom

**Consequence** (of complex vector)

The vector E is not a simple but complex vector. It contains the velocity (V) of the real (reason) flow and the amplitude (A) of the imaginary (result) cross vortices (Figure 1A, e) or the amplitude (A) of the real (reason) cross vortices and velocity (V) of the imaginary (result) flow (Figure 1A, g).

**The essence of Axiom 2**

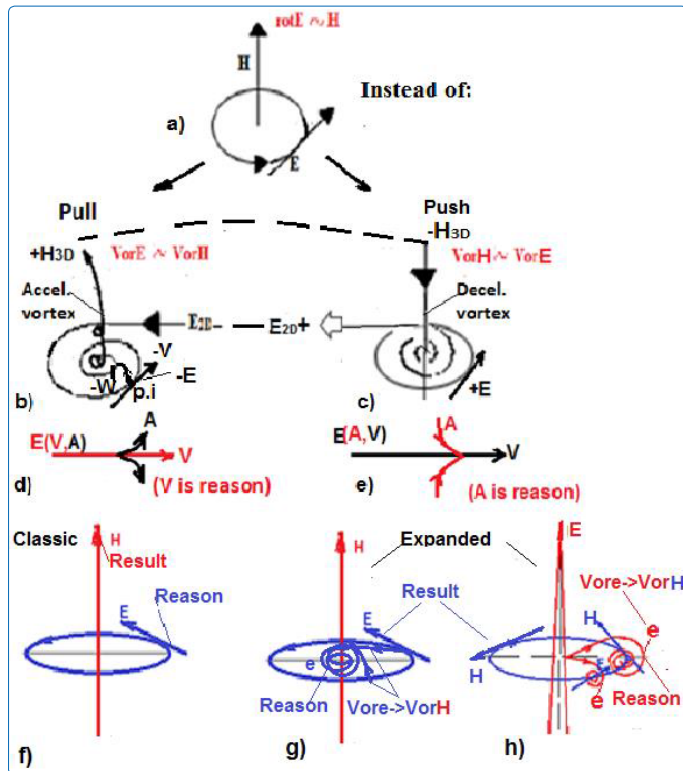
**Two directions of pair of complementary objects**

**Definition:** A pair of object for which actions are complementary, are called pair of complementary objects.

If one object pushes (Figure 1B, c), but other pulls (Figure 1B, b), they form a pair of complementary objects. Because of one object pushes (Figure 1B, c), the other- pulls (Figure 1B, b), the both of them are active generators or they form a pair of active generators in complementary work.

**Consequence:**

- The first pair is in straight direction: amplitude (A) can be the reason but the speed (V) is the result ( $E = A + iV$ ) (Figure 1B, c) and the velocity (V) can be the cause and the amplitude (A)- the result ( $E = V + iA$ ) (Figure 1B, b).
- The second pair is in the opposite direction: amplitude (-A) can be the reason but the speed (-V) is the result ( $E = -A - iV$ ) and the velocity (-V) can be the cause and the amplitude (A) is the result ( $E = -V - iA$ ) (this situation is not depicted in the figure).



**Figure 1B:** One pair (in one direction) of complex vortices in 3D

**Axiom 2: Two complex vortices of one complementary pair in one direction in 2D:**  $E_{2D} = +A + iV$ ;  $E_{2D} = +V + iA$ , or two complex vortices of complementary pair in opposite direction in 2D :  $E_{2D} = -A - iV$ ;  $E_{2D} = -V - iA$ , exist simultaneously in 3D. 6.

**A pair of active generators**

Because of one object pushes (Figure 1B, c), the other- pulls (Figure 1B, b), the both of them are active generators or they form a pair of active generators in complementary mode.

**Consequence:** In the pair of complementary objects, the both of them are active generators. That's why the efficiency is always more than one.

It is well known that in the Electromagnetic Field, the electrical circuit contains one generator element and one or several consumers. That's why the efficiency is always less than one.

**Expanding of Maxwell's Law**

**The inconvenience of the first Classic Maxwell's Law**

According to the classic axiom (1), the first classic law of Maxwell named "the law of electromagnetic induction" is presented as follows:

$$\text{rot } E = -\mu \partial H / \partial t \quad 7.$$

where (rot E) is the evenly movement of the electric vector E in a closed loop,  $\mu$  is the coefficient of magnetic permeability,  $\partial H / \partial t$  is the variation of the magnetic vector H in time t [1].

On the one hand, a change in magnetic induction over time ( $\partial H / \partial t$ ) creates a evenly movement of the electric vector (rot E). It is named "the law of electromagnetic induction" :

$$-\mu \partial H / \partial t \rightarrow \text{rot } E . \quad 7a.$$

On the other hand, an *evenly movement* of the electric vector (rot E) must generate a magnetic induction vector (H) in the center of the closed loop:

$$\text{rot } E \sim H , \quad 7b.$$

where the sign (~) means proportionality.

**Consequence** (about the sense of the first Classic Maxwell's law): This presentation of Classic Maxwell's law refers only to *evenly movement* of the electric vector (rot E) that must generate a magnetic induction vector (H) in the center of the closed loop.

**Expanded Law of Maxwell**

According to the new axiom (2) ( $\text{div}(\text{rot}E) \neq 0$ ) and the new definition of vortex (3) ( $\text{div}(\text{Vor}E) \neq 0$ ), the Expanded Maxwell's Law is modified like this: a cross vortex in 2D (Vor E) of vector (E) continues in the center as a *one single and simple* longitudinal vortex in 3D (VorH) of vector (H) (Figure 1B, b).

According to the new axiom (2) Expanded Maxwell's Law states that the cross vortex (Vor E) of vector (E) generates a *one single and simple* longitudinal vortex (VorH) of vector (H) in the center:

$$(\text{Vor } E)_{2D} = k(\text{Vor } H)_{3D}, \quad 7c.$$

where (Vor E) is a cross vortex in 2D of vector (E); (VorH) is an *one single and simple* longitudinal vortex in 3D of vector (H), (k) is an estimator of medium viscosity.

The direction of the resulting vector (H) is determined by the well known *Right-hand Rule*. If the right hand is facing down and the fingers indicate the direction of the velocity (V) (right), and the thumb indicates the amplitude direction (W) (left), the piercing through the palm will show the upward direction of the vector (H).

It expands the content of the meanings of movement of vector (E) and vector (H) in the development of laws later. Their main philosophy is affirmed as (E) is the cause vortex, and (H) is the result vortex. So in particular the cross vortex (VorE) generates in center a longitudinal vortex (VorH) (7c).

**Laws of Transformation (transformations Δ1, Δ2)**

**Laws of the transformation of a cross vortex (E<sub>2D</sub>) into a longitudinal vortex (H<sub>3D</sub>).**

At every (i) point p(i) of a decelerating cross vortex E there are two simultaneous movements: velocity vector (-V) and amplitude of the cross vortex(-W). The two simultaneous movements (V and W) also exist at all points of longitudinal vortices. The cross vortex (E<sub>2D</sub><sup>-</sup>) is transformed into a longitudinal vortex (H<sub>3D</sub><sup>+</sup>). This is accomplished through a specific operator (Δ1) for cross-longitudinal transformation (Figure 1B, b).

The cross (E<sub>2D</sub>) and the longitudinal (H<sub>3D</sub>) vortex are not an original and an image by analogy with the well-known transformations of *Laplace or Fourier*. They are representatives of spaces with qualitatively different structures. Therefore the introduced operator (Δ1) connects the original in one type (transverse) of space with its image in another type (longitudinal) of space, i.e. the transformation Δ1 connects two spaces with different qualities.

**Law 1 : The open cross vortex (E<sub>2D</sub>) generates (inward or outward) an open longitudinal vortex (H<sub>3D</sub>) in its center through a cross-longitudinal transformation Δ1:**

$$\text{Vor} (E_{2D}) \Rightarrow -- \text{Vor} (H_{3D}), \quad 8.$$

where Vor (for Vortex, meaning an unevenly vortex) replaces rot (for rotor, meaning closed loop); the cross vortex in 2D (E<sub>2D</sub>) continues its development in 3D as a longitudinal vortex (H<sub>3D</sub>) (Figure1Bb).

While Maxwell’s law (7) states that vector E generates vector H, the present law (8) postulates that the cross vortex Vor (E<sub>2D</sub>) of E in 2D generates a longitudinal vortex Vor (H<sub>3D</sub>) of H in 3D. The sign (-) for Vor (H<sub>3D</sub>) 3D means that E<sub>2D</sub> and H<sub>3D</sub> have opposite dynamics. For example when  $\text{div} (\text{Vor} E_{2D}) < 0$  (is decelerated),  $\text{div} (\text{Vor} H_{3D}) > 0$ (is accelerated).

**Definition:** A decelerating cross vortex (E<sub>2D</sub><sup>-</sup>) is a cross open vortex (E<sub>2D</sub>) for which  $\text{div} (\text{Vor} E_{2D}) < 0$ . Figure 2c shows a decelerating cross vortex (E<sub>2D</sub><sup>-</sup>) inward.

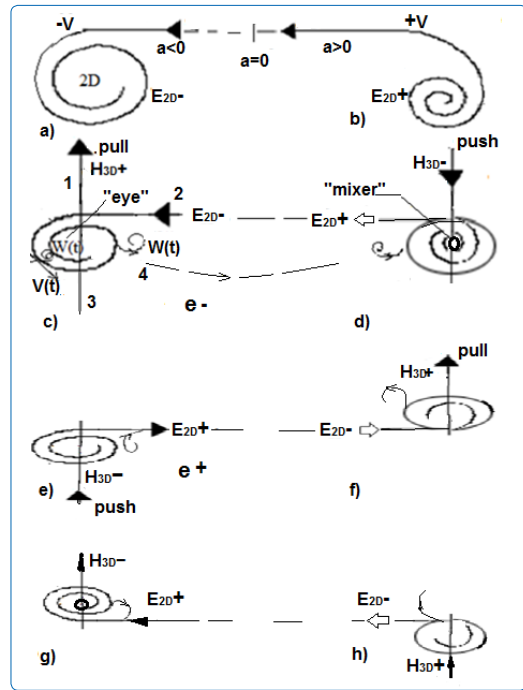
**Definition:** A decelerating longitudinal vortex (H<sub>3D</sub><sup>-</sup>) is a longitudinal open vortex (H<sub>3D</sub>) for which  $\text{div} (\text{Vor} H_{3D}) < 0$ . Figure 2d shows a decelerating longitudinal vortex (H<sub>3D</sub><sup>-</sup>) inward.

**Definition:** An accelerating cross vortex (E<sub>2D</sub><sup>+</sup>) is a cross open vortex (E<sub>2D</sub>) for which  $\text{div} (\text{Vor} E_{2D}) > 0$ .

Figure 2b, d shows an accelerating cross vortex (E<sub>2D</sub><sup>+</sup>) outward.

**Definition:** An accelerating longitudinal vortex (H<sub>3D</sub><sup>+</sup>) is a

longitudinal open vortex (H<sub>3D</sub>) for which  $\text{div} (\text{Vor} H_{3D}) > 0$ . Figure 2c shows an accelerating longitudinal vortex (H<sub>3D</sub><sup>+</sup>) outward.



**Figure 2:** Two Transformation Laws. Options in two complementary complex objects

The present paper describes only the chain of matter: the push-pull chain (Figure 2d - Figure 2c) or inverse pull-push chain (Figure 2f - Figure 2e). The decelerating cross vortex (E<sub>2D</sub><sup>-</sup>) inward generates an accelerating longitudinal vortex (H<sub>3D</sub><sup>+</sup>) outward in its center through a physical transformation (Δ1-) (Figure 2c).

This transformation (Δ1-) is achieved through a *phenomenon called full resonance (resonance in amplitude, frequency and phase)*. This type of resonance will be described in detail in further developments and reports.

**Consequence:** The open decelerating cross vortex (E<sub>2D</sub><sup>-</sup>) generates inward an open accelerating longitudinal vortex (H<sub>3D</sub><sup>+</sup>) outward. This action takes place in the center of decelerating cross vortex (E<sub>2D</sub><sup>-</sup>) through a particular cross-longitudinal transformation Δ1-:

$$\Delta 1- \text{Vor} (E_{2D}^-) \Rightarrow \text{Vor} (H_{3D}^+). \quad 8a.$$

Figure 2c shows this transformation in 3D.

- Consequence (8a) of Law1 corresponds only to the pulling part inward (Figure 2c) of the cross vortex pair of objects in 2D (Figure 2c - Figure 2d).
- If the Consequence (8a) of Law1 generates in 3D a *simple and single* longitudinal vortex, it would describe the Expanded Maxwell’s Law (7c) and *Electromagnetic Field*.
- If the Consequence (8a) of Law1 generates in 3D a pipe - wrapped vortices from longitudinal vortices inserted into each other, it describes another field with properties inverse to the Electromagnetic Field. It describes *the Gravity Field* as a Gravity Funnel. Gravity funnel is generated in 3D tube of longitudinal vortices as a longitudinal energy in pulling

part outward (Figure 2c) of the pair of complementary objects (Figure 2c – Figure 2d).

- The Consequence (8a) of Law1 describes in 2D the model of electron as the *decelerating inward vortex* (dec(e-)) (Figure 2c) in the chain of proton-electron (Figure 2d - Figure 2c). Every electron (dec(e-)) of this type pulsates in 3D in two modes of: ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” (Figure 6A, Figure 6C).

**Consequence:** The open accelerating cross vortex ( $E_{2D}^+$ ) generates inward an open decelerating longitudinal vortex ( $H_{3D}^-$ ) outward . This action takes place in the center of accelerating cross vortex ( $E_{2D}^+$ ) through a particular cross-longitudinal transformation  $\Delta 1+$ :

$$\text{Vor}(E_{2D}^+) \Rightarrow \text{Vor}(H_{3D}^-) \quad \Delta 1+ \quad \mathbf{8b}$$

The Consequence (8b) of Law1 describes in 2D the model of electron (e-) as the *accelerating inward vortex* (acc(e-)) (Figure 2c) in the chain of proton-electron (Figure 2d - Figure 2c). Every electron (acc(e-)) of this type pulsates in 3D in two modes of : ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6A, Figure 6C).

**Consequence:** The Consequence (8a) and Consequence (8b) describe decelerating or accelerating *cross vortex to inward* (Figure 6A).

We immediately obtain 4 type of electrons: (dec(e-)) and (acc(e-)) *electrons*, that each of them pulsates in two modes:” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6A, Figure 6C).

**Consequence:** It exists another two consequences (not described in the article), but they describe decelerating or accelerating *cross vortices to outward*. This is the 2 type of positrons: (dec(e+)) and (acc(e+)) positrons.

We immediately obtain 4 types of positrons: (dec(e+)) and (acc(e+)) that each of them pulsates in two modes: ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6B, Figure 6C).

### Laws of the transformation of a longitudinal vortex ( $H_{3D}$ ) into a cross vortex ( $E_{2D}$ ).

For the opposite transformation a new operator  $\Delta 2$  is introduced to transform a longitudinal ( $H_{3D}$ ) into a cross ( $E_{2D}$ ) vortex. The physical nature of this  $\Delta 2$  transformation is *quite different* in comparison with  $\Delta 1$ . Generally speaking, the transformations  $\Delta 1$  and  $\Delta 2$  are orthogonal rather than symmetrical to each other.

**Law 2: The open longitudinal vortex ( $H_{3D}$ ) generates (inward or outward) an open cross vortex ( $E_{2D}$ ) in its center through a longitudinal-cross transformation  $\Delta 2$ :**

$$\text{Vor}(H_{3D}) \Rightarrow \text{-- Vor}(E_{2D}) \quad \Delta 2 \quad \mathbf{9.}$$

**Consequence:** The open decelerating longitudinal vortex ( $H_{3D}^-$ )

inward generates an open accelerating cross vortex ( $E_{2D}^+$ ) outward. This action takes place in the center of accelerating cross vortex ( $E_{2D}^+$ ) through a particular longitudinal-cross transformation  $\Delta 2+$ :

$$\text{Vor}(H_{3D}^-) \Rightarrow \text{Vor}(E_{2D}^+) \quad \Delta 2- \quad \mathbf{9a}$$

The Consequence (9a) of Law2 in 3D refers to the pushing part (Figure 2d) of the pair of complementary objects (Figure 2c – Figure 2d). The transformation  $\Delta 2$  emphasizes that the movement of the longitudinal vortex ( $H_{3D}$ ) inward is the cause, and the movement of the cross vortex ( $E_{2D}$ ) outward is the result (Figure 2d).

When the Consequence (9a) of Law2 is generated by the pipe - wrapped longitudinal vortices, it describes Gravity field. It has the inverse properties to the Electromagnetic Field. This Gravity field exists as a tube from inserted one in another the longitudinal vortices .It forms a Gravity funnel which have a pushing and a pulling ends. The pushing end of Gravity funnel is attached to the pushing part (Figure 2d) of the pair of objects (Figure 2c – Figure 2d). This end decelerates inward and generates cross vortex outward *as a matter*.

**Consequence:** The open accelerating longitudinal vortex ( $H_{3D}^+$ ) inward generates an open decelerating cross vortex ( $E_{2D}^-$ ) outward in its center through a special longitudinal-cross transformation  $\Delta 2+$ :

$$\text{Vor}(H_{3D}^+) \Rightarrow \text{Vor}(E_{2D}^-) \quad \Delta 2+ \quad \mathbf{9b.}$$

The Consequence (9b) of Law2 describes in 2D the model of proton(p+) as the accelerating outward vortex( acc(p+)) (Figure 2d) in the chain of proton-electron (Figure 2d - Figure 2c). Every proton ( acc(p+)) of this type pulsates in 3D in two modes of : ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6A, Figure 6C).

**Consequence:** The Consequence (9a) and Consequence (9b) describe decelerating or accelerating *cross vortex to outward* (Figure 6A).

We immediately obtain 4 types of proton: (dec(p+)) and (acc(p+)) that each of them pulsates in two modes: ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6A, Figure 6C).

**Consequence:** It exists another two consequences (not described in the article), but they describe decelerating or accelerating *cross vortices to inward*. This is the 2 models of antiprotons (dec(p-)) and (acc(p-)) (Figure 6B).

We immediately obtain 4 types of antiproton: (dec(p-)) and (acc(p-)) that each of them pulsates in two modes: ” *expanded cross vortex and a shortened longitudinal vortex*” and “*shrunk cross vortex and extended longitudinal vortex*” ( Figure 6B, Figure 6C).

### Antiphase relations in pulse mode

It exists antiphase relations between the two objects of a complementary pairs in both directions (straight and opposite). According to Law 1 and Consequences the decelerating cross vortex shrinks, the longitudinal vortex increases and when decelerating

cross vortex expands, the longitudinal vortex becomes shorter. So when the decelerating crosses vortex shrinks, an energy quantum of longitudinal vortex is shot to the imaginary space (Figure 2c). According to Law 2 (9) and Consequences when the longitudinal vortex increases, the cross vortex object shrinks, when the longitudinal vortex becomes shorter the cross vortex expands (Figure 2d). So when the accelerating cross vortex expands (Figure 2d), an energy impulse quantum is shot to the decelerating vortex (Figure 2c). The distance between accelerating and decelerating vortices is pulsed simultaneously. When the accelerating cross vortex expands and the energy *quantum is shot* to the decelerating vortex and distance between accelerating and decelerating vortex increases (Figure 2c - Figure 2d).

**Consequence:** In pulsating mode a complementary pair of complex cross-longitudinal vortices works in antiphase. The objects of the two complementary pairs (in one and the opposite direction) pulse in counter-phase.

### Conclusions

- If Consequence (8a) of Law 1 generates a *simple and single* longitudinal vortex, it would refer to the Electromagnetic field.
- If the Consequence (8a) of Law 1 generates a *pipe - wrapped* vortices from accelerating longitudinal vortices inserted into each other, it really generates *accelerating Gravity Funnel*.
- If the Consequence (9a) of Law 2 is generated by a pipe - wrapped vortices from decelerating longitudinal vortices inserted into each other, it refers to the *decelerating Gravity Funnel*.
- The new extended meaning of the term "Complementarity" is when the two parts are generating and they act anti-phase - one push and the other pulls.
- The two transformations  $\Delta 1$  (Law1) and  $\Delta 2$  (Law2) are not symmetrical but rather form pairs of objects that complement each other in their action. So they form a pairs of complementary objects or they are mutually orthogonal.
- The two vortices in the described above vortex pairs (Figure 2c - Figure 2d) **play the role of generators** (!) - one push (Figure 2d) , the other -pulls (Figure 2c). Obviously in described above chain (Figure 2c - Figure 2d) *there is not the consumer*. Therefore this chain has not energy losses. It is well known that in every Electromagnetic chain has generator and one or more consumers. That's why Electromagnetic chain *has energy losses*.
- Both transformations,  $\Delta 1$  (Law1) and  $\Delta 2$  (Law2), are not regulated by external interference or external parameters. Therefore the processes *are regulated only by internal laws* and are not determined by outside parameters.

### Law of nonparametric movement of the vortex

Let us consider a decelerating longitudinal vortex with decreasing acceleration of velocity:  $V_1, V_2, \dots, V_n$ , decreasing acceleration of cross vortices and increasing amplitude of the cross vortices  $W_1, W_2, \dots, W_n$  (Figure 3 a,b). Let us consider also an accelerating longitudinal vortex with increasing acceleration of velocity:  $V_1, V_2, \dots, V_n$ , increasing acceleration of cross vortices and decreasing amplitude of the cross vortices  $W_1, W_2, \dots, W_n$  (Figure 3a,c).

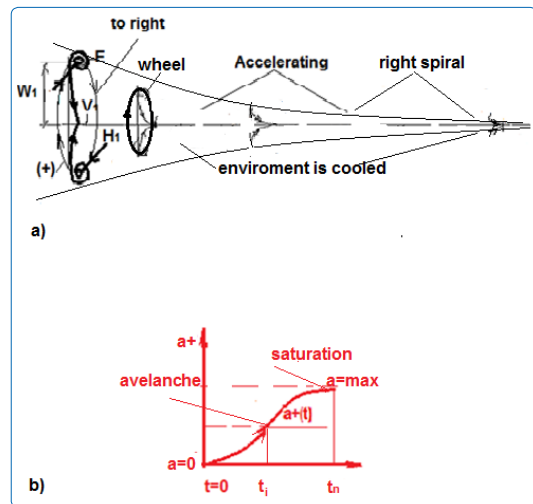


Figure 3: Positive Feedback

Obviously the acceleration and deceleration of the longitudinal vortex is a nonparametric process. Accelerating and decelerating longitudinal vortices do not manifest qualitative differences. They only differ quantitatively by their magnitude and sign of the change [5].

The Law 3(10) shows that when velocity  $V_i$  increases, the amplitude of cross vortices  $W_i$  decreases (or inverse). This phenomenon is due to *redistribution of the acceleration* of the cross and longitudinal vortices. There is also *redistribution of mass*. The mass of the cross vortices are added in portions (quanta) with acceleration to the initial mass of the longitudinal vortex and thus accelerate it (Figure 3a, c).

The accelerating longitudinal vortex sucks in more cross vortices from outside that accelerate further the longitudinal vortex and so on (Figure 4a,c). Thus the longitudinal vortex *increases of acceleration* and *increases of mass* at the exit which returns as an increase of the acceleration and mass to the entrance. This mechanism of amplification is known in cybernetics as *Positive Feedback*.

**Law 3: Accelerating longitudinal vortex is accelerated and decelerating longitudinal vortices is decelerated by internal logic as a nonparametric process through Positive Feedback.**

When, for example, an accelerating longitudinal vortex sucks in with acceleration the cross vortex, then *in start moment* ( $t=0$ ) its first derivative is minimum:  $a=0$ . However the accelerated absorption of the cross vortex increase and when *in the end moment* ( $t=t_n$ ) the positive acceleration of the cross vortex becomes maximum:  $a_{max} \gg 0$ . The mass of this cross vortex is added to the longitudinal vortex accelerating it further (Figure 3b).

It is an example of the avalanche process. In the next cycle the accelerated longitudinal vortex again sucks in a portion (quantum) of the cross vortex and so on. Through Positive Feedback the level of saturation constantly increases, the time interval needed for saturation becomes longer, etc. Positive Feedback turns the described above avalanche process from an amplifier to a *generator proces*.

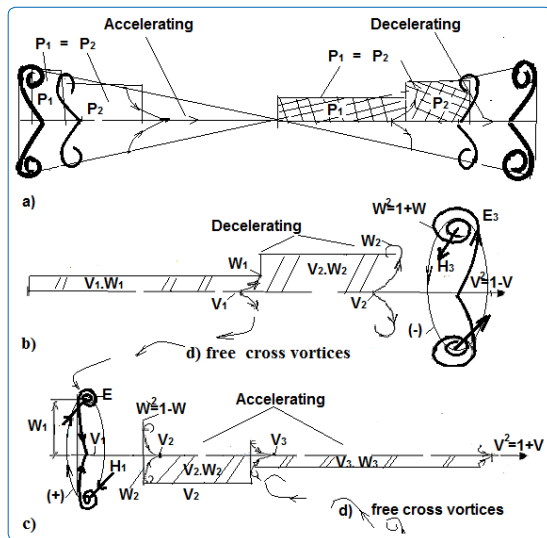
**Consequence:** The Positive Feedback in a longitudinal vortex turns the process of amplification to a process of generation. The Positive Feedback can be a base for constructing an energy generator.

Probably this generative effect of the Positive Feedback was used by Nikola Tesla in the construction of the electronic block for his electro mobile. The original engine worked in generator mode and needed a battery only at start up.

**Law of the constant Power of the vortex**

As we saw above there are two *qualitatively different* movements at each (i) point p (i) of the decelerating vortex E: longitudinal vector velocity (V) and cross vortex with amplitude (W) (Figure 1B, b). It is known that in Classic Mechanic the simultaneous operation of two homogeneous vectors *is equal to the sum* of these vectors.

According to Law 3, the transforming one vector (V) into a vortex (W) and vice versa is a *nonparametric process*. Transformation is done by internal laws but not by setting parameters from outside. The nonparametric transformation of two variables V (t) and W (t) is mathematically described by the product V (t) .W (t) of these variables.



**Figure 3:** A System of accelerating and decelerating vortices

The simultaneous operation of two qualitatively different vectors V (t) and W (t) *is equal to the product* of these variables V (t) . W (t). We have seen that at each (i) point of the vortex E there is simultaneously a vector velocity (V) in 1D and vortex pressure (W) in 2D (Figure 1B,d).

In the case of the accelerating longitudinal vortex the velocity increases (V+), while the amplitude of the cross vortices decreases (W-) in such a way that their product (V+).(W-) remains constant all along the longitudinal vortex (Figure 4a, b). The product (V+).(W-) is proportional to the power (P+) of the accelerating longitudinal vortex .

In the case of the decelerating longitudinal vortex the velocity decreases (V-), while the amplitude of the cross vortices increases (W+) in such a way that their product (V-).(W+) remains constant all along the longitudinal vortex (Figure 4a, c). The product (V-).(W+) is proportional to the power (P-) of the decelerating longitudinal vortex.

**Law 4:** For an uneven (accelerating or decelerating) longitudinal vortex with current velocity (Vi) and current amplitude of the cross vortices (Wi) , the product (Vi).(Wi) is a constant:

$$(Vi).(Wi) = \text{const.}, \quad 10.$$

where  $i = 0 \div \infty$  and the product (Vi).(Wi) is proportional to the power of the uneven longitudinal vortex (P).

**Consequence:** The complex action of velocity (V) and the amplitude of the cross vortex (W) at a given moment (t) is equal to the product(10) :V (t) .W (t).

At a decelerating vortex vector velocity (V) is transformed according to *internal law* into the amplitude of the cross vortex (W) (Figure 4a,b). -At a accelerating vortex the amplitude of the cross vortex (W) is transformed according to *internal law* into a vector velocity (V) (Figure 4a,c)

**Laws of the velocity of the longitudinal vortex (V) and the amplitude of the cross vortices (W)**

Law 4 claims that in the decelerating vortex vector velocity (V) is transformed according to *internal law* into the amplitude of the cross vortex (W) (Figure 4b) and in the accelerating vortex the amplitude of the cross vortex (W) is transformed according to *internal law* into a vector velocity (V) (Figure 4c)

**Law 5:** The velocity of a decelerating longitudinal vortex decreases in (n) portions  $(1/\psi)^n$  times, while the amplitude (W) of cross vortices increases reciprocally in (n) portions  $(\psi)^n$  times:

$$I V^2 = V_0 (1 - V), \quad 11a.$$

$$I W^2 = W_0 (1 + W), \quad 11b.$$

where  $v_n$  and  $\omega_n$  are periodic roots with period n that fulfill the requirement for orthogonality :  $v_n \cdot \omega_n = V_0 \cdot W_0$ ;  $n = 0 \div \infty$ ; the roots  $v_n$  and  $\omega_n$  are expressed as:  $v_n = \psi^n \cdot V_0$ ,  $\omega_n = (1/\psi)^n \cdot W_0$  ;  $V_0$  is the starting value of  $V_n$ ,  $W_0$  is the starting value of  $w_n$  and  $\psi$  is a number that fulfills the requirement:  $\psi - 1/\psi = 1$ .

**Consequence:** A decelerating vortex( $E_{2D}^-$ ) with a velocity vector (V) emits to the environment decelerating vortices with increasing amplitude (W). The amplitude (W) increases in perpendicular direction to the velocity vector(V). In decelerating longitudinal vortex, the amplitude (W) increases only if it is directed from the inside to the outside, ie. if the decelerating vortex emits outward cross vortices with increasing amplitude (W) (Figure 4b).

**Consequence:** Decelerating longitudinal vortices wind counterclockwise (-) (Figure 4b).

**Consequence:** Two or more decelerating longitudinal vortices, due to the emission of transverse vortices, are repelled.

**Law 6:** The velocity (V) of an accelerating longitudinal vortex increases in (n) portions  $(\psi)^n$  times while the amplitude (W) of cross vortices decreases reciprocally in (n) portions  $(1/\psi)^n$  times;

$$I V^2 = V_0 (1 + V), \quad 12a.$$

$$I W^2 = W_0 (1 - W), \quad 12b.$$

where  $v_n$  and  $\omega_n$  are periodic roots with period  $n$  that fulfill the requirement for orthogonality:  $\mathbf{v}_n \cdot \boldsymbol{\omega}_n = \mathbf{V}_0 \cdot \mathbf{W}_0$ ;  $n = 0 \div \infty$ ; the roots  $v_n$  and  $\omega_n$  are expressed as:  $v_n = \psi^n \cdot V_0$ ,  $\omega_n = (1/\psi)^n \cdot W_0$ ;  $V_0$  is the starting value of  $v_n$ ,  $W_0$  is the starting value of  $\omega_n$  and  $\psi$  is a number that fulfills the requirement:  $\psi - 1/\psi = 1$ .

The first positive root of the first equation (12a) is  $v_1 = \psi \cdot V_0 = 1, 62 \cdot V_0$ . The first positive root of the second equation (12b) is:  $w_1 = 1/\psi \cdot W_0 = 0, 62 \cdot W_0$ . The periodic roots of the first equation (11a) are obtained from the expression  $v^n = V_0 \cdot (V^{n-1} + v^{n-2})$ . The periodic roots of the second equation (12b) are obtained from the expression  $w^{n-2} = W_0 \cdot (W^n - w^{n-1})$ .

**Consequence:** When velocity ( $V$ ) increases, the amplitude ( $W$ ) decreases so that at each step (i) (according to Law 3) the product ( $Vi$ ). ( $Wi$ ) is a constant. For an accelerating longitudinal vortex, the amplitude ( $W$ ) decreases only if it is directed from the outside to inside, i.e. if the accelerating vortex sucks in cross vortices with decreasing amplitude ( $W$ ) (Figure 4c)

**Consequence:** It exists an expanded sense of the simultaneous action of equations from each of systems (11) and (12). They portray a qualitatively new, specific and combined movement in the form of a system:

- The system expresses the *joint action of two movements* - longitudinal and transverse vortex;
- This system is *mutually orthogonal*; the direction of velocity of the longitudinal vortex  $V$  is perpendicular to the direction of the amplitude  $W$  of the transverse vortices and, respectively, to the direction in which the transverse vortices
- This system is *open* (not closed) i.e. the system contains: a closed inner part - the longitudinal vortex, and an open outer part - the transverse vortices.
- Exactly the openness of the system of two mutually orthogonal, simultaneous and cooperative movements is the cause of the *exchange of cross vortices (inward or outward) with the environment*.

**Consequence:** An accelerating vortex ( $E_{2D}^+$ ) with a velocity vector ( $V$ ) **sucks in** accelerating vortices with decreasing amplitude ( $W$ ) in *perpendicular direction*.

According to the Consequence 8b of Law1 the direction of the resultant vortex ( $H$ ) caused by an accelerating cross vortex ( $E$ ) is from left to the right. Therefore, the entire acceleration vortex will twist to the right – clockwise (+), viewed against the movement (Figure 4c).

**Consequence:** Accelerating longitudinal vortices wind clockwise (+) (Figure 4c).

**Consequence:** Two or several accelerating longitudinal vortices, due to the suction of transverse vortices, are attracted.

**Consequence:** Accelerating longitudinal vortices form a *tube* like: the vortex is inserted at the center with the maximum speed, the minimum number of coils and the minimum distance, the slower vortex is with more coils and a longer way along the spiral and the

vortex at the periphery is winding with a minimum speed, maximum number of coils and a maximum spiral path. Because of acceleration this tube turns to the so called Gravity Funnel.

### Laws of Continuity

In Euclidean geometry has an axiom that postulates that only one straight line passes through two points. The Axiom 2 for two complementary objects resembles an axiom in Euclidean geometry. But in essence Axiom1 and Axiom 2 are physical, rather than geometrical. Instead of points as geometric objects there is a pair of vortices with different dynamics as physical objects: the both of them are generators-one pulls, the other pushes (Figure 2c, d).

Provisionally vortices can be classified as *primary ( $W$ ) and secondary ( $E$ )* uneven vortices. The primary uneven vortices are micro cross vortices ( $W$ ) (Figure 4d). The secondary uneven vortices are macro cross vortices ( $E$ ) (Figure 2c,d). The primary cross vortices exist as a free form or free cross vortices. *They are also called as “free energy”* (Figure 4d).

**Definition:** Primary vortices are emitted to the environment or sucked in from environment by the secondary (main) vortex.

### Law of continuity in a closed loop in 2D

According Law 5 (11) decelerating cross vortex ( $E_{2D}^-$ ) emits decelerating primary cross vortices in perpendicular direction (Figure 4b). In general the primary micro vortices are derivatives of the main secondary macro vortices. Since cross vortex objects are physical, they must fulfill the main *Physical Law of continuity cycle of movement*. The Axiom2 considers the question of the link in the opposite direction which closes the full circle (loop) of cross vortices in 2D.

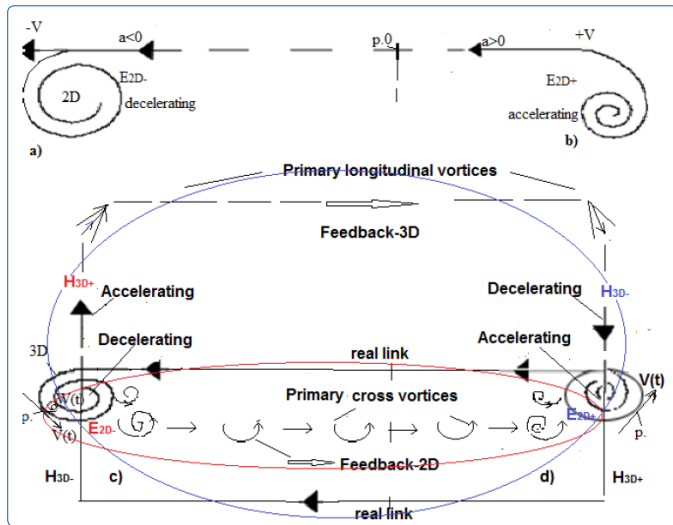
In order to fulfill the *fundamental law of continuity*, the feedback must pass through empty space (feedback 2D). It contains *elementary primary* cross vortices generated and emitted by the secondary decelerating cross vortex (Figure 4c) and consumed and sucked in by the secondary accelerating cross vortex (Figure 4d). This feedback is closed through the so called “*empty space*”. The feedback has link in inverse direction to link of the main cross vortices.

Therefore, in order to satisfy this fundamental law in physics, apparently this space cannot be “empty”, as we often call it. The imaginary space is filled with primary cross vortices: *copies of the secondary cross vortices but at a much smaller scale*.

**Law 7: A pair of open cross objects in 2D forms a closed loop in 2D by feedback in 2D of primary cross vortices. This pair conducts energy through the real connection: (Figure 5d - Figure 5c), ( $E_{2D}^+ - E_{2D}^-$ ) and conducts matter through the back link: (Figure 5c - Figure 5d), ( $E_{2D}^- - E_{2D}^+$ ) or through the feedback 2D.**

The reason for the emission of primary elementary cross vortices is the deceleration of the main longitudinal vortex ( $E_{2D}^-$ ) (Figure 4b, Figure 5c). But their movement in the space between the two vortex objects in 2D is due to the sucking action of the accelerating main longitudinal vortex ( $E_{2D}^+$ ) (the second vortex in the pair) (Figure 4c, Figure 4d).





**Figure 5:** System of one pair of complementary vortices

### Law of continuity in a closed loop in 3D

Let us consider the nature of the link in the opposite direction that closes the full circle (loop) of main longitudinal vortices in 3D, perpendicular to the circle (loop) in 2D. In order to fulfill the *fundamental law of physics* the feedback of the main longitudinal vortices in 3D must close through the space (feedback 3D). It contains elementary primary longitudinal vortices, generated and consumed by the main secondary longitudinal vortices.

This imaginary space is filled with primary longitudinal vortices resembling copies of the secondary longitudinal vortices but at a much smaller scale. All longitudinal vortices (primary and secondary) create a new type of field that contributes to our knowledge of the field as a form of matter.

The real link (Figure 5d - Figure 5c) of the chain in 3D conducts real pulsating energy ( $H_{3D}^+$ ) ÷ ( $H_{3D}^-$ ). The back link (Figure 5c- Figure 5d) of the 3D chain *conducts pulsating matter*.

The reason for this is that the pulsating accelerated longitudinal vortex ( $H_{3D}^+$ ) is made to dashes in the form of primary longitudinal vortices. As these longitudinal vortices are highly accelerated they attract, suck and form longitudinal packet as a funnel [6]. They will move in the opposite direction as a feedback in 3D.

**Law 8: A pair of open complex objects in 3D forms a closed loop in 3D by feedback of primary longitudinal vortices: ( $H_{3D}^+$ ) ÷ ( $H_{3D}^-$ ). This pair conducts energy through the real connection and conducts matter through the imaginary link.**

**Consequence:** The reason for the emission of primary elementary longitudinal vortices is that the secondary longitudinal vortex tears in dashes by high frequency pulses ( $H_{3D}^+$ ) (Figure 5c).

The primary elementary longitudinal vortices form the feedback link (Figure 5c - Figure 5d). The reason for their movement in the space between the pair of vortex objects in 3D is the sucking action of the entrance of secondary longitudinal funnel that has a decelerating exit ( $H_{3D}^-$ ) (Figure 2d). The real links in 2D and 3D are simple, but the imaginary links in 2D (feedback 2D) and 3D (feedback 3D) are

most likely multi ciphered.

Feedback (2D and 3D) connects a pair of different vortex objects (Figure 5 c, d). When these objects include both cross and longitudinal vortices, connected internally with reason-result transformations, either ( $\Delta 1$ ) or ( $\Delta 2$ ), they are called complex vortex objects.

**Definition:** A complex vortex object is an object that contains a cross and a longitudinal vortex connected internally by reason-result transformations, either ( $\Delta 1$ ) or ( $\Delta 2$ ).

**Consequence:** (of continuity in two mutually perpendicular closed loops in 2D and 3D).

Two complex vortex objects are connected with mutually perpendicular closed loops in 2D and 3D. The closed loop:  $\{E_{2D}^+ \div E_{2D}^-\} \div \{(\text{feedback (2D)})\}$  is perpendicular to the closed loop:  $\{H_{3D}^- \div H_{3D}^+\} \div \{(\text{feedback (3D)})\}$ , (Figure 5c, d).

### Conclusions

The extension of the classical main axiom led to a new first axiom that certifies open or non-uniform vortices. As a result, the decelerated and accelerated longitudinal vortices were obtained. Their acceleration realizes forces as in the direction of the plain of a cross vortex and as in the perpendicular direction of the plain (in volume) in longitudinal vortex. The accelerating longitudinal vortices attract each other because of sucking in outside-inward the cross vortices. So they form a pipe in which the fastest vortex is in the center, and the slowest vortex is in the periphery. Due to the acceleration, this tube becomes a funnel called Gravity Funnel the Gravity Funnel has two ends-one end in repulsion mode and other end in suction mode.

The introduction of a new second axiom certifies the presence of complementary pairs of complex objects. Both objects in a pair are complex cross-longitudinal vortices that operate in generator mode. If one work in pulling mode, the other work in pushing mode. They describe complementary relations between the complex vortex objects, which include the gravitational impact of both types.

### Some beforehand results in nutshell

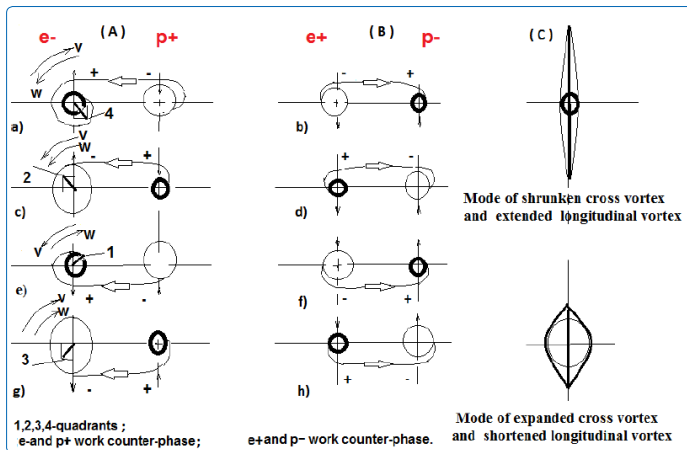
#### Model of Fractal structures

- Examples of complementary pairs of elementary particles:  $e^-$ ,  $p^+$ ; and  $e^+$ ,  $p^-$ .  
The Figure 6A, c shows the model of electron-proton link.  
The Figure 6B, d shows the model of positron-antiproton link
- Examples of complementary pairs of space objects.  
The Figure 6A, c shows the model of Earth-Sun link.  
The Figure 6A, e shows the model of Venus-Sun link.

#### Some explanation of cross vortex objects work

- The acceleration (positive or negative) is the reason for the eccentricity of the cross vortex objects (Axiom1, Law 1), (Figure 1b).
- Two complementary pairs work counter-phase as generators (Axiom 2, Law 1, Law 2) (Figure 2c).
- The center of Gravity is in different quadrants : in first quadrant is center in accelerating cross vortex ,but in second- is center in decelerating cross vortex(Law 5, Law 6), (Figure 6A).
- The direction (inward or outward) of cross vortex determines the charge (negative or positive) of cross objects (Figure 6 A, B).

- The stationary mode describes creation of objects, but pulsating mode explains their work in time and pulsating and transmitting transverse waves at the speed of light (Figure 6C).



**Figure 6:** Complex design of complementary pairs

It explains the cause for mass increasing of an elementary particle, described in *Theory of Relativity* of Einstein and confirmed by the experiment. For example an electron that moves at the speed of light, increases its mass (Law5, Law 6), (Figure 6C). The reason is in structure of electron as a vortex from outside to inside. When electron is not connected to the proton, it is in free form. The cross vortex of electron sucks inward the free primary vortices. The higher the speed - the more primary vortices are sucked in and are glued to the electron.

### Some explanation of extremely new moving as longitudinal vortex

- Explanation why according to the Theory of Relativity of Einstein, a longitudinal vortex because of maximum velocity and minimum amplitude is moving in minimum time and a longitudinal vortex because of minimum velocity and maximum amplitude is moving in maximum time
- Explanation why accelerating longitudinal vortices, because of suck in the cross vortices outside - inward, are attracted each other and form Gravity Funnel.

### Some explanation of Gravity field

- Gravity field participates in a stationary structure in the tube (at the entrance or at the exit) of Gravity funnel that generates the cross part of object .Gravity field participates and in a pulsating structure as a wrap around the object. -Gravity funnel consists by accelerating longitudinal vortices inserted one in another. It has one push end and one pull end. It attracts in both directions - along the axis of the funnel and perpendicular to the axis. The Gravity funnel has an accelerating central axis and decelerating periphery (due to the resistance on border surface) (Law 1, Law 2 and Consequences) .Then It returns back and envelops the cross object.
- In the pulsating mode, the cross vortex of object is stretched and collapsed and the longitudinal funnel is extended and shortened. Thus, a gravitational pulsating envelope is generated around the object and so on.

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