Gravitational Vortexes of Cosmic Plenum

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Against the conservative attitude of the academic world, a massive number of clues indicate that our universe consists substantially in an undetectable fundamental essence, which is commonly referred to as "ether". The need for the "ether" was finally and openly admitted even by Einstein; whereas quantum physics lingers still on fuzzy concepts like "zero/ground energy level" or similar ones, with no capacity of re-founding physics from the bottom up. The basic problem is now to try hypotheses on what the ether is and which properties are inherent in it.

This paper draws materials also from a book of mine, to try suggestions for a different approach to physics. The space of our universe is here addressed as it were a finite physical – though undetectable – *fluid continuum* (not consisting of component particles), here dubbed the "plenum", which is surrounded (and partly permeated) by a boundless space of "true vacuum" (the *void)*. In the *void* no physical event occurs. All material elements and detectable phenomena are effects of kinematical states of the "plenum". Allowing for such a basic assumption, the principal issue addressed here regards gravity and gravitation. Instead of "mutual attraction between masses", gravitation is here viewed and described as one particular effect associated with vortexes of plenum that establish gravitational fields. Also the formation of mass and the aggregation of matter components are viewed as states of plenum around nuclei of void, which "enters" the physical space through tears and openings caused by motions and/or turbulence of the plenum. The analysis leads to the formulation of tentative gravity and gravitational equations, though a complete solution to them requires further research.

1. Introduction

This paper may be considered as an introduction to the theory expounded in my book "*Vacuum, Vortices and Gravitation*" [1].

Alike several other theories on the subject (including the *mature* edition of General Relativity proposed by Einstein after 1916 [2]), also my philosophical approach is based on the assumption that the *darkness* between atoms, planets and stellar systems of our universe is not a "void", i.e., it is not an absolute nothingness, but - to the contrary - it is the fundamental physical substance of which all the observable phenomena consist. Said it in other words, all physical phenomena should be considered as systems of states and/or conditions of a common basic universal essence.

In this connection, the fundamental theoretical issue is how the characteristics of this "basic essence", which I name "*plenum*", can be defined in order to allow us to formulate reasonable hypotheses on the variety of phenomena that originate from it, such as those we are used to identify as light, electricity, magnetism, gravitation, matter, weak and strong interactions, etc.

I must immediately affirm that my main interest focuses on gravity and gravitation, though I deem it also necessary to draft explanations for most of the other phenomena mentioned above. However, it is also worth stating soon that I have no intention of outlining a "theory of everything"; primarily because, in my opinion, attempts of that kind become metaphysical very soon and – therefore – of no practical use. As to this point, I think that any human language, obviously including mathematics, has intrinsic and insuperable limits that prevent humans from a final complete and viable knowledge of the reality of which human beings too are a constituent part.

As far as gravitation and gravity are concerned, any innovative philosophical approach deserves attention, especially if it leads to feasible experimental proposals aimed at controlling gravity through any means that overcome the limits of our present scientific knowledge.

2. The "plenum" and the void. Mass and matter

What is currently referred to as "*the vacuum*", is here renamed the "plenum" in order to distinguish the space where all physical events are possible (that is the plenum) from the *true vacuum*, (or *the true void*) which is the absence of physical space and within which no physical event is possible. To be clearer: light cannot propagate through the true void.

It is assumed that our physical universe, which consists substantially in the plenum, is finite, whereas the *true vacuum* (or *the void*) is unlimited. The plenum exists within the void, and, as we shall see, the void appears through tears in the plenum.

The hypothesis I am here expounding about the plenum differs from most of the other hypotheses concerning the *ether* because of two major features:

(i) At variance with the ether, *the plenum does not consist of elementary particles*, as it is a physical *continuum* which, in its rest state, does not possess either mass or energy.

(ii) The plenum can behave like an incompressible and extremely dense fluid. The plenum is not a static and rigid substance and is instead intrinsically endowed with internal motions whose original causes are currently unknown.

Moreover, the plenum is not something that surrounds and/or permeates matter, since matter is substantially homogeneous to the plenum. Actually, matter and energy form a variety of discontinuities in the original uniformity and idleness (if any) of the plenum.

Because of its characteristics, the plenum cannot be detected directly. The plenum is everywhere, and everything consists of *local states* of the plenum.

Necessary logic consequences of the assumptions made are as follows:

(a) Because of the perfect continuity proper to such a basic cosmic substance, no point of the plenum can *slide* with respect to any other adjacent point of plenum; this means that motions of all the points of the plenum are *continuously* associated with the motion of any other point of the plenum.

(b) If any point of the plenum rotates with respect to any reference frame, all of the adjacent points rotate about the same rotation centre in such a way that the *total shift*, of all the points along each rotation path, remains constant. Therefore, the way in which the motion transmission occurs must be imagined consistent with the fluid characteristics. Because of its perfect and permanent cohesiveness with the adjacent points, any point of the plenum in motion pulls all of the other points into motion too. Thus, it is necessary to admit that the total length of the path travelled per time unit by any point in motion is also the total length of the path travelled by the adjacent points. As a particular example, if *all* the points together, which move along a *plenum circle line,* describe a route whose total length is l in time T, then *all* the points together of the contiguous circle lines (either internal or external to the former) will also travel a path length l in the same time. This is equivalent to saying that the *dragged* circular motion in the fluid has a speed inversely proportional to the distance from the moving points that are considered as the origin of the motion. It is the only way to overcome the difficulty of dealing with different infinities of adjacent points in a *continuum*. Let's refer to this conclusion as to the principle of *shift conservation.*

In simple mathematical terms, let us suppose that each point of a circle line of plenum makes a complete revolution around the circle centre in time T, to mean that the complete revolution of each point of the considered circle occurs at the average speed expressed by

$$V = \frac{2\pi R}{T} \tag{1}$$

R being the radius of the circle. Let's dub "reference circle" this particular circle.

Because of the fluid perfect continuity and cohesiveness, all the points together along any concentric circle line are pulled to make a revolutionary motion in the same sense, to an identical extent, and in the same time as made by the reference circle.

This implies that each point of any concentric circle with radius r travels in time T a section of the circle (to which it belongs) that is expressed by $s = (2\pi\ R\ /\ 2\pi\ r)\ 2\pi\ R = 2\pi R^2/r$. This also means that the revolution speed of each point of any concentric circle line is expressed by

$$v = \frac{2\pi R^2}{rT} = \frac{RV}{r}. \tag{2}$$

With respect to the "reference circle", the revolution speed of *external* concentric lines of the fluid *decreases* according to the coefficient expressed by the ratio R/r, whereas the speed *increases* according to the same coefficient for the points of the *internal* concentric circles.

(c) Formula (2) suggests that for $r = 0$ the speed of the fluid would be infinite. This fact leads necessarily to a choice among the two following additional hypotheses:

[a] below a certain value for r, the fluid starts behaving like a *solid*, i.e., with the rigidity of a solid body, thus creating a circle line of discontinuity in the fluid; or

[b] below a certain value for r in correspondence with a maximum possible speed for the plenum, the plenum tears away, leaving room to a *nucleus of true void* **:** i.e., the plenum starts moving around a core of void space.

If we assume that an infinite speed is possible at the centre of the fluid revolution, we cannot explain why the speed of the fluid is less than infinite at any distance from the revolution centre.

The necessary choice seems clear. Hypothesis [b] appears much more credible than hypothesis [a], because it does not conflict with the perfect structural cohesiveness that characterizes the plenum. Instead, if we imagine the nucleus of the fluid rotation as a rotating solid body, we would have to introduce an additional hypothesis that is inconsistent with the hypothesised properties of the plenum. Not only would the "solid rotating core" necessarily *slide* over the surrounding plenum, but also the "rule" of the speed transmission would either cease or be inverted, since the revolution speed of the points in the core would *decrease* to zero (instead of increasing) in approaching the motion's centre.

(There is also something "natural" in choosing hypothesis [b], upon the observation of the whirls that normally form in the surface of material fluid streams: The fluid's rotary motion around "empty" nuclei holds the ***cohesiveness of the fluid substance***, though the whirls do locally interrupt the *continuity of the fluid surface*).

The vacuum cores of the plenum revolution motions are discontinuities in the volume of the fluid, but do not imply any discontinuity in the fluid consistence.

Since the revolution speed of the fluid decreases with the distance from the motion origin, the motion of the fluid tends to vanish as the distance from its origin tends to infinity. Nevertheless, we must remember that the overall volume of space filled by the plenum is by hypothesis finite.

The preceding discussion, which concerns the circular motion transmission within the plenum, is limited to the unrealistic case of a flat *sheet* of plenum. However, it should not be difficult to guess that the conclusions of the preceding analysis can at least be extended to the rotation of coaxial cylinders of fluid space, this being a three-dimensional space. In this case, the motion transmission concerns coaxial cylindrical surfaces whose rotation speed around the common axis can still be expressed by

$$v = \frac{\rho V}{r}, \tag{3}$$

in which ρ represents the radius of the true-vacuum cylindrical core, and V represents the rotation speed of the cylindrical surface of plenum that delimits and contains the vacuum core. In this equation, it must always be assumed $r \geq \rho$.

Classical fluid dynamics calls any kind of fluid rotation around a line, the "vortex-line".

Cylinders of rotating plenum may be of any shape: They may form cylindrical rings (*annular vortexes* or *ring-vortexes*) or any complicated loops, provided that the "axes" of these are "closed" curves. In fact, an important theorem of fluid-dynamics concerning homogeneous, continuous and incompressible fluids, establishes that vortex-lines cannot remain open lines inside the fluid: They must form closed filaments.

The only alternative shapes for vortex-lines are filaments that remain open because they traverse the fluid volume from one point to another of its boundaries with a non-fluid environment. The two extremities of any open vortex filament are in fact characterised by two opposite polarities, which – within the same medium that forms the filament – tend to join each other immediately. That is why the simplest shape of a vortex, when fully confined within its own fluid medium - is shown by *ring-vortexes***.**

If the medium around a vortex is affected by other interfering motions or disturbance, it may happen that the extremities of a vortex filament rejoin in different complicated shapes, which one may generally dub "vortex-knots".

Accounting for the preceding considerations, it must be born in mind that every vortex line of plenum develops along its own *central spine-line of true void*.

Another point to account for is that the *velocity distribution* (i.e., the speed direction) of the fluid around the void spine-line may vary from vortex to vortex, whereas the *speed distribution* (i.e., the scalar module of the velocity vectors) obeys the law (3) of the inverse distance always.

However, states of turbulence may arise inside the volume of any vortex just because of particular local velocity distributions that take place in the field of the same vortex. The turbulence consists of "chaotic" chains of minor (or much minor) sub-vortices that usually interact with each other in extremely complicated ways and in a large range of different scales.

The theory assumes that this is just the process of mass and matter formation**,** in which *the nuclei of true void included in the various vortices and sub-vortices are the basic components of mass*. In simpler words, matter forms in a variety of shapes around nuclei of true void through the vortical turbulence of the fluid plenum, the volume of the involved void being the *core mass* of the matter that forms. An immediate consequence of this assumption is that the greater the density of matter the greater the volume of *true void* it includes.

According to the description provided above, all physical phenomena should consist both of fluid kinematics and of fluid-dynamic interactions.

An undeniable problem is that analytical fluid-dynamics – as it is today - cannot enter the details of fluid turbulence.

Nevertheless, at macro-scales we can obtain significant indications from an appropriate use of the kinematics of fluids and from fluid-dynamics theory.

3. Vortexes as fields of velocity with "discontinuities"

From the classic theory of fluid kinematics and dynamics we can learn a few basic notions, which help us understand some aspects of vortices.

Example**:** A ring-vortex, like any fluid dipole, has two *poles* situated on the central rectilinear axis orthogonal to the plane of the ring. A ring vortex moves across its own fluid medium working like a jet-propeller, sucking fluid from one of its poles and ejecting fluid from the opposite pole. Such a motion entails a relative current of the surrounding fluid medium that flows parallel to the ring axis. As a consequence, the vortex (i.e., its set of inherent lines of flux) tends to shape the ring into a sphere or spheroid, depending on the relative speed of the ring with respect to the fluid medium within which the vortex forms and moves.[3]

The figure that follows gives a schematic sketch of the cross section of a ring-vortex that moves across its fluid medium.

In **Figure 1** the two major round black spots represent the cross section of the *ring core*, which is a ring *void* of physical space. The central minor black spot represents the vortex nucleus of true void that forms because of the plenum's rotation around the ring's axis (due to the lines of flux along the vortex "parallels"). From now on, the expressions "ring vortex" and "spherical vortex" will refer to the same kind of vortex, since it is generally understood that any ring-vortex is in a relative motion with respect to its own fluid medium.

Once formed, any closed vortex line persists indefinitely, as fluid kinematics theory proves. Individual vortices constitute permanent motion states of the plenum, unless involved in *traumatic* events such as crushes or merging processes with other vortex systems.

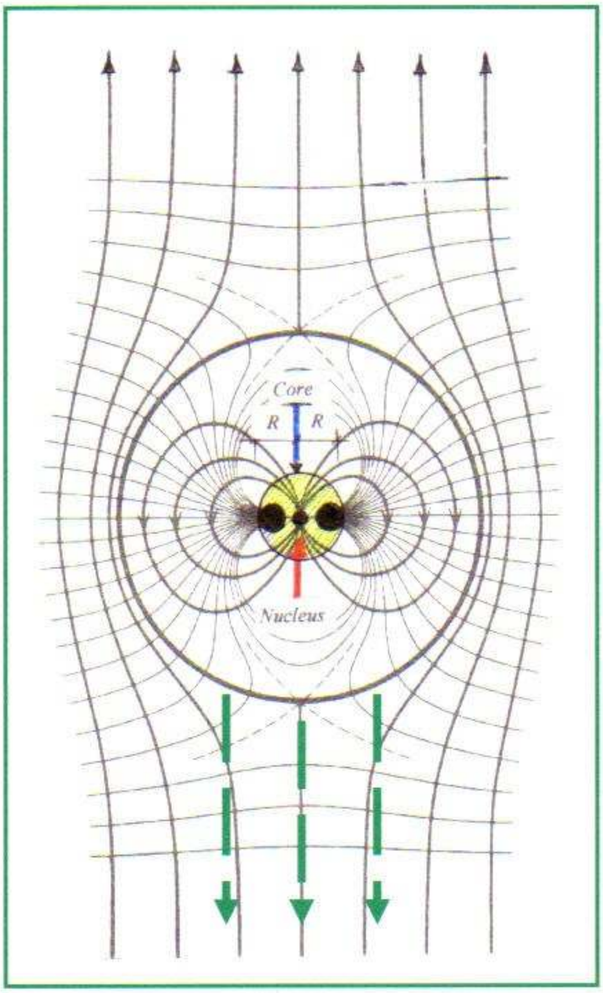

Fig. 1. This sketch represents the polar cross section of a ring vortex (or fluid dipole) that moves "downwards" with respect to the surrounding fluid medium. In this figure, only flux components along the vortex "meridian" lines are shown. In general, the existence of flux components along the "parallel" lines shall also be accounted for.

It is easy to guess that the *size* of a vortex depends on the size of its core, i.e., on the volume of *true void* hosted in the vortex core. The propagation of the vortex motion starts from the surface of the true-void ring where the plenum attains its maximum possible speed. In this connection, it goes without saying that sub-vortices included in a major one do actually occupy demarcated volumes of plenum according to the compatibility of the respective lines of flux with the flux lines of the major vortex.

Figure 2 here below gives a very schematic bi-dimensional representation of sub-vortices included in a major vortex. In this example, the orientation of the spinning motion is the same for all of the three represented vortices.

It is an example of those special cases in which the vortices interact and *tend* to repel each other, unless a *possible* dynamic equilibrium intervenes to stabilize the respective motions.

As already remarked, the ring vortex is the simplest kind of vortex, but it is sufficient to make us understand that vortices of any kind establish places of discontinuity within the plenum's stuff. To the extent to which formation of matter means presence of vortices, intrusion of true void into the plenum's space has occurred, thus determining the emergence of fields of mass and energy.

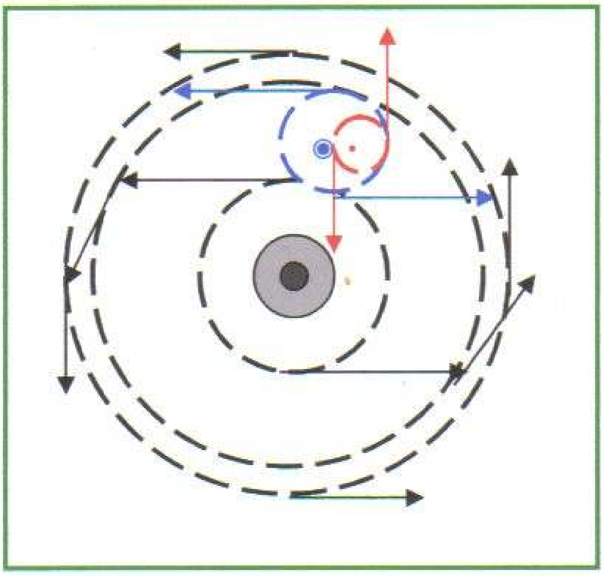

Fig. 2. This sketch represents an "equatorial" cross section of a vortex that includes a minor vortex, which, in turn, includes a sub-minor vortex. The sight-line coincides with the axes of the three ring-vortices. The vortex spin axes have the same direction: it is a situation in which vortices tend to repel each other, if no equilibrium establishes between fluxes with equal velocity at the vortices' contact areas.

4. Kinematics of the fluid plenum and vortex dynamics

From fluid-dynamics theory we also know that the gradient of speed in a fluid flow may establish "velocity circulation" around closed surfaces immersed in the flow. The velocity "circulation" Γ around any given closed surface is expressed by

$$\vec{\Gamma} = \oint_S \vec{v} \times dS \qquad (4)$$

where $\vec{v}$ is the varying velocity vector of the fluid flow, and S is the closed surface surrounded by the fluid.

In general, it must be understood that any motion with respect to the plenum determines or alters the fluid circulation around the moving body; the motion may have more than one cause.

Prior to presenting the gravitational effects that can be associated with vortices, I deem it worth proposing an explanation for centrifugal force. Historically, centrifugal force was considered as an "apparent force" because there was no direct "apparent" cause of it, other than its association with the rotation of any material body. (The word "apparent" has induced many people to erroneously believe that the meaning of the adjective is "fictitious". Instead, centrifugal forces are real forces, conceptually similar to the "couple" of forces of a torque).

Centrifugal force manifests through the *tension* to which any moving body is subject when it deviates from a rectilinear motion. *Tension* arises within a material body when it is pulled along a certain direction while being simultaneously pulled in the opposite direction. A banal example of centrifugal force is given by a sling used for throwing stones.

Consider a disk-shaped stone that whirls held by a sling around the wrist of a boy. The orbiting of the sling creates a circulation of the plenum around the stone, because this rotates like a rigid body, and the orbital speed is different at the disk's internal and external orbital lines as shown in Figure 3 below.

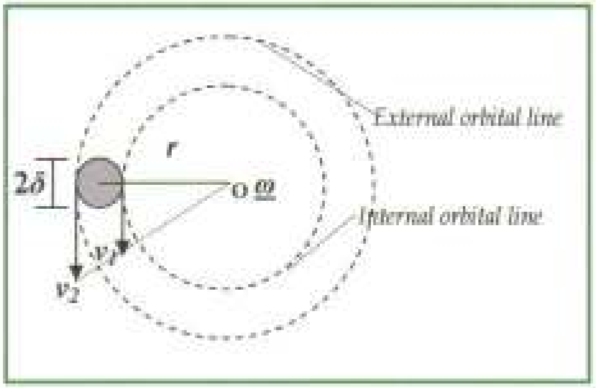

Fig. 3. Internal and external orbits of a stone in a sling

Let's denote with 2δ the diameter of the stone disk, whose thickness is b, and r is the distance between the centre of the stone-disk and the centre O of the sling's rotation.

The relative speed v of the plenum with respect to the disk is directly proportional to the distance of each point of the disk from rotation centre O, i.e., $v = 2\pi\, r/T = \omega\, r$, in which $\omega = 2\pi/T$ is the angular speed of the stone with respect to centre O.

In addition to the permanent effect of the Earth's gravity field (which we here neglect for the sake of simplicity), the rotating sling determines a "circulation" Γ of the plenum's velocity around the stone as expressed by:

$$\vec{\Gamma} = \oint_{2\pi\delta} \vec{v} \times dS = \left|2\omega\pi\delta^2\right\rangle . \qquad (4a)$$

In fact, the plenum's relative speed along the internal orbital line of the stone-disk at distance r-δ from the rotation centre, i.e., $v_1 = 2\pi(r-\delta)/T$, is lesser than $v_2 = 2\pi(r+\delta)/T$, which is the plenum's relative speed at distance $r+\delta$ along the external orbital line. The sign of the fluid circulation $\vec{\Gamma}$ is also coincident with the sign of angular velocity $\vec{\omega}$, so that the sling's rope and the circulation of the plenum around the stone-disk determine a combination of central forces.

Said μ the density of the "basic mass" m of the stone (i.e., the density of the *true* void included in the stone's volume), there is a double force acting as a tension on the disk, as expressed by

$$F = \mu\, \Gamma\, v\, b = 2\, \mu\, \omega\, \pi\, v\, \delta^2\, b = 2mv^2/r, \qquad (5)$$

b being the disk's thickness, $\mu = m/\pi\,\delta^2\, b$, and $\omega = v/r$.

This is a special version/application of the theorem of fluid-dynamics known as the Kutta-Jukowski theorem, commonly referred to also as the *Magnus effect.*

The double-force tension is the consequence of centrifugal force mv^2/r added with the equivalent opposite reaction or constraint force exerted by the sling.

Actually, in the Kutta-Jukowski theorem density μ relates to the fluid's density, whereas the mass density μ in Equation (5) regards the mass density of the stone, since the fluid plenum has by hypothesis no mass.

In my opinion, centrifugal force proves both the existence of the plenum and the existence of absolute motion with respect to the plenum.

(It is significant to remark that – according to *kinematics* – any *mass-less* point that moves along a non-rectilinear path undergoes *centripetal* accelerations only**.** The same point *never* undergoes centrifugal accelerations. Centrifugal accelerations intervene in dynamics *only if* the moving point has a mass, which determines the simultaneous rise of centripetal and centrifugal accelerations together with the relevant *couple of centripetal and centrifugal forces*).

Similarly, any material body immersed in a vortex undergoes the effect of the circulation around the body's surface in consequence of the velocity gradient that characterises the plenum's velocity field of the vortex.

The effect depends on the nature and the *state* of the "object" that is immersed in the vortex flow. In particular, the effect depends also on the possible existence of the object's own acceleration in addition to the action of the acceleration field intrinsic to the gradient of the velocity field of the vortex. For instance, if the "object" is a sub-vortex, it is clear that the "circulation" around the sub-vortex depends also on its own velocity field. Or else, assuming that gravity is the acceleration field of the plenum's vortex from which the Earth originates, "objects" of any kind may be seen as subject to a variety of physical constraints that bar gravity by means of other forces.

Also the distribution of the velocity vectors in a vortex field plays a determinant role. The simplest velocity distribution is illustrated by **Figure 1**, once the "meridian" components of the velocity vectors are considered as the only components of the vortex field (i.e., if no "parallel" velocity component exists). In such a case the vortex is quite equivalent to a fluid dipole, in which no circulation can be associated with the relevant velocity distribution. In fact, it is easily proved that where the fluid velocity depends only on the distance from the origin of the fluid motion, this motion is *irrotational*. "Irrotational" means that no velocity "circulation" exists around a closed surface immersed in the fluid flow, unless the surface itself is endowed with its own spinning motion.

In all other cases, the velocity field is *rotational* and is always associated with an inherent *acceleration gradient*. Then, each vortex becomes a special case of fluid dipole depending on the nature of its own velocity field.

5. Example of gravitational vortex

In order to simplify the analysis, I will consider – amongst an ample variety of possible examples - the spherical vortex represented by **Figure 4** here below, which describes a possible version of a more general distribution of velocities in a spherical vortex.

In the figure that follows, the velocity vector $\vec{V}_r$ that characterises the field is in red colour. At any given distance r from the vortex centre, velocity vector $\vec{V}_r$ has constant module but different direction, according to the application point on each of the concentric spherical surfaces of the vortex field. In the figure, only a few application points are shown for vector $\vec{V}_r$ at the two poles of the sphere whose radius is r, at any two points of a "meridian" between the poles and the sphere's "equator", and at any one point of the equator.

The components of vector $\vec{V}_r$ along the tangent to any "parallel" and to any "meridian" of the sphere are, respectively**:**

$$V_p = V\cos\alpha \tag{6a}$$
$$V_m = V\sin\alpha \tag{6b}$$

Module v_r of vector $\vec{V}_r$ remains constant as it depends only on its distance r from the centre of the spherical vortex. Module v_r of $\vec{V}_r$ is expressed by

$$v_r = \frac{nV_c}{(D-R)} = \frac{nV_c}{r} \tag{7}$$

in which D is the distance from the geometrical centre of the vortex, constants V_c and n are the plenum's speed at the surface of the vortex core and the radius of the core's vacuum ring, respectively; so that

$$r \geq R\,. \tag{8}$$

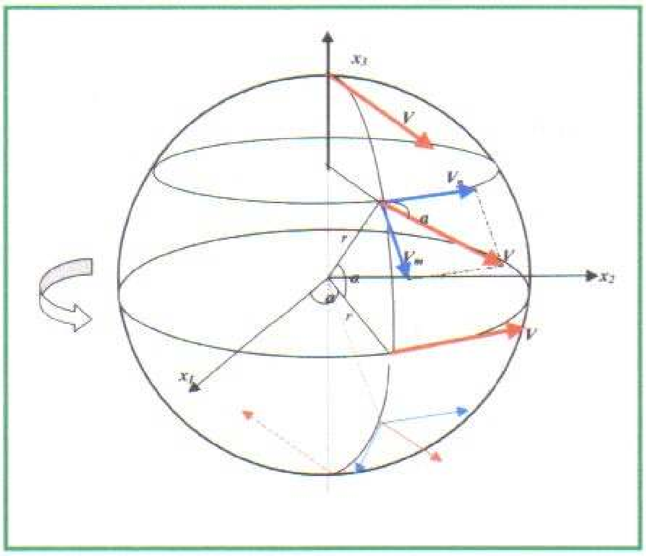

Fig. 4. Geometry of flux velocities in a sample spherical vortex

In this particular spherical vortex, it is assumed that the application point of $\vec{V}_r$ - for any given r - is identified by simultaneously identical values of the latitude and longitude, both expressed by angle α.

Under the conditions that define this spherical vortex, every concentric fluid sphere of the field rotates around axis x_3 *as if* it were a solid spherical shell, at the angular velocity expressed by

$$\omega_r = \frac{v_r}{r} = \frac{nV_c}{r^2}\,. \tag{9}$$

The trajectory of any point of the field may be seen as the route travelled by the point along a meridian – from the upper pole to the lower pole of each sphere – while the plane of the meridian rotates around axis x_3 with a constant angular velocity that depends on the square of radius r . *The condition of motion is stationary in every point of the spherical vortex, i.e., motion does not change with time, as it is in* general *true of the motion condition proper to ring-vortexes.*

The coordinates of any application point of $\vec{V}_r$ on the sphere are expressed in function of radius r and angle α as follows:

$$x_1 = r\cos^2\alpha\,,\quad x_2 = r\sin\alpha\cos\alpha\,,\quad x_3 = r\sin\alpha\,. \tag{10}$$

Meanwhile, Cartesian components of velocity vector $\vec{V}_r$ depend on angle α as follows:

$$v_{r1} = v_r \sin\alpha\cos\alpha\,(\sin\alpha - 1),$$

$v_{r2} = v_r(\sin^3\alpha + \cos^2\alpha)$, (11)
$v_{r3} = -v_r \sin\alpha \cos\alpha$.

A significant aspect of any velocity field is the variation in the ***rotor*** (or also ***curl***, symbolised with $\nabla \times \vec{V}_r$) of the velocity vector at any distance r from the vortex centre.

As shown below, in the spherical vortex considered here the *rotor* (or *curl*) of $\vec{V}_r$ is almost everywhere different from zero, and its value is infinite at the sphere's poles and equator.

Cartesian scalar components ρ_{r1}, ρ_{r2}, ρ_{r3}, of $\nabla \times \vec{V}_r$ are:

$$\rho_{r1} = \partial v_{r3}/\partial x_2 - \partial v_{r2}/\partial x_3$$
$$\rho_{r2} = \partial v_{r1}/\partial x_3 - \partial v_{r3}/\partial x_1 \qquad (12)$$
$$\rho_{r3} = \partial v_{r2}/\partial x_1 - \partial v_{r1}/\partial x_2 \ ,$$

to obtain, after the relevant calculations,

1. $\partial v_{r1}/\partial x_2 = (2v_r/r)(\sin\alpha \cos^2\alpha)$
2. $\partial v_{r1}/\partial x_3 = (v_r/r)[(2\sin\alpha - 1)\cos\alpha - (1 - \sin\alpha)\sin^2\alpha]$
3. $\partial v_{r2}/\partial x_1 = (v_r/2r)(1 - 3\sin\alpha)$ (13)
4. $\partial v_{r2}/\partial x_3 = (v_r/r)(2\sin^2\alpha - \mathrm{tg}\alpha)$
5. $\partial v_{r3}/\partial x_1 = -(v_r/2r)[(\cos^2\alpha/\sin\alpha) - (\sin\alpha)]$
6. $\partial v_{r3}/\partial x_2 = -v_r/r$.

For example, when angle $\alpha = 0$, $\alpha = \pi/4$, $\alpha = \pi/2$, the components of $\nabla \times \vec{V}_r$ are, respectively**:**

$$\rho_{r1}(0) = -v_r/r\ ;\ \rho_{r1}(\pi/4) = -v_r/r\ ;\ \rho_{r1}(\pi/2) = \infty\ ;$$
$$\rho_{r2}(0) = \infty\ ;\ \rho_{r2}(\pi/4) = 0.1464\ v_r/r\ ;\ \rho_{r2}(\pi/2) = -v_r/2r\ ; \qquad (14)$$
$$\rho_{r3}(0) = v_r/2r\ ;\ \rho_{r3}(\pi/4) = -1.2677\ v_r/r\ ;\ \rho_{r3}(\pi/2) = -v_r/r\ .$$

Therefore, the respective values of the modules of the relevant $\nabla \times \vec{V}_r$ in the field are:

$$\rho_r(0) = \infty\ ;\ \rho_r(\pi/4) = 1.62132\ v/r\ ;\ \rho_r(\pi/2) = \infty\ , \qquad (15)$$

after considering that the module of $\nabla \times \vec{V}_r$ in the vortex is in general expressed by

$$\rho_r(\alpha) = \sqrt{\sum_1^3 {}_i\rho_{ri}^2(\alpha)}\ . \qquad (14a)$$

Then, the spinning intensity of the fluid at the poles and at the equator of the spherical vortex is infinite.

As for $\alpha = \pi/4$ in particular, bearing in mind also Equation (9) and allowing for a property of operator $\nabla \times$, the module of the angular velocity of the fluid that spins around any point of the sphere is given by:

$$\left|\omega_{r(\pi/4)}\right| = \left|\frac{1}{2}\nabla \times \vec{V}_{r(\pi/4)}\right| = 1.6213\frac{v_r}{2r} = 0.8106\frac{nV_c}{r^2}\ . \qquad (16)$$

To note: the *values* (14a) of the *modules* of $\nabla \times \vec{V}_r$ are identical in the two (upper and lower) hemispheres of the gravitational vortex for any equal *absolute value* of α, whereas the corresponding vector directions are opposite to each other.

The fact that $\nabla \times \vec{V}_r$ is not nil in a number of points of the vortex is a first indication of discontinuities in the fluid spherical surfaces.

There is to interpret $\rho = \infty$ **.** The meaning of "infinity" is that the nucleus of the spinning fluid has a radius equal to zero. In such cases, the only way to overcome the difficulty is through an *assumption* like that made in Paragraph **2**.[b], according to which an infinite intensity of the rotational motion shall *conventionally* imply the intrusion of a *true-vacuum* nucleus whose radius is greater than zero.

Therefore, for $\alpha = 0$ and $\alpha = \pm \tfrac{1}{2}\pi$, we may re-write

$$\rho(0) = \xi\ , \quad \text{and} \quad \rho(\pm \tfrac{1}{2}\pi) = \xi\ , \qquad (17)$$

ξ being the absolute maximum value of the module of vector $\nabla \times \vec{V}_r$ in the plenum, whatever r, as it is determined according to the particular vortex considered. In a subsequent paper, it will be shown that the values of ξ are connected with both the vortex size and the plenum's *kinetic* viscosity.

6. A gravity law

Let's now consider any material body whose elementary components, for simplification purposes, are supposed to be in an overall dynamic equilibrium, so as to involve no "significant" transformation for the body. "Significant transformation" would imply accounting for not negligible velocity-fields of plenum associated with each component particle, whereas, for the purposes of this schematic analysis, we assume that the absolute speed of each component particle is on an average nil or negligible, and that the body's geometrical volume is constant.

Let us imagine the body, immersed in a gravitational vortex like that described above and schematised by **Figure 4,** as if completely encapsulated in a small sphere whose radius is δ, and whose centre is at any distance r from the core of the vortex**.**

The vortex field circulation around any circle line of the small sphere around the body can be calculated by use of Stoke's theorem concerning circulation, by which we can write

$$\vec{\Gamma} = \int_S \left(\nabla \times \vec{V}_r\right) \times \vec{\imath}\, dS\ , \qquad (18)$$

where $S = 4\pi\,\delta^2$ is the area of the small geometrical sphere that wraps the body, and $\vec{\imath}$ is the unit direction vector orthogonal to S.

(Note: Actually, every particle of matter is not only *something immersed* in the plenum, for it is basically in itself a *local state* of the plenum gravity field).

Remembering Equations (12) and (13)**,** which define the components of $\nabla \times \vec{V}_r$, we can write:

$$\rho_{ri}(\alpha) = f_i(\alpha)\frac{v_r}{r}\ , \qquad (i = 1, 2, 3) \qquad (19)$$

$f_i(\alpha)$ being the trigonometric functions associated with the components ρ_{ri} ; while v_r is the module of the vortex stream velocity as per Equation (7).

Therefore, Equation (18) becomes:

$$\vec{\Gamma} = \int_S \left(\nabla \times \vec{V}_r\right) \times \vec{\imath}\, dS = \left|4\pi\delta^2 g(\alpha)\frac{v_r}{r}\right\rangle, \qquad (20)$$

in which

$$g(\alpha) = \sqrt{\sum_{i=1}^3 f_i^2(\alpha)}\ . \qquad (20')$$

In this connection, it is important to remember the convention fixed by Relations (17), in order to consider only finite values for *g(α).*

Let's denote with μ the **density of the vacuum** within the body, for we take this density as the *basic mass density* of the matter involved. The *Magnus effect* applies on every "slice" of the body formed by a circular section of the small wrapping sphere having thickness $d\delta$ (refer to Kutta-Joukowski's equation). It results in the *element* of "gravity" force expressed by

$$dF = \mu\Gamma v_r dr = 4g(\alpha)\pi\mu n^2 V_c^2 \delta^2 \frac{dr}{r^3}, \tag{21}$$

because of Equation (7) for field velocity $\vec{V}_r$.

It is assumed that the gravity action on the body coincides substantially with the action on its small wrapping geometrical sphere. After denoting with m the basic "vacuum mass" of the body, and considering mass density $\mu = 3m/4\pi\delta^3$, the total gravity force applied to the body is:

$$F = \int_{r-\delta}^{r+\delta} dF = -\frac{3}{2\delta} g(\alpha) m n^2 V_c^2 \left[\frac{1}{r^2}\right]_{r-\delta}^{r+\delta} = = 6H^2 m g(\alpha)\frac{r}{(r^2-\delta^2)^2} \tag{22}$$

in which $H^2 = n^2\ V_c^2$ is a constant value that pertains to the gravity vortex considered (it varies with the vortex size). V_c, as already explained through Equation (7), is the plenum's speed at the core-origin of the vortex motion (i.e., at distance R from the vortex centre; refer to **Figure 1**).

This force – as per Kutta-Jukowski theorem – is orthogonal to velocity $\vec{V}_r$ of the plenum, and centripetal along the direction of r, provided that the initial state of the body (i.e., its own initial velocity) doesn't alter *the sign* of circulation $\mathbf{\Gamma}$ in the surrounding velocity field. Otherwise, the force might become centrifugal because of the intrinsic velocity of the body.

If, instead of a "body", there is – for example – a smaller vortex whose plenum spins like that of the vortex in which the former is included, the self-acceleration of the minor vortex would intervene, opposite to the acceleration exerted by the major vortex.

It must be remarked that this gravity force, set apart the constant values of H and mass m, depends not only on r, but also on the value of $g(\alpha)$, which varies with the position of the body in the vortex velocity field: $g(\alpha)$ increases remarkably when the position of the body approaches the equator plane of the vortex field, and vice-versa when the body's distance from the equator plane increases.

In principle, it is remarked that the shape and relative orientation of any object seized by a gravitational vortex should also matter. However, in almost all cases, when the gravity force is undergone by any object *that is not* a smaller vortex, quantity δ is negligible in a comparison with r. Thus, Equation (22) becomes

$$F = \frac{6H^2 g(\alpha)}{r^3} m. \tag{23}$$

Therefore, at variance with Newtonian gravitational law, the gravity force inherent in a spherical vortex like that addressed above varies approximately with the inverse of the cube distance from the vortex centre, and is case by case affected by a local factor $g(\alpha)$ associated with the initial position of the "object" subject to the force.

More important is the *nature* of the "gravity field" described. It is *not* an interaction between masses, but only one local effect of the kinematical state of the cosmic plenum. We may call the pull of a mass or of a minor vortex towards the centre of a dominant vortex, the "gravity effect", but the "gravitational field" of any vortex, as expressed by Equation (23), may imply both "*pull-in*" and "*push-out*" forces, depending on various possible local kinematical conditions.

It is worth pointing out that the *propagation* of the vortex velocity field **is in no case** the *transmission* of a force. It is only the propagation of a special transverse wave ***during the vortex formation***. Once the vortex is formed, the relevant kinetic and gravitational field is *stationary*: i. e., in every point of the vortex the velocity of the fluid plenum does not change with time.

Conceptually, at every fixed distance and position with respect to the vortex core, consider the analogy with any fixed point in the parallel water stream in an artificial canal built in concrete.

The edges of the canal exert their friction on the lapping water flow, thus slowing down the stream's speed along the edge walls. The edge's friction, through the water's viscosity, does partially propagate towards the central thread of flux of the water stream, where the flux is at its highest speed. Therefore, in the canal, the distribution of the flow velocity has a *gradient* that establishes a particular stationary state in the water flux.

Refer to the figure below:

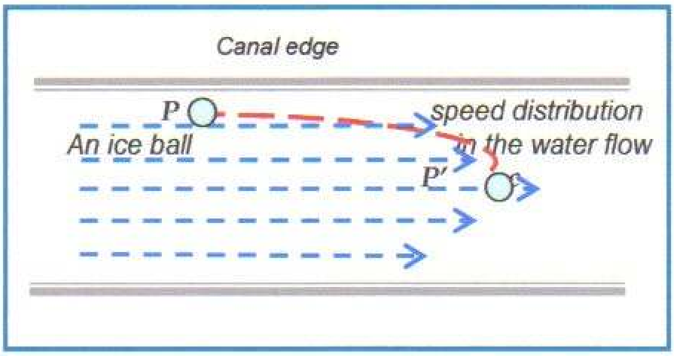

Fig. 5. This figure suggests an analogy between the velocity field established by the water stream in a canal and the field of a gravitational vortex. In the canal, the (false) "attraction" exerted by the central stream line c on a floating ice-ball dropped in P draws the ball toward P'.

Figure 5 sketches the water flow in a canal. An ice ball dropped in P is "pushed-towards" or "attracted-by" P' where the flow speed is maximum, because of the velocity gradient that characterizes the water flux. The ice ball, once joined the thread ***c*** of the stream, continues its run along ***c***. This fact means neither that there is an attraction force inherent in flux thread "***c***" and "transmitted" to the ice ball in *P*, nor is there a repulsive force inherent in the concrete edges of the canal that pushes the ice ball away. Actually, the velocity distribution of the water in the canal establishes in itself a *stationary field of accelerations* (a particular *water space deformation*) that acts instantaneously on any object immersed in the stream, according to fluid-dynamic laws.

The preceding remark gives an indication of the extent to which the concept of gravitational field outlined in this essay differs from various concepts of *quantized gravitation* proposed by several physicists and other researchers. In *quantum physics,* fields of force are identified in (or consist of) special particles that convey the force from one material particle to another material particle: as to gravity and gravitation, for example, the force conveyers should be "gravitons" or the like. No such gravity/gravitational conveyers have ever been detected though.

Instead, according to the paradigm proposed here, the "gravitational interaction" *might seem to be instantaneous*; but there is ***no transmission of force***, because there is no interaction between masses in mutual presence**.** The point, as already explained also through **Figure 6**, is that gravity and gravitational effects depend on the *state* of the plenum, which involves and *constrains* any material particle and/or phenomenon.

In this connection, and following a clear indication provided by Newton himself, in *Part II* of my book [4] I have discussed the issue concerning the property that masses supposedly have to attract each other, with a view to questioning such a belief. While also the basic question concerning mass formation is honestly far from receiving any credible answer within the standard model of physics.

7. Gravitation

The force defined by Equation (23) is a *central force*, according to the classification of mechanics. It is the effect of the field of acceleration inherent in the velocity distribution of the plenum's fluid in a vortex.

Therefore, and irrespective of its *sign*, this force – i.e., the vortex "gravity" – compels the "body" to move along a geometrical path contained in a plane passing through its mass centre and the centre of the vortex. The intensity of the force is inversely proportional to the cube distance from the centre of the vortex and, although it also varies in relation to variable $g(\alpha)$, the force remains a central force in any case, with all relevant mechanical implications.

A preliminary analytical investigation may be carried out assuming that the trajectory of the body keeps on a plane constantly close to the equator plane of the vortex, so as to make the *variation* of $g(\alpha)$ nil or negligible - in a first approximation – during the body's motion. By this preliminary assumption, it is possible to write a simple motion equation for the body immerged in the vortex, in the case that the body is not subject to any own velocity and/or acceleration.

Let's assume that a polar reference frame (x, r, ψ) for this motion has its origin in the vortex centre and lies on the motion plane, and that ψ is the angle between r and the abscissa x.

Concerning Equation (23), there is to note that centripetal force vector $\vec{F}$ is determined by the relevant acceleration vector expressed by

$$\vec{h} = -\left| 6\frac{H^2}{r^3}g(\alpha) \right\rangle = -\left[\frac{d^2r}{dt^2} - r\left(\frac{d\psi}{dt}\right)^2 \right]\vec{r}\,, \qquad (24)$$

which acts only along the negative direction of radius r, so that the body is not subject to any transverse acceleration. It's also worth noting that a **gravitational potential** expressed by

$$G = \int h dr = 3\frac{H^2}{r^2}g(\alpha)\,; \qquad (25)$$

its physical dimension is $[L^2\,T^{-2}]$. This potential is associated with the vector field of acceleration $\vec{h}$.

Considering (24), it is possible to write the following equation:

$$6\frac{H^2}{r^3}mg(\alpha) = m\left[\frac{d^2r}{dt^2} - r\left(\frac{d\psi}{dt}\right)^2 \right]. \qquad (26)$$

Actually, mass m is eliminated, while it is convenient to rewrite this equation by use of Binet's formula for central acceleration, by which (26) is transformed into

$$\gamma^2\left(\frac{1}{r}\right)^2\left[\left(\frac{1}{r}\right) + \frac{d^2}{d\psi^2}\left(\frac{1}{r}\right)\right] = 6g(\alpha)H^2\left(\frac{1}{r^3}\right). \qquad (27)$$

Constant value $\gamma = 2\,r^2(\frac{d\psi}{dt})$ represents the *double* of the *area speed,* which is a *constant* quantity in any *central motion*. Thus, Equation (27) becomes the following linear homogeneous differential equation of the second order with respect to variable $1/r$:

$$\frac{d^2}{d\psi^2}\left(\frac{1}{r}\right) + \left[1 - 6H^2g(\alpha)/\gamma^2\right]\cdot\left(\frac{1}{r}\right) = 0\,. \qquad (28)$$

The general solution to this equation is expressed by

$$\frac{1}{r} = B_1\exp(\psi i\sqrt{\lambda}) + B_2\exp(-\psi i\sqrt{\lambda})\,. \qquad (29)$$

There is to consider that $\lambda = [1 - 6H^2\,g(\alpha)/\gamma^2]$ may be either a positive or negative number.

If $\lambda = 0$, the orbits are permanent circle lines, whose radius is $r = 1/(B_1+B_2)$.

In this form, the solution represents the curvature of the body's orbit under the gravity effect only. B_1 and B_2 are two integration constants that depend on the initial conditions relevant to the position and motion of the body, and $i = (-1)^{0.5}$.

If $\lambda > 0$, the solution to (28) is expressed by

$$r = 1/[C_1\cos(\psi\,\lambda^{1/2} - C_2)], \qquad (30)$$

in which C_1 and C_2 are integration constants whose values depend on the initial conditions considered. In general, this solution represents parabolas focused on the vortex centre.

If $\lambda < 0$, solution (29) represent spiral orbits, which approach or recede from a point asymptotically. Actually, the spiral lines stop on (or start from) the vortex core. The spiral progress rate depends on the values of constants B_1 and B_2. If B_2 is much smaller than B_1, the spiral orbit might initially expand up to a certain point and then contract down to join the vortex core. Instead, if B_2 is for any reason nil then the spiral tends to expand indefinitely.

All these orbits neglect the variation of coefficient $g(\alpha)$, because of the simplifying assumption that the orbits lie on planes almost coincident with the vortex equator plane. Instead, the effects of variable $g(a)$ cannot be neglected in all other cases.

As already remarked, Equations (26) and (27) regard only bodies that are not in condition to determine significant changes in the velocity circulation activated around them by the gravity field. This is an important point to account for, because bodies should generally be considered as also under dynamic effects different from gravity. In such a case, the motion of the bodies with respect to the vortex plenum does not obey Equations (26) and (27) only**.**

In general, it is expected that any own-motion of "bodies" with respect to fields of flowing plenum determines (or alters) the fluid-dynamic circulation around the moving body, and any motion may not be the effect of a single cause. All material points of our universe must be considered as permanently subjected to a complex system of actions, most of which are unknown. I deem it is conceptually impossible to think of any material body as in a perfect rest condition or in a perfectly linear and uniform motion, i.e., free from any influence from the rest of the universe.

In the light of the preceding considerations, the *general* definition of "applied force" should be formulated as follows:

$$F = ma + f_0 \ , \tag{31}$$

which may be viewed as a generalisation of D'Alembert's principle in Mechanics. Equation (31) simply states that any force that alters the state of any material body in the physical universe adds with pre-existing forces f_o to which the body is already subjected. Obviously, f_o might in special cases be nil.

Allowing for Equation (31), we can now generalise Equation (26) by the introduction of a "constraint term" f_o, which may be either constant or variable, according to the study subject; so as to write:

$$6\frac{H^2}{r^3}mg(\alpha) + f_0 = m\left[\frac{d^2r}{dt^2} - r\left(\frac{d\psi}{dt}\right)^2\right]. \tag{32}$$

Concerning the study of gravitational trajectories within a gravitational vortex, what matters in this equation is only the *central component* of force f_o.

A more accurate analysis of the plenum's circulation around any minor vortex that is included in a larger one is here omitted; it is, however presented in a section of my book, previously mentioned [5]. The problem is here simplified considering that any minor vortex, as included in a larger one, can either accentuate or diminish the effect of the latter's velocity circulation.

The simplification comes from noticing that the minor vortex tends to accelerate toward the centre of the major vortex if the spin of the two vortices is discordant; whereas the minor vortex tends to recede from the centre of the major vortex if the two vortices have concordant spin. This simply means that either centripetal or centrifugal acceleration must be associated with any vortex included in a larger one.

For the description of a few gravitational orbits, we assume now that it is possible to neglect those acceleration components of f_o that are different from central (positive or negative) acceleration a_o. On this basis, we may re-write Equation (27) as follows:

$$\gamma^2\left(\frac{1}{r}\right)^2\left[\left(\frac{1}{r}\right) + \frac{d^2}{d\psi^2}\left(\frac{1}{r}\right)\right] = 6g(\alpha)H^2\left(\frac{1}{r^3}\right) + \frac{f_0}{m}, \tag{33}$$

from which the following differential equation:

$$\frac{d^2}{d\psi^2}\left(\frac{1}{r}\right) + \left[1 - 6H^2g(\alpha)/\gamma^2\right]\cdot\left(\frac{1}{r}\right) - \frac{a_0}{\lambda^2}r^2 = 0, \tag{34}$$

in which $a_o = f_o/m$. This differential equation makes the problem more complicated, because the equation is not linear. If we denote $u = 1/r$, Equation (34) can be written

$$u^2\frac{d^2u}{d\psi^2} + \left[1 - 6H^2g(\alpha)/\gamma^2\right]\cdot u^3 - \frac{a_0}{\gamma^2} = 0\,. \tag{34a}$$

The integration of this non-linear equation seems difficult. *Actually, I could not yet determine its general solution.*

Nevertheless, following a procedure in which $du/d\psi$ is replaced by $y(u)$, it is possible to obtain the pseudo-solution expressed by

$$\psi = \int\frac{udu}{\sqrt{\lambda u^4 + 2C_1u^2 - 2\frac{a_0}{\gamma^2}u}}, \tag{35}$$

where $\lambda = [1-6H^2g(\alpha)/\gamma^2]$, and C_1 (whose physical dimension is [L-2]) is an intermediate integration constant. This equation expresses angle ψ in function of curvature u, which requires a difficult analytical interpretation.

Two particular forms of integral (35) are relatively simple. The first of these versions is obtained assuming intermediate integration constant $C_1 = 0$. In this case, it would be possible to write

$$u = \frac{1}{r} = \sqrt[3]{\frac{2a_0\{\sin[-1.5\lambda^{0.5}(\psi + C_2)]\}^2}{\lambda\gamma^2}}, \tag{36}$$

C_2 being another (dimensionless) integration constant that depends on given border conditions. The orbits described by this equation vary with the values assigned to its constant parameters. In general, the equation describes parabolas. The equation may also describe a remarkable variety of spiral orbits, which includes spirals that expand or shrink very slowly so as to describe *quasi-circular* orbits, whose varying diameters pivot on the spiral's centre.

A second integration of Equation (34a) is relatively easy if one considers the particular case in which $\lambda = 0$, i.e., when it is possible to assume $6H^2 g(\alpha) / \gamma^2 = 1$. Then, the differential equation becomes

$$u^2\frac{d^2u}{d\psi^2} - \frac{a_0}{\gamma^2} = 0\,. \tag{37}$$

This equation can be solved through two changes of variable: first, replacing $du/d\psi$ with $y(u)$, and, after, through the replacement of $[C_1 u - (a_o / \gamma^2)]^{1/2}$ with z ; $C_1 > 0$ still being an intermediate integration constant (dimension = [L-2]) that depends on border conditions.

The solution is obtained in the form of the following inverse function:

$$\psi = \sqrt{\frac{2}{C_1^3}}\left\{\frac{a_0}{2\gamma^2}\ln\left[\sqrt{\frac{C_1}{r} + \frac{a_0}{\gamma^2}} + \sqrt{\frac{C_1}{r}}\right] + \sqrt{\frac{C_1^3}{r^2} - \frac{a_0C_1}{\gamma^2 r}}\right\} + C_2, \tag{38}$$

in which C_2 is another (dimensionless) integration constant. The interpretation of this equation is not easy. However, real values for ψ are possible only if

$$C_1 - a_o r/\gamma^2 \geq 0\,, \quad \text{or} \quad r \leq C_1\gamma^2/a_o\,,$$

which also implies $a_o \geq 0$ for any $C_1 > 0$, since $\gamma^2 > 0$ always. This means that central self-acceleration a_o (if it is not nil) must here be considered as centrifugal.

If $a_o = 0$, then angle $\psi = (2/C_1)^{0.5}/r + C_2$. In such a case, as expected [see (37)], the orbit becomes a spiral, which represents the *line of fall* of the attracted body towards the vortex core.

Condition $\lambda = 0$ imposes (remembering definition $H^2 = n^2V_c^2$) that $\gamma^2 = 6\, n^2\, V_c^2 g(\alpha)$. Thus, for any $a_o > 0$, the above variability constraints for r become

$$n \;\leq\; r \;\leq\; 6\, C_1 n^2\, V_c^2 g(\alpha)\, /\, a_o\,;$$

whence also the variability constraints for self-acceleration a_o, which are expressed by

$$0 < a_o \leq 6\, C_1 n^2\, V_c^2 g(\alpha)\, /\, r.$$

Nothing more can here be said about the gravitational orbits relevant to the particular case ($\lambda = 0$) described by (38), except that r, due to its constrained variability, and given any $a_o > 0$, must describe orbits that cannot expand beyond certain distances from the orbital focus, while considering that the extent of r - in correspondence of any ψ - depends also on local changes in the value of $g(\alpha)$ (which, in this special case, is constantly positive).

For further details and analysis concerning gravitational orbits, which also involve orbits of *included* vortices of lesser size, I suggest reading the sections of my book, where attempts are made to address more complicated issues (see references at the end of this article). Inevitably, the book addresses also possible interpretations of electromagnetic phenomena through the description of particular activities or states of the plenum.

In this paper, instead, I prefer to limit myself to gravity and gravitational issues, and to spend a few words on a possible experimental test suggested by the theoretical paradigm introduced here.

8. Supremacy of experimentation

In my view, what matters is the supremacy of any experimental activity aimed at giving direct or indirect evidence to the existence of the plenum. Scientists, especially those working in theoretical physics, should never forget that modern science thrives thanks to the supremacy of experimentation. No theory should be considered as a scientific one until it is corroborated by experimental evidence.

There are nowadays unquestionable clues that the belief professed by the XIX Century's physicists about the "ether" was justified though roughly expressed [6]. Light and electromagnetic fields in general provide the first sound basis for the hypothesis that the physical space is prevailingly characterised by the active presence of a fundamental substance, which *is not* material, whereas is *physical* and distinguished from the absolute void.

Others, before me, have already suggested the necessity to revise the foundations of physics starting from the study of the "vacuum" *as if it were the opposite* of the nothingness. This is now more-than-a-reasonable option, since even Einstein (the aggressive "initial killer" of the ether [7]) had to change his mind about the ether. In the light of both the achievements and the riddles that have sprung from the field of quantum dynamics, responding to such a necessity becomes no more deferrable.

In approaching the end of this essay I feel the moral obligation to suggest a way to oppose gravity by use of the same physical principles that bring gravity into existence. It is a difficult task that I cannot avoid, if I do really believe it is worth proposing the ideas I have so far expressed.

A reasonable interpretation for the magnetic effect between two parallel continuous electrical currents suggests that magnetic force cannot be *substantially* different from gravity force.

The velocity field created in the plenum by an electrical current involves not only electrons but also the other atomic components of the electrical conductors. For the sake of consistency, if we accept the hypothesis that the plenum is the actual medium of any action between different bodies, it would be impossible to explain why components of matter different from electrons are insensitive to what is so effective between two electrical currents. Also protons, at least as particles that bear electric charges, are affected by magnetic fields. In any case, I deem that no matter can escape the effects brought about by velocity fields of the plenum, irrespective of whether the matter is electrically charged or not.

Electrons are particularly "light and sensitive" components of matter, relatively "free" to roam metals and a number of various fluids and fluid solutions. Protons and nucleons in general are strongly bound to each other, which makes them affected by a remarkable inertia under external actions. On the other hand, where electrons enjoy a sufficient degree of liberty, their response to magnetic fields is strong enough to drag – through the medium they mobilize – also the other components of the associated matter which are considered as much less sensitive to magnetic fields.

If gravity is the effect of velocity fields of the kind described in the preceding paragraphs, then *anti-gravity* should also consist in a different velocity field of the plenum capable of neutralising or overcoming the gravity force.

The only suggestion I can here provide, as to the possibility of creating an antigravity field, is with respect to the draught of plenum associated with a flux of very speedy electrons, like that expected along a cathode beam created by a high electric potential.

Electron beams *drag* plenum around them inevitably. The cathode electrons should flow at least at the speed of 20,000 to 30,000 kilometres per second, as entailed by a difference of potential of about 2,600 Volt. The electron beam *drags* the adjacent plenum into a coaxial cylindrical distribution of plenum's velocities, which actually is an intense magnetic field, since this is the mechanism through which a magnetic field originates.

Around the flux of electrons, co-axial cylinders of plenum are put into co-motion at speeds that decrease with the distance from the origin of the motion, i.e., from the current of electrons.

As a preliminary and "conceptually simple" experiment, I can suggest the following. Refer to the sketch of **Figure 6** below.

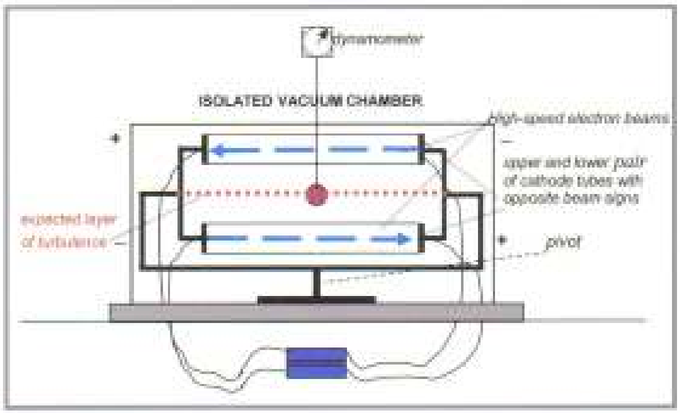

Fig. 6. Parallel cathode-ray tubes with opposite polarities placed at two different levels create a circulation of cosmic plenum around a dielectric body suspended between the tubes, thus determining changes in the weight of the body.

Take a piece of *dielectric material* and hang it through a thread on a very sensitive dynamometer. Place the dielectric body between two pairs of cathode-ray horizontal tubes to be kept parallel to each other on two different planes, both planes orthogonal to the vertical planes that minimise the distances between the upper and the lower pairs of tubes. A difference of electric potential of 15,000 to 20,000 volt should be established inside each cathode-ray tube so as to produce two pairs of parallel electron beams with opposite flow directions.

When the cathode sparks are released, a change in the weight of the suspended body should be recorded by the connected dynamometer: if not immediately, the effect should at least occur after a few seconds, since the atoms of the dielectric material need time to re-adjust to the new plenum velocity field involving them.

The described set of cathode-tubes should rest on a pivot, in order to allow the observer to rotate it horizontally. The weight of the suspended body should increase or decrease according to the horizontal direction of cathode-tubes with respect to the rotation of the Earth. Our planet rotates because of the vortex flow by which it has been generated. However, the inclination of the threads of the Earth's vortex flux is so far unknown.

This experiment should prove that the high-speed electron fluxes in the cathode-ray tubes interfere with the flux of plenum of the gravity field. There should be a position of the apparatus which minimises the weight of the sample body**:** the measurement of the variation in the weight of this, in relation to the electric potential that generates the high-speed electron beams, should provide the searched indications on the anti-gravity effect. By an approximate calculation, 18,000 Volt potential could be sufficient, at the most favourable orientation of the cathode-tubes, to neutralise the weight of about 150 grams of chalk of a spherical sample having 5 cm diameter, whose mass centre is at 7.5 centimetres from the above and below cathode rays.

Obviously, the practical implementation of such an experiment is not that easy, mainly because of the need for a vacuum-chamber (which is necessary to avoid misleading air ionization effects) and for the shielding against X-rays.

In addition to the test mentioned above, in my book [8] I sketch also the suggestion for a different attempt to control gravity. The idea is based on the way in which electromagnetic transverse waves are supposed to propagate across the plenum. At least at a theoretical level, it seems possible to generate a compound *electromagnetic wave characterized by a steady amplitude*, which is kept ample and strong enough to oppose the kinetic "circulation"- with relevant acceleration - that the gravity field determines around material bodies. For "steady amplitude" I do not mean *constant* amplitude of the wave, but *non-oscillating amplitude* instead**;** i.e., an electromagnetic quantity that does not oscillate with time as a result of the superimposition of component electromagnetic waves whose frequencies and amplitudes are suitably modulated for the purpose. Such a possibility is thought of in connection with the fact that *any* function of variable quantities can be decomposed according to appropriate Fourier series.

9. Conclusion

According to Einstein's late writings, the cosmic "*space, brought about by the corporeal objects and made a physical reality by Newton, has in the last few decades swallowed ether and time and also seems about to swallow the field and the corpuscles* [of quantum mechanics], *so that it remains as the sole carrier of reality*"[2]. Heisenberg, Thirring and several other scientists have substantially expressed this same opinion.

This essay formulates hypotheses on the properties of such a cosmic space, which is here named "the plenum". It is thought of as a *finite*, incompressible and continuous *whole*, not consisting of component particles, and endowed with a fluid consistence that allows it to generate a variety of motions, amongst which vortex of various kinds. According to the leading hypothesis of this essay, the r*ing-vortex* is an appropriate model to describe the salient features of a gravitational field. The new idea introduced here is the hypothesized co-presence of a *boundless true vacuum*, the *void*, and of its "dialectical" relationship with the plenum. Because of its motions and turbulences, this special cosmic fluid may break and open spots and/or space-strings to the *void*, i.e., to the absolute nothingness, around which the plenum may form various types of kinetic fields. In this connection, it is suggested that the formation of masses occurs just through the involvement of the *nuclei of void* that appear inside kinetic states of the plenum. Tears in the plenum entail some kind of viscosity of the fluid, but it cannot be *dynamic* viscosity to the extent to which *the plenum is* by hypothesis a medium *destitute of mass*. (This particular topic, however, will be addressed in a subsequent paper).

Through a tentative mathematical analysis, it has been possible to outline the behaviour of a ring-vortex as to its gravitational properties with respect to various "objects" involved by the vortex field of velocities. A number of possible *orbits* have been identified, though the general solution to the equation of the gravitational motions has not yet been determined.

The essay suggests also experiments for probing the alleged properties of the plenum.

References

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