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Energy of the Vacuum: Basic Brick for the Great Unification of Physics

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ABSTRACT

Modern physics is struggling for the great unification since General Relativity and Quantum Mechanics cannot agree on either a common energy density of the vacuum or a common understanding of the vacuum. This paper shows all the advantages and simple explanations the forgotten concept of aether, that was valid until Einstein's publications, can bring to these two branches of physics, unifying them with the third main branch of Physics, Maxwell's theory of electromagnetism. Assuming the aether is a perfect fluid filling space, gravity will be first assimilated to an aether wind. Secondly, a model of proton giving an excellent prediction of the proton radius will be proposed. Third, Einstein's famous equation $E=mc^2$ will be demonstrated and a physical explanation of the strong nuclear force will be proposed. Fourth, a meaning of the Lorenz gauge in electromagnetism will be given, and fifth the notion of mass and how mass cancellation can be envisioned will be exposed. The conclusion will give a focus on black holes theory. These considerations will cast new light on the Michelson and Morley experiment and possibilities of gravity cancellation.

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Introduction

At the end of 19th century, Lord Kelvin was assuming particles were vortex in a perfect fluid filling space, named the aether [1], but the existence of this aether was called into question by Michelson and Morley experiment of July 1887, that failed to prove the Earth was moving in a fixed aether. In his publication of 1926, Dayton Miller reminded the results of this experiment, that were not null but "the observations show that the relative motion of the earth and the ether is probably less than one sixth of the earth's orbital velocity and certainly less than one fourth" [2].

The same paper indicates he obtained measurements about 10 km/s +/- 0.6 km/s with his new set of experiments at Mount Palomar, and Einstein himself stated in his famous speech at Leiden University in 1920 that "according to the general theory of relativity space without ether is unthinkable".

As soon as the end of the 17th century, Issac Newton made the assumption that the origin of gravity was a density of the vacuum lower in matter than in surrounding space [3]. In a preliminary publication of his theory of electromagnetism, James C. Maxwell made the same assumption that "gravitation arises from the action of the surrounding medium in the way pointed out, leads to the conclusion that every part of this medium possesses, when undisturbed, an enormous intrinsic energy, and that the presence of dense bodies influences the medium so as to diminish this energy wherever there is a resultant attraction" [4].

Cosmology has introduced the concept of dark energy to explain the acceleration of the red shift of distant galaxies and quantum mechanics introduced the notion of Higgs field to explain why particles have a mass. These two branches of physics put into question the basic assumptions of their own theory. Numerous papers are now studying the properties of vortex filaments in an incompressible perfect fluid, that obeys Schrödinger equation, such as [5].

Let's revisit physics by reintroducing this energy of the vacuum as a foundation, and let's start with gravity.

Gravity as a Wind of Aether

Let's elaborate on Newton and Maxwell assumptions, and consider vacuum is filled with an incompressible perfect fluid. The fundamental equations of fluid mechanics are named after the famous Swiss mathematician Euler who lived in the 18th century.

In the case of a perfect fluid, i.e. without viscosity, Euler conservation equation of momentum is written :

$$\rho \frac{d\vec{v}}{dt} = -\overrightarrow{grad}\, P + \rho \vec{g} \qquad (1)$$

with :

$\vec{v}$ velocity of the fluid

$\frac{d\vec{v}}{dt}$ the acceleration of the fluid

ρ the volume mass of the fluid, constant for an incompressible fluid

P the pressure

$\vec{g}$ the acceleration due to external forces, usually gravity

In the case the fluid is aether itself, the external gravitation is null, because internal to the fluid. (1) becomes :

$$\frac{d\vec{v}}{dt} = -\frac{1}{\rho}\overrightarrow{grad}\,P \qquad (2)$$

but for a perfect fluid, we also have this relation between wave celerity c, pressure P , volume mass ρ and adiabatic coefficient γ

$$c = \sqrt{\frac{\gamma P}{\rho}} \qquad (3)$$

γ and ρ are constant, and c varies as the square root of P. Let's note c_∞ and P_∞ the celerity and pressure at infinity far from any mass.

Einstein's equivalence principle assumes the equivalence between gravity and an acceleration, thus, from (2) and (3) we get :

$$\vec{g} = -\frac{c_\infty^2}{\gamma . P_\infty}\overrightarrow{grad}\,P \qquad (4)$$

In a spherical coordinate system, and using Newton's law of gravitation outside an isolated spherical celestial body :

$$\vec{g} = -\frac{c_\infty^2}{\gamma . P_\infty}\frac{\partial P}{\partial r}\vec{u}_r = -\frac{G.M}{r^2}\vec{u}_r \qquad (5)$$

$$\frac{\partial P}{\partial r} = \frac{\gamma . P_\infty}{c_\infty^2}\frac{G.M}{r^2} \qquad (6)$$

by integration over r, $P(r) = P_\infty\left(1 - \frac{\gamma . G . M}{c_\infty^2 r}\right)$ (7)

Let's note c(r) the celerity at distance r of the center of a celestial body. Outside the celestial body:

$$\frac{c^2(r)}{P(r)} = \frac{c_\infty^2}{P_\infty} = \frac{\gamma}{\rho} = constant \qquad (8)$$

From (7) and (8) :

$$c^2(r) = c^2_\infty\left(1 - \frac{\gamma . G . M}{c_\infty^2 r}\right) \qquad (9)$$

If we compare (9) with the well known Schwarzschild solution of general relativity for an isolated non rotating spherical body :

$$ds^2 = c^2\left(1 - \frac{R_s}{r}\right)dt^2 - \frac{1}{\left(1 - \frac{R_s}{r}\right)}dr^2 - r^2\left(d\theta^2 + \cos^2\theta\, d\phi^2\right)$$

with $R_s = \frac{2.G.M}{c^2}$ (R_s)

we recognize in the dt^2 coefficient the expression of $c^2(r)$, and thus, we can conclude that the adiabatic coefficient of the aether equals 2 :

$$\gamma = 2 \qquad (10)$$

It should also be reminded that Einstein's paper [6] claiming that a gravity field bends light rays and that this could be proven during a total eclipse of the Sun, is clearly using a variable speed of light in a gravity field.

Simple Model of the Proton as a Vortex of Aether

Let's now take Lord Kelvin assumptions, and let's assimilate a particle to a toroidal vortex of aether.
We will note :

r_p : the external radius of a toroidal particle
r_s : the radius of the toroid section
ω : the angular velocity of the aether inside r_s section

and determine the kinetic momentum of this toroidal particle , rotating at angular velocity ω .

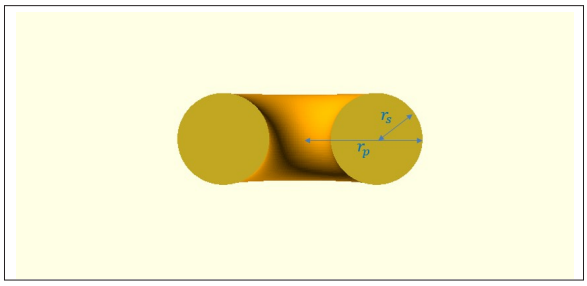

Figure 1: Radius of the Toroid

For an homogeneous cylinder of mass *m* and radius *r* rotating around its axis of symmetry, its kinetic momentum is equal to :

$$J = \frac{1}{2}m r^2 \omega \qquad (11)$$

We will assimilate a toroid rotating at speed ω to a curved cylinder rotating at the same angular velocity along its symmetry axis and thus, for such a toroid :

$$J = \frac{1}{2}m r_s^2 \omega \qquad (12)$$

Let's see what can be the maximum angular velocity for this toroid placed in an aether field of external pressure P.

From (3) and (10) $P = \frac{\rho c^2}{\gamma} = \frac{1}{2}\rho c^2$ (13)

[7] demonstrates that for a rotating fluid, the dynamic pressure P_{dyn} at distance r is :

$$P_{dyn} = \frac{1}{2}\rho r^2 \omega^2 \qquad (14)$$

At the maximum rotation speed, in order to have the toroidal particle stable, dynamic pressure and external pressure have to be equal, so from (13) and (14) we get $r\,\omega = c$ and from (12) we get :

$$J = \frac{1}{2}m r_s c \qquad (15)$$

For a toroidal particle, the maximum kinetic momentum is obtained when r_s is maximum ie when $r_s = r_p/2$:

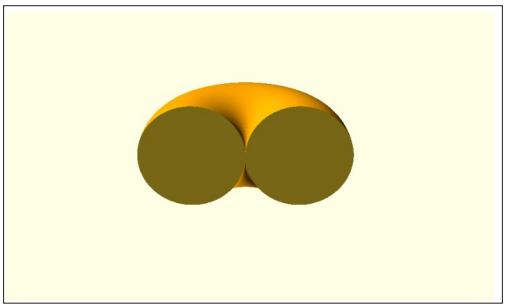

Figure 2: Toroidal particle with maximum Kinetic Momentum

$$J_{max}=\frac{1}{4}mr_pc \qquad (16)$$

In quantum physics, Bohr's quantification principle states that the kinetic momentum has to be a multiple of $\bar{h}$. Let's take the first possible value for the kinetic momentum of a proton of mass m_p :

$$J_p=\frac{1}{4}m_pr_pc=\bar{h} \qquad (17)$$

and so :

$$m_p.r_p=\frac{4\bar{h}}{c} \qquad (18)$$

Based on the official values of m_p,h,c in [8] :

m_p = 1,672 621 923 69(51) 10^{-27} kg
h = 6,626 070 15 10^{-34} Js
c = 299 792 458 m/s

The theoretical value of r_p is :

r_p = 0,841 235 641 34(26) fm (19)

The number in parentheses is the one-sigma (1 σ) uncertainty in the last two digits of the given value.

Experimental Verification of the Radius of the Proton

[9] teaches us that in 2010, the official value given by CODATA for the radius of the proton was 0,877(7) fm but that a new method of measurement was used by an international research team using the Lamb shift in muonic hydrogen and found a lower value of 0,841 84(67) fm, incompatible with previous CODATA value.

Since 2010, 5 new measurements have been published, and table 1 summarizes these measures.

Table 1: Published Measurements of Proton Radius Since 2010

Date	Value	Sigma	Value-1σ	Value+1σ
2010	0,84184	0,00067	0,84117	0,84251
2013	0,84087	0,00039	0,84048	0,84126
2017	0,8335	0,0095	0,824	0,843
2018	0,8414	0,0019	0,8395	0,8433
2019-1	0,833	0,01	0,823	0,843
2019-2	0,831	0,012	0,819	0,843

The low value of their common range (ie 0.84117) is given by the highest "value-1σ" while the high value of their common range (ie 0.84126) is given by the lowest "value+1σ". The central value is then 0.841 215 fm and the uncertainty is half of this range width, ie 0,000 045 fm.

It is easy to see that the theoretical value r_p = 0.841 235... fm given in (19) falls within this common range.

E=mc² and the Strong Nuclear Force

The binding energy between two protons is given by Einstein's formula : $\delta E=\delta m.c^2$
This formula can be very simply demonstrated with an aether field filling space.

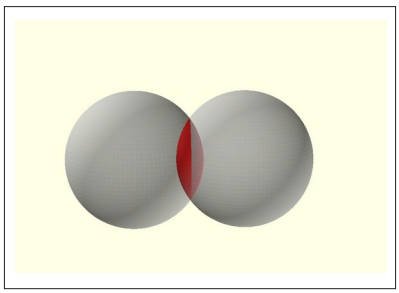

Figure 3: Nucleus with two protons

Let's take 2 protons maintained together in an aether field at pressure P . The demonstration is independent of the real shape of the protons, so figure 3 shows two spherical protons.

Let's call δ v the elementary volume in red in previous figure. The binding energy is the energy needed to separate the two protons in the pressure field *P*. This energy is the work needed to reduce external volume by δ v under pressure *P* :

Thus, the work W done to split the two protons is :

$$W=P\delta v \qquad (20)$$

From (20) and (13) $W=\frac{1}{2}\rho.\delta v.c^2$ (21)

$\rho.\delta v$ is the variation of mass δm_{tot} for the whole system made of two protons, since protons are vortex of incompressible aether :

$$\rho.\delta v=\delta m_{tot}=2\delta m \qquad (22)$$

where δ*m* is the variation of mass of one proton.
The variation of energy of the system is equal to the work of the external forces, and thus

From (21) and (22) $\delta E=W=\frac{1}{2}2.\delta m.c^2$ (23)

$$\delta E=\delta m.c^2 \qquad (24)$$

Strong Nuclear Force:

According to [10], the strong nuclear force is estimated to be attractive up to 25,000 N between 2 protons at a distance of 1 fm, but repulsive at distance lower than 0.8 fm and nearly null at 2.5fm.

With the model of a proton as a toroidal vortex of aether, we can imagine that two protons facing each other with opposite poloidal circulation will create a gearing effect.

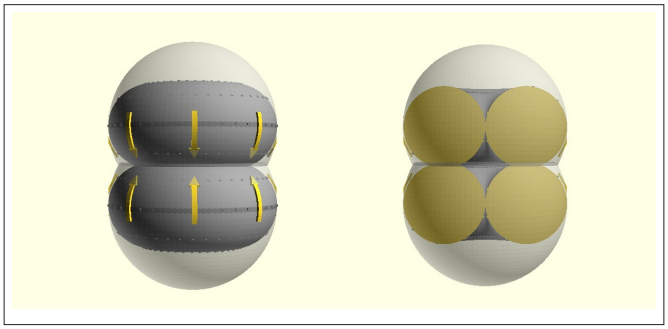

Figure 4: Two Toroidal Protons stuck by the strong Nuclear Force

Using this model, let's determine the contact surface needed to generate this force of 25,000N with an external aether field P that has the same energy density P as the proton itself. It is reminded that since the aether is assumed to be a perfect fluid, energy density and pressure are equivalent.

The energy density of a toroidal proton is: $P=\frac{m_p c^2}{\pi r_s^2 2\pi r_s}$ (25)

with $r_s=\frac{r_p}{2}$

$$P=\frac{4 m_p c^2}{\pi^2 r_p^3}\simeq 10^{35} J/m^3 \quad (26)$$

According to figure 5 below, the contact surface between the two toroidal protons is :

$$S_c=\pi r_s^2\left((1+x)^2-(1-x)^2\right)=4\pi r_s^2 x=\pi r_p^2 x \quad (27)$$

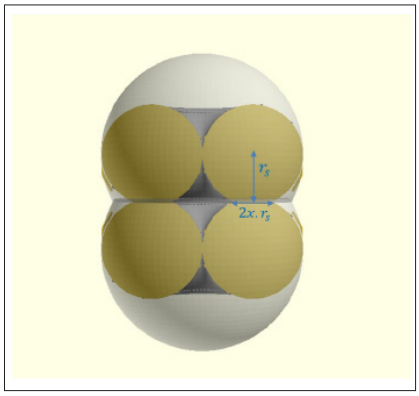

Figure 5: Two Toroidal Protons in Contact

In order to get a pressure force equivalent to the strong nuclear force:

$$P S_c=F_{strong} \quad (28)$$

$$x=\frac{F_{strong}}{\pi r_p^2 P}\simeq 11\% \quad (29)$$

This clearly shows that the hypothesis of the strong nuclear force assumed to be a gearing effect between two toroidal protons has a lot of credibility, more than the hypothetical gluons.

Electron, Neutron and Antimatter

With the same approach that for the proton, the electron can be assimilated as a annular vortex of aether, but with an internal radius at least the size of a proton. As such, it can be placed at the equator of a proton to constitute a neutron, but this position is not a stable equilibrium, and this can explain why the life time of an isolated neutron is about 15 minutes only.

The toroidal vortex combines two circulations of aether : a poloidal circulation and a toroidal circulation, parallel to the tore itself. The combined movement is levogyre or dextrogyre, giving a positive or negative charge. Antimatter corresponds to an inversion of the rotation direction.

Lorenz Gauge in Electromagnetism

The Lorenz gauge is a well known condition in the modern version of the theory of electromagnetism linking the potential-vector A and the electrical potential V to simplify the 4 Maxwell equations revised by Heaviside. In current interpretation of the theory, the potential-vector A is purely a mathematical concept with no physical existence, although the Aharonov-Bohm effect discovered in 1959 can be explained only with a physical meaning of A. This is already true in [11], since all Maxwell theory is based on Fluid Mechanics applied to the aether, and the very last sentence of his conclusion is very clear : "Hence all these theories lead to the conception of a medium in which the propagation takes place, and if we admit this medium as an hypothesis, I think it ought to occupy a prominent place in our investigations, and that we ought to endeavour to construct a mental representation of all the details of its action, and this has been my constant aim in this treatise."

Ref [12] brings a generalisation of Maxwell equations, without the Lorenz gauge condition verified, and shows that longitudinal waves, ie compression waves, are solutions of these generalised equations. Let's clarify what is the meaning of the Lorenz gauge when used in the correct units.

Its current expression is:

$$\nabla.\vec{A}+\epsilon_0\mu_0\frac{\partial V}{\partial t}=0 \quad (30)$$

In [11] Vol II Chapter XX "Electromagnetic theory of light", Maxwell assumes electric potential is due to the elasticity of the medium that is polarized. Let call ρ_c the local volume density of charges in C/m³. The Lorenz gauge can be rewritten :

$$\frac{\rho_c}{\epsilon_0\mu_0}\nabla.\vec{A}+\rho_c\frac{\partial V}{\partial t}=0 \quad (31)$$

This equation is expressed in W/m³ and this equation is an equation of conservation of the energy density flux. When $\frac{\partial V}{\partial t}$ reaches very high values, like Nikola Tesla was doing with his Tesla Coils, the Lorenz gauge is no more verified, and energy flux is injected or extracted from the aether. The correct formulation should be :

$$\frac{\rho_c}{\epsilon_0\mu_0}\nabla.\vec{A}+\rho_c\frac{\partial V}{\partial t}=\frac{\partial P}{\partial t} \quad (32)$$

and this formulation explains the longitudinal waves ie compression waves that are created in such a case, as stated in [12]. These longitudinal waves were detected by Nikola Tesla as early as 1892 according to [13].

Quantum Entanglement

Quantum entanglement has no physical explanation with official science since its violates the theory of general relativity. A longitudinal wave in a incompressible fluid has an infinite velocity, so quantum entanglement can be explained as stationary longitudinal waves between two particles.

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Curvature of Space

In the field theory of gravity, gravity is expressed through the Gauss equation :

$$\nabla . \vec{g} = -4\pi\rho_m G \qquad (33)$$

With G gravitational constant and ρ_m density of matter

From (4)(33) $$\nabla . \vec{g} = -\frac{{c_\infty}^2}{\gamma . P_\infty} \nabla . \overrightarrow{\nabla P} = -4\pi\rho_m G \qquad (34)$$

Since γ = 2 $$\Delta P = \left(\frac{8\pi P_\infty G}{{c_\infty}^4}\right) . \rho_m . {c_\infty}^2 \qquad (35)$$

We recognize in this expression the formula of Einstein cosmological constant Λ but determined with a pressure that has nothing to do with the "dark" energy density of modern science. Let's note Λ_∞ this cosmological constant determined with the aether pressure estimated to be about 10^{35} J/m³ as seen in (26). Let's note also ρ_E the energy density of matter.

$$\Delta P = \Lambda_\infty . \rho_E \qquad (36)$$

From a physical point of view, the Laplacian operator is the curvature operator acting on field P, and (36) states that the energy density of matter curves the pressure field, as if matter was behaving as a sink, sucking the aether. This raises a very interesting question : where does the aether go ?

Einstein's Equivalence Principle

General relativity theory is based on Einstein's equivalence principle between a gravity field and an acceleration but this remains a principle that is not explained from a physical point of view.

The explanation is very simple : since aether is sucked by matter, and since gravity is an accelerated aether wind, a body on a planet is crossed by a downstream accelerated aether wind.

At the opposite, a body accelerating is space far from any other mass crosses an aether wind supposed to be at rest. The two effects are equivalent, hence the equivalence principle.

Notion of Mass and Mass Cancellation

[14] and [15] have led to the conclusion that particles have no mass, and get their mass from their interaction with the vacuum. Modern physics introduces the Higgs boson, responsible of the interactions with matter. A much simpler explanation can be given using standard fluid mechanics, applied to a body immersed in a perfect fluid. The well-known result as shown in [16] §678 is that the body gets an apparent mass proportional to fluid density when its accelerates. This is its inertial mass.

In a gravity field, the grave mass is due to a downstream accelerated aether wind. For an acceleration and a gravity field of the same intensity, inertial mass and grave mass are identical.

If a body, let's say an advanced craft, is able to shield the downstream aether wind of a gravity field, it will cancel its mass, since particles have no mass according to Higgs theory. A theoretical mean to achieve this result would be to isolate the craft in an aether vortex, that cannot be penetrated by the external gravity wind.

Cancellation of Gravity

Cancelling gravity locally means shielding the downstream aether wind of the gravity field. This is exactly the same principle that the cancellation of mass, meaning that an advanced craft that is able to cancel gravity also cancels its mass.

The potential vector A in electromagnetism has to be understood as the density momentum of the aether. An electrical current generates a density momentum A co-linear with the current, so creating a vortex of aether can be done with very high circular electrical currents. An effective way would be a highly charged plasma, like liquid metal plasma, circulating in a toroid.

Magnetic Field

Modern science does not give a clear explanation to what is a magnetic field and why two magnets repels each other. The equations of electromagnetism indicates that the magnetic field B is the curl of the potential vector A, so in physical terms, the vorticity of the density momentum of the aether. The magnetic field is the signature of an aether vortex. Two vortex facing each other in contrarotation repels each other, while two vortex aligned with the same direction of rotation attracts each other.

Michelson and Morley Experiment

In [2], D.Miller indicates he obtained values of 10 km/s for the aether wind during his tests at Mount Palomar. In [17], he published refined measurements of the aether wind, with a maximum value of 11.2 km/s obtained with Aug 1, 1925 measures. This is far from the expected 30 km/s, orbital velocity of the Earth around the Sun, and even further from 200 km/s taking into account the displacement of the Sun towards Vega, but significant anyway to consider that speed of light is not constant in all reference frames. This measure of 11.2 km/s had no physical explanation up to now. As explained above, gravity is an accelerated aether wind, sucked by matter. With this view in mind, the explanation of this asymptotical value of 11.2 km/s is quite simple as it is the escape velocity of the Earth.

The escape velocity is also the velocity of a body in free fall from infinity, as determined by the law of conservation of the total energy, kinetic plus potential energy, null at infinity:

$$\frac{1}{2} m v^2 - \frac{GmM}{r} = 0 \qquad (37)$$

For an Earth radius R of 6371 km, the escape velocity is :

$$v_{esc} = \sqrt{\frac{2GM}{R}} = 11.2 \text{ km/s} \qquad (38)$$

This result is a perfect match with this theory and Dayton Miller measurements.

Black Holes

Black holes are a singularity of the theory of General Relativity and their existence raises a lot of questions. Again, we will see that aether theory brings very simple answers, with no singularity. Let's go back to the very definition of a black hole. At its horizon, the escape velocity is equal to the speed of light, which is variable in a gravity field.

From (9) and (R_s) $$c(r) = c_\infty \sqrt{1 - \frac{R_s}{r}} \qquad (39)$$

From (38) and (R_s) $$v_{esc}=\sqrt{\frac{2.G.M}{r}}=c_\infty\sqrt{\frac{R_s}{r}} \quad (40)$$

But at the horizon $c(r)=v_{esc}$ then $$1-\frac{R_s}{r_{horiz}}=\frac{R_s}{r_{horiz}} \quad (41)$$

$$r_{horiz}=2R_s \quad (42)$$

Aether theory finds that the true horizon of a black hole is twice the value given by the theory of General Relativity.

The aether pressure is given by (7) that gives a null value at $r = R_s$.

And at the true horizon $$P(r_{horiz})=\frac{P_\infty}{2} \quad (43)$$

A null value at the horizon is yet a singularity since aether pressure still decreases in matter and that would give a negative pressure inside the black hole, which has no physical reality.

The minimum radius of a black hole is obtained when the pressure at its center reaches 0. Let's determine now this minimal radius R_{min} .

Inside a homogeneous celestial body of radius R, at a distance r from the center, by integration of (33) it is well known that the gravitational field varies linearly with r and verifies :

$$g(r)=g(R)\frac{r}{R} \quad (44)$$

$$g(r)=\frac{G.M}{R^2}\frac{r}{R}=\frac{G.M}{R^3}r \quad (45)$$

From (4) and (45) $$\frac{G.M}{R^3}r=\frac{c_\infty{}^2}{2.P_\infty}\frac{\partial P}{\partial r} \quad (46)$$

$$\partial P=P_\infty\frac{2.G.M}{c_\infty{}^2R^3}.r\,\partial r \quad (47)$$

From (R_s) $$\partial P=P_\infty\frac{R_s}{R^3}.r\,\partial r \quad (48)$$

By integration of (48) from R to r:

$$P(r)=P_\infty\left(\frac{R_s}{2.R^3}(r^2-R^2)+Constant\right) \quad (49)$$

From (49) and (7) at r = R $$Constant=1-\frac{R_s}{R} \quad (50)$$

From (49) and (50) $$P(r)=P_\infty\left(\frac{R_s}{2.R^3}(r^2-R^2)+1-\frac{R_s}{R}\right) \quad (51)$$

From (51) we can determine the critical radius R_{min} of a black hole where pressure becomes zero at the center, let's say:

$$P(0)=0 \quad (52)$$

From (51) and (52): $$-\frac{R_s}{2.R_{min}}+1-\frac{R_s}{R_{min}}=0 \quad (53)$$

$$R_{min}=\frac{3}{2}R_s \quad (54)$$

From (42) and (54) we can conclude that black holes can have a physical reality and are no more a singularity as long as their radius is comprised between $2R_s$ and $\frac{3}{2}R_s$.

Anomaly of Spiral Galaxies

Cosmology has introduced the yet to be explained concept of dark matter to justify the speed anomaly of stars at the periphery of a spiral galaxy. A much better explanation is that a spiral galaxy is a gigantic vortex of aether driving stars in its stream, potentially towards a central black hole.

Drift of Mercury's Perihelion

Einstein has been able to provide a formula giving a correct estimation of the non-Newtonian drift of Mercury's perihelion, which is about 40 arc-second per century, and this is one of the justifications used to consider that the theory of general relativity is correct. The relative variation over one orbit is given by Einstein's formula :

$$\frac{\Delta\theta}{2\pi}=\frac{3}{2}\frac{R_s}{a(1-e^2)} \quad (55)$$

with
a :semi-major axis of the orbit of the planet
e : eccentricity of the orbit of the planet
R_s : Schwarzschild radius of the central celestial body

Applied to planet Mercury (55) gives a relative variation of $8.\ 10^{-8}$

Taking into account the physical meaning of what is mass, a coupling with the pressure of the vacuum, there is no reason to have a constant mass when pressure varies along the orbit.

The demonstration of Kepler laws relies on the basic principle of dynamics, assuming the mass of the planet is constant, and neglecting the last term of (56) :

$$\Sigma Forces=\frac{dp}{dt}=\frac{d(mv)}{dt}=m\frac{dv}{dt}+\frac{dm}{dt}v \quad (56)$$

Let's now evaluate the relative variation of the Ether pressure field along the orbit of a planet around a star.

At the perihelion and aphelia : $$r=a(1\pm e) \quad (57)$$

The relative variation of pressure $\frac{\Delta P}{P}$ is close to $\frac{\Delta P}{P_\infty}$.

From (7) (57) (R_s) $$\frac{\Delta P}{P_\infty}=\frac{R_s}{a}.\left(\frac{1}{1-e}-\frac{1}{1+e}\right) \quad (58)$$

$$\frac{\Delta P}{P_\infty}=2e\frac{R_s}{a(1-e^2)} \quad (59)$$

Over one turn, the absolute variation of pressure is even twice this value when transiting from perihelion to aphelia to perihelion again.

$$\frac{\Delta P_{tot}}{P_\infty}=4e\frac{R_s}{a(1-e^2)} \quad (60)$$

(55) and (60) give the same order of magnitude in a ratio close to ½ in the case of planet Mercury, but General Relativity gives a surprising non-null result when eccentricity is null. An accurate evaluation of the drift of Mercury's perihelion determined with aether physics is given in [18] with a theoretical value of 38.8 arc-second per century, in perfect accordance with the measurements done by French astronomer Le Verrier in the 19th century.

Conclusion

Theory of a vacuum filled with an incompressible perfect fluid brings very simple explanations to many mysteries of physics where modern science cannot give satisfactory explanations. Einstein's hypothesis (constant speed of light, empty vacuum, curved space) have to be inverted to get a much better understanding of underlying physical principles, while bringing the same high level results. These explanations shed new light on Nikola Tesla's words that he pronounced in New-York the day of his 81th birthday, on July 10th, 1937 :

« I returned to this country in 1892 eager to devote myself to the subject of predilection on my thoughts: the study of the universe. During the succeeding two years of intense concentration I was fortunate enough to make two far-reaching discoveries. The first was a dynamic theory of gravity, which I have worked out in all details and hope to give to the world very soon. It explains the causes of this force and the motions of heavenly bodies under its influence so satisfactorily that it will put an end to idle speculations and false conceptions, as that of curved space […]

Only the existence of a field of force can account for them and its assumption dispenses with space curvature. All literature on this subject is futile and destined to oblivion. So are also all attempts to explain the workings of the universe without recognizing the existence of the aether and the indispensable function it plays in the phenomena. My second discovery was a physical truth of the greatest importance […] There is no energy in matter other than that received from the environment »

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