Centrifugal Force and the Electron-Positron Sea

Frederick David Tombe,
Northern Ireland, United Kingdom,
sirius184@hotmail.com
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Abstract. **We often hear it said that centrifugal force is not a real force and that it is only the effects of inertia that are caused by a body undergoing its uniform straight line path, as per Newton's first law of motion. These effects of inertia however are very real and this suggests that the inertial path itself must have an underlying physical cause. This cause will now be ascribed to a background elasticity that is rooted in electrostatics. The electric dipole, with its inverse cube law field, will be proposed as the primary physical cause of centrifugal force, while the inertial path and the Mach Principle will be seen to result from the compound effect of a dense multitude of superimposed dipole fields filling all of space.**

The Dipole Field

I. In the absence of a force field, and unless subjected to a physical constraint, a body will move in a uniform straight line path known as the inertial path. This is equivalent to stating Newton's first law of motion.

A pivoted spinning gyroscope can defy gravity. Its apparent weight is shifted from the centre of mass to the pivot. Mainstream physicists argue that this counter-intuitive behaviour can be fully explained by Newton's first law of motion. While this is true, it is not the full story. The force in question that acts against gravity is the Coriolis force, yet this key fact is generally omitted from the mainstream literature for the reason that the Coriolis force is wrongly believed to be merely an artefact of making observations from a rotating frame of reference. It follows therefore that mainstream physicists also deny that a Coriolis force is involved in the simple case of a body undergoing its straight line inertial path. The following analysis will however demonstrate that on the contrary, Coriolis forces and centrifugal forces are latently present in the uniform straight line inertial path.

Consider a particle in motion in an inertial frame of reference. We write its position vector relative to any arbitrarily chosen polar origin as,

$$\mathbf{r} = r\hat{\mathbf{r}} \qquad \textbf{(1)}$$

where the unit vector $\hat{\mathbf{r}}$ is in the radial direction and where r is the radial distance. Taking the time derivative and using the product rule, we obtain the velocity term,

$$\dot{\mathbf{r}} = \dot{r}\hat{\mathbf{r}} + r\dot{\theta}\hat{\boldsymbol{\theta}} \qquad \textbf{(2)}$$

where $\hat{\boldsymbol{\theta}}$ is the unit vector in the transverse direction and where $\dot{\theta}$ is the angular speed about the polar origin. Taking the time derivative for a second time, we obtain the expression for acceleration in the inertial frame,

$$\ddot{\mathbf{r}} = \ddot{r}\hat{\mathbf{r}} + \dot{r}\dot{\theta}\hat{\boldsymbol{\theta}} + \dot{r}\dot{\theta}\hat{\boldsymbol{\theta}} + r\ddot{\theta}\hat{\boldsymbol{\theta}} - r\dot{\theta}^2\hat{\mathbf{r}} \qquad \textbf{(3)}$$

which can be rearranged as,

$$\ddot{\mathbf{r}} = (\ddot{r} - r\dot{\theta}^2)\hat{\mathbf{r}} + (2\dot{r}\dot{\theta} + r\ddot{\theta})\hat{\boldsymbol{\theta}} \qquad \textbf{(4)}$$

The straight line inertial path occurs when equation **(4)** is equated to zero, and it should be noted that centrifugal and Coriolis terms both appear in the equation. Mainstream physicists will however deny that these centrifugal and Coriolis terms correspond in any way to the fictitious centrifugal and Coriolis forces which they promote in the literature in conjunction with rotating frames of reference. Nevertheless, it is the Coriolis term in equation **(4)** that is responsible for the gravity defying effect that is observed in a spinning pivoted gyroscope, and it is unconvincing to attribute the cause of the gravity defiance merely to Newton's laws of motion without highlighting this physically real force that is latent in the inertial path. Without recognizing this active inertial force, the gyroscopic behaviour is counter-intuitive, because otherwise the only recognized force is downwards. With the only recognized force being the downward action of gravity, it's not easy to grasp how the mere tendency to move in a straight line is going to result in a sustained opposition to the downward action of gravity on the centre of mass. The existence of the Coriolis force that is hidden in the uniform straight line inertial path needs to be highlighted and exposed before Newton's laws can serve as a convincing explanation for why a pivoted spinning gyroscope doesn't fall to the ground like a stone.

Even when we do recognize the reality of the hidden Coriolis force, we still however appear to have a dilemma. The Coriolis and centrifugal terms in equation **(4)** are not unique. We can identify centrifugal and Coriolis forces with respect to *any* arbitrarily chosen point origin and the values are different in each case. Indeed, what is a centrifugal force for one chosen origin can be a Coriolis force for another.

So how can the inertial forces be physically real if they change their value for different points of origin? And what could the physical explanation be? One possible explanation is that the uniform straight line inertial path is a consequence of the sum of individual fundamental centrifugal forces that originate at every point in space. But what would cause those fundamental centrifugal forces in the first place?

It's an established fact that the force field surrounding an electric dipole obeys the inverse cube law in distance. It's also an established fact that the straight line inertial path results in conservation of angular momentum, relative to any arbitrarily chosen point origin, and that therefore the associated centrifugal force, as well as being directly dependent on angular momentum, is also, just as in the case of the electric dipole field, inversely dependent on the cube of the distance to that origin. See section **V** below.

In a gravitational field, the radial component of equation **(4)** can be written,

$$\ddot{r} = -k/r^2 + l/r^3 \qquad \textbf{(5)}$$

where k is the gravitational constant and l is a constant related to angular momentum. Equation **(5)** was first postulated in the seventeenth century by Gottfried Leibniz. Because the interplay between the gravitational inverse square law attractive force and the inverse cube law centrifugal repulsive force involves two different power laws, this leads to stable equilibrium nodes and hence to stable orbits which are elliptical, circular, parabolic, or hyperbolic. The centrifugal repulsive term in equation **(5)** will be there whether or not gravity is involved, and the fact that it follows the inverse cube law makes it reasonable to suspect that the inertial path is caused by a dense sea of tiny electric dipoles.

The Electron-Positron Dipole Sea

II. Consider the idea that space is densely packed with tiny electron-positron dipoles on the pico-scale, so that they can flow through gross matter as like water flows through a basket [1], [2]. Further consider the idea that an electron is a sink in a continuous fluid-like aethereal medium which is dynamic, compressible, and stretchable [3], and that vorticity surrounding the sink has the effect of constricting the inflow in the equatorial plane. Consider a positron to be an aether source, and such that vorticity surrounding it has the effect of increasing the outflow in the equatorial plane. The vorticity (rotation) surrounding the source is therefore like a fundamental Archimedes' screw. Tension and pressure in the aether will accelerate other sinks and sources, but sinks and sources will not be governed by the velocity of the aether, and they

will be free to move through the aether at arbitrary velocities. An electron-positron dipole, such that the electron and positron are in mutual circular orbit, is a dipolar vortex and will therefore serve as the fundamental cause of centrifugal force, while a dense sea of such dipoles all pressing against each other with centrifugal force while striving to dilate **[4]**, then becomes the basis upon which the inertial path can be defined, and upon which rotation and the Mach Principle can be understood. None of these electron-positron dipoles could possibly be rotating if they didn't have immediate neighbours relative to which the rotation could occur and such as would induce vorticity in the aether, while gross matter could not rotate unless a background medium exists relative to which the rotation can occur.

The electrostatic field surrounding an electron-positron dipole will obey the inverse cube law, and if the dipole is angularly accelerating, the centrifugal repulsive force field will be increasing in the equatorial plane of the angular acceleration. It is proposed that in the absence of rotation, attraction is dominant, and that this is the basis for stability throughout the universe. Rotation undermines the tendency to collapse.

The Inertial Path

III. The centrifugal force field surrounding an electron-positron dipole will be dependent on both its angular momentum and the inverse of the cube of the distance from the dipole. Consider a body of gross matter immersed and stationary in the all pervading background electron-positron sea. As in the case of a body immersed in the Pacific Ocean, the hydrostatic pressure, primarily caused by the Earth's gravitational field acting on the ocean, will be pushing in on the body from all directions.

Whether the pressure in the electron-positron sea is ultimately sustained by a gravitational field, or by a magnetic field, or both, the immediate contact pressure acting on a submerged body is caused by the combined centrifugal force being generated by all the electron-positron dipoles in the sea, just as the pressure acting on an immersed body in the Pacific Ocean is caused by the combined effect of all the water molecules in the ocean pressing together from all sides. In the static case, the centrifugal pressure will mathematically cancel and there will be no net centrifugal acceleration.

Now consider that the body starts to move through the electron-positron sea. The motion will induce a shear stress relative to the immediately surrounding electron-positron dipoles, which will induce in them an angular acceleration, as well as a reactive angular acceleration in the molecules of the body itself. It is proposed that the molecules of the body will then precess with their precession axes aligned in the direction of motion. This fine-grained

angular momentum is the physical basis of kinetic energy and linear momentum in gross matter, and the body will have an angular momentum on the large scale, relative to every electron-positron dipole in the sea beyond, apart from in the case of those dipoles lying along the line of motion. Centrifugal forces, different relative to every point in space, can then be identified and quantified with respect to the large scale angular momentum of the body and the inverse of the cube of the distance of the body to that point.

These centrifugal forces can be attributed primarily to the electrostatic repulsive force that is being generated by the individual electron-positron dipole which is located at the chosen point origin. And that's why centrifugal force obeys the inverse cube law. This is then supplemented by the additional pressure that arises due to the additional angular speed of the electron-positron dipoles that are in contact with the moving body, and which has been induced by the contact shear stress as the body moves through the dipole sea. The convectively induced centrifugal pressure will be at right angles to the direction of motion and this fact explains the dependence on angular momentum. The straight line inertial path through the electron-positron sea as a whole is the result of the compound effect of the many centrifugal force fields that are being generated by all the electron-positron dipoles in the sea.

Planetary Orbits

IV. In the case of planetary orbits, the shear action that generates the centrifugal force occurs at the interface between the two regions of the electron-positron sea that are entrained by the two respective gravitational fields. The shear action at the interface angularly accelerates the tiny electron-positron *idler wheels* in that locality, hence increasing the aether outflow from the positrons while decreasing the aether inflow into the electrons. This causes a cushion of aether pressure at the interface, which rather than causing friction, actually causes the hovercraft effect which we identify as centrifugal force. As far as Kepler's second law is accurate, there is no vorticity in the gravitational fields of the planets, and so the large scale aether inflow that is being caused by the planetary sinks is irrotational and is not constricted by the rotatory effect of the orbital motion. The large scale vorticity that might have been caused by the orbital motion seems to have been absorbed by the tiny rotating electron-positron dipoles. It's only at the interface between the two gravitational fields that the aether tension caused by gravity is cancelled by the centrifugal pressure that is caused by the rotating electron-positron dipoles.

The Elimination of the Elasticity Constant

V. If centrifugal force is due to electrostatic repulsion, it still needs to be explained why the elasticity factor in Coulomb's law, known as the electric permittivity ε, doesn't show up in the centrifugal force formula. One might have expected the electric permittivity to appear in the formula for centrifugal force if the root cause were to lie in Coulomb's law of electrostatics. Instead, the formula for centrifugal force suggests that it is purely a matter of geometry, albeit that the geometry in question is dictated by the physical presence of a background sea of electron-positron dipoles relative to which motion can be defined.

The answer to this conundrum lies firstly in the fact that the centrifugal force on the large scale is a convective effect that is over and above an already existing uniform centrifugal pressure that is present even in the static state, and which is not observed because it is balanced and symmetrical. The centrifugal pressure in the static case is related to the centrifugal pressure of the individual rotating electron-positron dipoles that are pressing against the body. This pressure is in turn related to the squares of the circumferential speeds of the rotating electron-positron dipoles, which we will denote as c^2. This c^2 factor can be shown to be a function of the elasticity factor ε in Coulomb's law. The calculation to show this inter-relationship can be seen in section **2** of the article ***"The Speed of Light"*** **[5]**.

It then remains to ascertain how the centrifugal pressure increases as a result of a body moving through the electron-positron sea, and to show how the increase is a function only of the speed of the moving body. As a body moves at speed v past a rotating electron-positron dipole, the mutual speed could be anything between $c + v$ and $c - v$. Although the stability of the sea as a whole depends on a magnetic alignment and/or the presence of a radial force field (electrostatic or gravitational), which will in turn have the effect of deflecting a moving body from its straight line inertial path, this article is considering only the ideal case in which there is neither solenoidal (magnetic) nor radial (electric or gravitational) force fields present. In this ideal generalized case, the effective speed as between a moving body and an adjacent rotating electron-positron dipole will on average be $\frac{1}{2}[(c + v)^2 + (c - v)^2]$, which expands *to* $c^2 + v^2$. Hence the additional convectively induced component of the pressure, acting at right angles to the direction of motion, over and above the already existing uniform static pressure in the electron-positron sea is v^2. We know that the instantaneous centrifugal acceleration of a body relative to any arbitrarily chosen point origin is v^2/r, where v is the transverse speed and r is the distance to the origin, and so we now know that this additional convectively induced pressure is due to the elasticity factor ε, which is the electric permittivity in the electron-positron sea.

In the case of a body that is moving in its uniform straight line inertial path, the instantaneous transverse speed with respect to the chosen origin will vary with time, but from the law of conservation of angular momentum, the product $r^2\omega$, which we will denote by the letter l, will be a constant. The angular speed ω must therefore equal l/r^2, and since $v = r\omega$, the centrifugal acceleration v^2/r is equal to $r\omega^2$. It follows therefore that, consistent with Leibniz's equation (equation **(5)** above), the centrifugal acceleration is equal to l^2/r^3.

Hence the fact that the centrifugal acceleration of a moving body, with respect to any arbitrarily chosen point origin, is proportional to its angular momentum and inversely proportional to the cube of the distance to that point, can be attributed to Coulomb's law of electrostatics, as applied to the dipole field, operating latently within a background sea of electron-positron dipoles.

The Coriolis Force

VI. The uniform straight line inertial path is caused by compound centrifugal force. The electron-positron sea presses against the moving body in all directions and the resulting motion arises from the compound effect of all the centrifugal force fields in the sea. As stated above in section **I**, a centrifugal force from the perspective of one arbitrarily chosen point origin can be a Coriolis force for another origin. However, there is a physical reality to the inertial path which results in a physical distinction between the centrifugal force and the Coriolis force.

A body undergoing its uniform straight line inertial path is comprised of molecules which are precessing with their precessional axes directed along the direction of motion through the electron-positron sea. This fine-grained angular momentum is the fundamental physical basis of both linear momentum and angular momentum on the large scale. It is a consequence of the physical interaction between the molecules of the body and the background electron-positron sea, and it has parallels with that of a turbine being caused to rotate in the wind. Fine-grained gyroscopic stability contributes towards the uniform straight line inertial path. In the case of a physically rotating system, when we choose the centre of rotation as the polar origin, the physical explanation for centrifugal force is different from that of the Coriolis force. The rattleback (Celtic stone) is the best physical example of ordinary centrifugal force. The asymmetry of the rattleback means that in the rocking mode, the centrifugal force couple acts out of the plane of rotation that is associated with the rocking motion. This centrifugal force couple changes the angular momentum of the rattleback leaving no doubt that centrifugal force is a real physical force. Without acknowledging the reality of the centrifugal force, it would be impossible to explain how the rattleback works. And because mainstream

physicists don’t believe in centrifugal force as a real force, they can’t explain the rattleback.

The Coriolis force on the other hand only becomes physically evident in a rotating system when a body is constrained to move in a radial direction. When this occurs, the radial speed and the transverse speed of the body become segregated and independent of each other, although still physically connected through the rotating system. One example of this, as mentioned in section **I** above, is the case of a spinning gyroscope that is subjected to a forced precession. Looking into the rim of the spinning gyroscope, the elements of the disc are moving radially with respect to the axis of the forced precession **[7]**. Hence a Coriolis force couple is induced in the gyroscope at right angles to the forced precession. The underlying physical cause of this Coriolis force is closely related to the P-Factor in aerodynamics. It arises through the electron-positron wind causing an asymmetry in the centrifugal pressure with which the electron-positron sea presses against the molecules of the gyroscope when their angle of attack increases. A Coriolis force is a compound centrifugal force that arises when an asymmetry is introduced in the centrifugal pressure surrounding a moving body. Contrary to what has been stated in earlier articles in the series, there is no Coriolis force involved in the rattleback. The rattleback is the best physical demonstration of ordinary centrifugal force and the asymmetry is in the rattleback itself rather than in the surrounding electron-positron sea.

The Electromagnetic Connection

VII. The fine-grained angular acceleration induced in the surrounding electron-positron sea, due to the acceleration of a body of gross matter, is similar in principle to that of the magnetic field that is being induced around an electric circuit as the current increases.

When one dipole angularly accelerates for whatever reason, this will cause a net flow of pressurized aether to emerge from the positron and surge over into the electron of a neighbouring dipole. This in turn will have the effect of pulling on that neighbouring electron so as to cause the dipole, of which that electron is a part, to angularly accelerate also. This causes the cycle to perpetuate to the next neighbouring dipole along the line **[6]**. Meanwhile, the first dipole will angularly decelerate as it confronts the newly induced excess pressure in the second dipole, and hence it will return to its original equilibrium state. This fine-grained pico-scale rotational hydrodynamical wave action constitutes electromagnetic radiation.

The speed of electromagnetic radiation is determined by the average speed that pressurized aether flows from positrons to their immediate electron

neighbours. This is also what determines the escape velocity of the individual electrons and positrons within a dipole, and hence also their orbital speeds [5].

Conclusion

VIII. The uniform straight line inertial path of Newton's first law of motion necessarily assumes the existence of a rational basis relative to which a straight line can be defined, and relative to which rotation can be measured. Additionally, with respect to any chosen point origin, the transverse component of the uniform straight line inertial path induces a real radial physical force when the body is constrained to a fixed distance from that origin.

It is proposed that centrifugal force is fundamentally caused by the principle that vorticity tightens sinks and loosens sources, and that in the absence of rotation, attraction dominates. A dense sea of tiny electron-positron dipoles on the picoscopic scale, pervading throughout the universe, with electrons being aether sinks and positrons being aether sources, would act as the cause of the luminiferous medium, the magnetic forces, and the inertial forces, providing that the dipoles were rotating. Dipoles comprised of an electron orbiting a positron would serve as the fundamental cause of centrifugal force and account for the inverse cube law which is associated with both centrifugal force and an electric dipole field. These tiny dipoles would constitute dipolar aether vortices and would press against each other with fundamental centrifugal force while striving to dilate. The orientation and stability mechanisms have already been discussed at ***"The Speed of Light"*** [5]. Contrary to what might be expected, it is cylindrical symmetry rather than spherical symmetry which is the key to stability.

The inertial path of a body is then dictated by the sum of the multitude of electrostatic repulsive fields that are generated by this sea of electron-positron dipoles that fills all of space. This pressure acts uniformly around a body, but the additional convective effects, which depend only on the mutual speed as between the moving body and the background electron-positron sea, show up specifically with respect to individual arbitrarily chosen point origins. The centrifugal force relative to any particular point in space obeys the inverse cube law that results from the tiny electric dipole located at that particular point.

It's as though space is densely packed with two-pin electric power points on the picoscopic scale, and that the pressure which emerges from them causes a pressurized luminiferous medium. Disturbance of this dipole sea induces an additional infusion of aether pressure which results in the inertial forces, as opposed to resulting in friction.

References

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"Long ago he (mankind) recognized that all perceptible matter comes from a primary substance, of a tenuity beyond conception and filling all space - the Akasha or luminiferous ether - which is acted upon by the life-giving Prana or creative force, calling into existence, in never ending cycles, all things and phenomena. The primary substance, thrown into infinitesimal whirls of prodigious velocity, becomes gross matter; the force subsiding, the motion ceases and matter disappears, reverting to the primary substance".
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"All space, according to the younger Bernoulli, is permeated by a fluid aether, containing an immense number of excessively small whirlpools. The elasticity which the aether appears to possess, and in virtue of which it is able to transmit vibrations, is really due to the presence of these whirlpools; for, owing to centrifugal force, each whirlpool is continually striving to dilate, and so presses against the neighbouring whirlpools."

[5] Tombe, F.D., *"The Speed of Light"* (2014)
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"The most probable surmise or guess at present is that the ether is a perfectly incompressible continuous fluid, in a state of fine-grained vortex motion, circulating with that same enormous speed. For it has been partly, though as yet incompletely, shown that such a vortex fluid would transmit waves of the same general nature as light waves— i.e., periodic disturbances across the line of propagation—and would transmit them at a rate of the same order of magnitude as the vortex or circulation speed"
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