

## The Cause of Centrifugal Force

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**Abstract.** Centrifugal force is the outward radial expansion that arises in connection with absolute rotation. Gottfried Leibniz (1646-1716) demonstrated that centrifugal force obeys an inverse cube law relationship when angular momentum is conserved. This reveals the dielectric nature of space, since we know that the inverse cube law relationship is associated with an electric dipole force field. It will now be proposed that space is densely packed with dipolar aethereal vortices that act like tiny Archimedes' screws, and that centrifugal force is the aether pressure that is drawn up when these vortices are linearly stretched or angularly accelerated. When a compound variety of centrifugal force acts in either the transverse direction or the axial direction, it will be known as the 'Coriolis Force'.

### The Dipole Field

I. Centrifugal force is the outward radial force that acts on an object relative to any arbitrarily chosen point in space, and which is induced by the absolute transverse motion of that object relative to that point. Centrifugal force takes on the mathematical form  $m r \omega^2$ , where  $m$  is the mass of the moving object,  $r$  is the radial distance between the object and the point, and where  $\omega$  is the angular speed (circulation) relative to the point. Kepler's second law of planetary motion is the law of constant areal velocity which is equivalent to the law of conservation of angular momentum. This leads to an areal constant,  $I$ , such that  $I = \omega r^2$ . If we substitute the areal constant,  $I$ , into  $m r \omega^2$ , we obtain an expression for centrifugal force in the form  $m I^2 / r^3$ . An electric dipole force field obeys the inverse cube law relationship and this therefore points to the fact that centrifugal force must be the pressure that arises from positive electric charge in a dipole field. This state of affairs would come about if space were to be densely packed with rotating electron-positron dipoles which act like Archimedes' screws that can draw up pressurized aether. These dipoles would each consist of an electron in mutual circular orbit with a positron. See "The Double Helix Theory of the Magnetic Field".[1]

Consider a positron to be a source of pressurized aether and an electron to be an aether sink. The aether itself is a mysterious medium which pervades all space and which gives the familiar physical characteristics to a fluid on the atomic and molecular scale. Although we can identify a rotating electron-positron dipole with an Archimedes' screw, the ultimate mechanism whereby the aether is pumped in through a positron source and pulled out through an electron sink will remain unknown. The aether is dynamic, stretchable, and compressible, and the basis of the screw is that when the aether is stretched, the positron sources will open wider and the electron sinks will tighten. Hence when an electron-positron dipole is angularly accelerated (magnetized), the torsional stress in the aether, which constitutes vorticity, will lead to the induction of excess aether pressure. This is the basis of Lenz's law. A tension in the aether induces an opposing pressure, although there seems to be no evidence that it works the other way around. If mass is a measure of the amount of aether, and charge is a measure of aether pressure, then we will have the basis for a close connection between mass, charge, spin, and energy. Magnetization is therefore a kind of positive electric charge, but it is not the kind that is normally identified with that name. Magnetic charge will occur in the form of a magnetic field surrounding a current carrying wire. Positive electric current is a flow of pressurized aether (vitreous fluid) through the wire, and negative electric current is the rarefied aether which is pulled into the return terminal of the circuit. When electric current flows in a wire it will cause a transverse stress in the aether adjacent to the wire that will induce an opposing aether pressure while angularly accelerating the electron-positron dipoles. The angular acceleration will cause the electron-positron dipoles to spin faster and also to align solenoidally with their rotation axes tracing out the familiar magnetic lines of force.

The kind of positive electric charge that more commonly bears that name is induced in connection with linear polarization. When linear polarization of a dielectric occurs, the stretched aether widens the positive charge sources and aether pressure emerges which opposes the applied electric field. Positive charge can also be generated in the electron-positron sea when the electron-positron dipoles are rarefied as on the leeward side of the motion of an object that is moving through the sea. This latter effect is of major importance in Kepler's second law of planetary motion and also in the induction of electric current in a wire that is moving at right angles through a magnetic field.

## The Kepler Orbit

II. The two body planetary orbital problem is solved using Gottfried Leibniz's second order differential equation in the radial distance, in conjunction with the conservation of angular momentum. The two radial forces involved are the inward gravitational force (which is acting as a centripetal force) and the outward centrifugal force. Leibniz's equation was equivalent to,

$$d^2r/dt^2 = -k/r^2 + l^2/r^3 \quad (1)$$

The constant,  $k$ , relates to the gravitational inflow tension in the system whereas the constant,  $l$ , relates to the angular momentum (spin). Leibniz had obtained both the inverse square law relationship for gravity and also the inverse cube law relationship for centrifugal force, whereas Sir Isaac Newton (1642-1727) had only got as far as obtaining the inverse square law relationship for gravity. On seeing Leibniz's equation, Newton attempted to denigrate Leibniz's work by deliberately confusing the subject. Newton claimed that centrifugal force is the equal and opposite reaction to a centripetal force, even though the evidence is that he didn't always believe that. Newton was clearly wrong on this point because centrifugal force is not in general equal in magnitude to centripetal force, and it is certainly not a reaction to centripetal force. Centripetal force on the other hand can be an induced reaction to centrifugal force when the latter pulls on a string or pushes on a surface.

Leibniz's equation solves to yield orbits which are hyperbolic, parabolic, or elliptical. If gravity were by chance to have obeyed an inverse cube law relationship instead of an inverse square law relationship, then the planetary orbits would have been unstable. If such a state of affairs had existed, it would still have been theoretically possible to have had circular orbits. But if any such circular orbit were to be disturbed in the slightest, then the planet would spiral into the Sun. Having two different power laws involved gives rise to a centrifugal repulsive barrier that causes a falling planet to recoil. When a planet is falling, and providing that it has at least some angular momentum, then the inverse cube law force of repulsion will rise at a greater rate than the inverse square law force of attraction. For a given angular momentum, there will be a radial distance that corresponds to a reversal threshold where the net force changes from repulsive to attractive, or vice-versa. Hence if we disturb a Keplerian orbit it will not collapse. It will simply change to a new stable equilibrium. See fig. 1 on the next page,

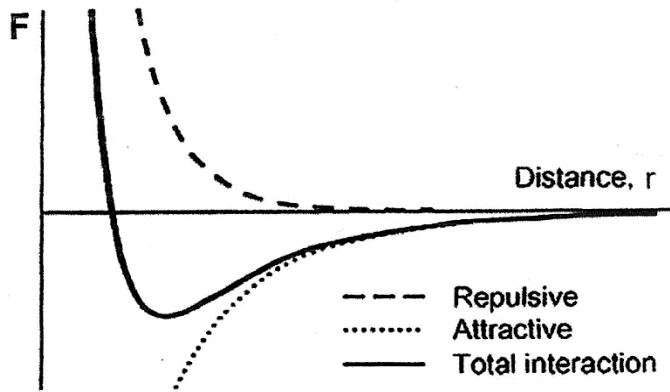


Fig. 1 The graph for the Keplerian orbit showing the stable equilibrium separation distance. A similar shaped graph is observed for intermolecular forces, which suggests once again that we are dealing with the interplay between a monopole field that is associated with pure aethereal gravity, and a dipolar vortex pressure field that is associated with the molecules.

In the special case when the inward centripetal force is zero, the solution to the planetary orbital equation will be a hyperbola with infinite eccentricity. This is equivalent to a straight line fly-by motion. In order to have a curved path, we need to have some centripetal force. Rotation causes outward centrifugal force, whereas centripetal force causes curved path motion in connection with rotation. The fact that centrifugal force is built into straight line fly-by motion results in the fact that it is not generally noticed unless it is opposed. We mostly observe centrifugal force only passively, and hence it is often wrongly taught that centrifugal force doesn't exist. Modern physics courses teach that centripetal force is the only force that is involved in circular motion, but this bad teaching totally overlooks the already existing centrifugal force that was associated with the straight line fly-by motion, relative to the centre of the circle, prior to the application of the centripetal force. Circular motion is in fact the product of an exact balance between the inward centripetal force and the outward centrifugal force. When these two radial forces are not balanced, and providing that the centripetal force is non-zero and that we have some rotation, then we will obtain another kind of non-circular curved path motion.

## Maxwell's Molecular Vortices

III. Centrifugal force that is built into the geometry of space, and which is associated with straight line motion, does not convince many people of

the reality of its existence. They can't immediately see where the pressure in the situation lies. However, consider Leibniz's equation as extrapolated to two electron-positron dipole orbits that are sitting side by side and aligned in their mutual equatorial planes, and both rotating in the same direction. Leibniz's equation leads us to speculate that the inverse cube law centrifugal force will act between any pair of particles in a four-body problem, and that the two dipoles will therefore repel each other if the mutual transverse speeds are sufficiently high. This extrapolation of Leibniz's equation to the four-body problem exposes a more active and convincing face of centrifugal force as being an induced aether pressure, and it seems that both Maxwell and one of the Bernoullis were aware of the significance of it.

ET Whittaker writes "*All space, according to the young [John] 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.*" [2]

James Clerk-Maxwell adopts a similar approach in his 1861 paper 'On Physical Lines of Force'. [3] Maxwell advocates a sea of molecular vortices to account for electromagnetic phenomena. He uses the centrifugal pressure that acts in the equatorial plane of his molecular vortices to explain magnetic repulsion between like magnetic poles. When two like magnetic poles repel each other, the magnetic lines of force in the space between the two magnets spread outwards and away from each other. Maxwell considered these magnetic lines of force to arise from a solenoidal alignment of his molecular vortices, such that the rotation axes of the vortices should trace out the magnetic lines of force. As such, a centrifugal pressure in the equatorial plane of the vortices will cause a lateral pressure between adjacent magnetic lines of force that will push two like magnetic poles apart.

In general, the motion of an object through the electron-positron sea induces centrifugal force as a result of the transverse stress which it causes at the shear regions in the sea. Gravity will cause the object to entrain an extended region of electron-positron sea with it in its translational motion. This region will be called the gravitosphere and the gravitosphere will extend to a shear region where it gives way to the gravitosphere of a neighbouring object. The transverse shear stress in

the lubricating aether between the electron-positron dipoles at the shear region will induce aether pressure which will manifest itself as centrifugal force and cause a frictionless hovercraft effect. Hence centrifugal force can be induced by an object that is moving linearly with a constant speed. The centrifugal force formula can be rearranged to reflect this fact and written in the form  $\mathbf{F} = m\mathbf{v}\times\boldsymbol{\omega}$  where  $\mathbf{v}$  is the linear transverse speed and where  $\boldsymbol{\omega}$  is the circulation or angular speed. In electromagnetism this expression appears as  $\mathbf{E} = \mathbf{v}\times\mathbf{B}$  where  $\mathbf{E}$  is the electric field,  $\mathbf{B}$  is the magnetic flux density and it is equal to  $\mu\mathbf{H}$ , where  $\mu$  is the areal density of the electron-positron dipoles, commonly known as the magnetic permeability, and where  $\mathbf{H}$  is related to the vorticity or circulation of the electron-positron dipoles.[4] Centrifugal force can also be written in the form  $\text{grad}(\mathbf{A}\cdot\mathbf{v})$  where  $\mathbf{A}$  is the aether momentum per unit volume and where  $\text{curl } \mathbf{A} = \mathbf{B}$ . This means that centrifugal force has an associated potential energy of the form  $\mathbf{A}\cdot\mathbf{v}$ , which is equivalent to transverse kinetic energy.

Centrifugal force can also take on the mathematical form  $\partial\mathbf{A}/\partial t$  in the case of the aether pressure that is propagating through the electron-positron sea in relation to time varying electromagnetic induction or in relation to electromagnetic radiation in general. In this form, it relates to the pressure that causes the torque that in turn causes the angular acceleration of the dipoles. This angular acceleration can however be of the kind that causes a precession of the dipoles rather than of the kind that causes an increase in the angular speed. The precessional kind of electromagnetic radiation occurs when the propagation direction is parallel to the magnetic lines of force, rather than perpendicular to them. In this case, the aether pressure is not strictly centrifugal by nature in the sense that centrifugal force by its very etymology is normally associated with being an outward radial effect. In the case of precessional EM radiation, the aether pressure propagates in the axial direction, and so we now have to investigate whether or not the cause of centrifugal force as discussed in this article might apply more generally to similar effects in directions other than the radial direction.

## **Compound Centrifugal Force**

**IV.** Centrifugal force is an electromagnetic pressure which arises due to motion through a solenoidal dipolar field, and so we should not therefore expect this effect to be restricted to the radial direction. A transverse

centrifugal force can arise when a radial motion is being constrained to rotate. We can witness this state of affairs in a non-circular planetary orbit or in any vortex phenomena. The radial motion will induce an equal and opposite transverse centrifugal pressure on either side. In addition to this, there will be a transverse motion that will cause a windward compression and a leeward rarefaction in the electron-positron sea. This in turn will cause a transverse vorticity gradient. This vorticity gradient causes the equal and opposite transverse centrifugal pressures to have different effects. If the radial motion is inwards, the leeward transverse centrifugal force will cause an increase in the transverse speed, while the windward transverse effect is a centrifugal barrier that causes the radial motion to deflect into the transverse direction such as to conserve angular momentum. This windward transverse centrifugal barrier has double the circulation of the radial centrifugal force due to the fact that the motion is equivalent to a radial motion through a large vortex that rotates as one rigid solid. The electron-positron sea behaves as a rigid solid for this mode of motion. Hence this compound transverse centrifugal force has the mathematical form  $2m\mathbf{v}\times\boldsymbol{\omega}$  and it is known as the Coriolis force.[5]

## **Axial Coriolis Force**

**V.** When we subject a spinning gyroscope to a forced precession, it will swivel sideways. This gyroscopic component of centrifugal force is like an axial Coriolis force in that a transverse motion is deflected into the axial direction, based on the rotation axis. Or alternatively we can look at it as the transverse deflection of an axial motion based on the precession axis. Axial Coriolis force occurs in gyroscopes, rattlebacks, and also in electromagnetic radiation in cases where the radiation is being propagated along the axes of the magnetic lines of force. Axial Coriolis force is also involved in Ampère's circuital law in respect of the aspect whereby the electric current causes the surrounding electron-positron dipoles to precess into their solenoidal alignment. For more information, see "The Cause of Coriolis Force".[6]

## Direct Encounters with the Centrifugal Force

**VI.** Normally the centrifugal force is only encountered passively such as when it is opposed by a centripetal force. There are however some circumstances in which the centrifugal force can be felt directly. The best known example as regards radial centrifugal force is in the case of two like magnetic poles being pressed together. The aethereal repulsion pressure that we feel in that situation is pure centrifugal force. A more interesting example is to be found in the axial case. If we cause a spinning gyroscope to precess, it will swivel sideways. If we constrain that gyroscope to the plane of the forced precession such as to prevent it from swivelling sideways, work will have to be done, and we will feel a resistance pressure that has a physical nature identical to that which is encountered in the case of the two repelling magnets being pushed together. We are feeling pure aether pressure. In the gyroscopic case however, the pressure will not recoil. There is no existing theory in the literature to physically account for the nature of the propagation of direct pressure through the electron-positron sea. Electromagnetic radiation, which is much better understood, involves the flow of pressurized aether through the electron-positron sea, but the mechanism begins with aether tension, and it involves Lenz's law. Lenz's law does not appear to apply to direct centrifugal pressure barriers such as are encountered on the windward side of a motion or when mutually repelling magnets are being pushed together. In the case of the Newton's cradle, a direct aether pressure wave propagates through the system at an unknown speed. In the case of the repelling magnets, potential energy is stored and it can recoil again. But in the case of the spinning gyroscope that is undergoing forced precession and being constrained to the plane of the forced precession, there is no recoil. There is no official accounting for where the energy has gone to in that situation although some of it is likely to have been dissipated as heat in the structure of the gyroscope due to stress in the material of the gyroscope.

As regards the transverse Coriolis force, it cannot easily be encountered directly since it is built into the law of conservation of angular momentum. To encounter the transverse Coriolis force directly we need to have a constrained radial motion on a rotating turntable. If a marble were to be rolling outwards on a radial groove on a turntable, we would need to do work to maintain the turntable at a constant angular speed. The rotational resistance experienced in that situation would be a direct encounter with the transverse Coriolis force.



## Conclusion

**VII.** Centrifugal force is most familiar as a radial force, but it is actually one of three mutually orthogonal pressures that are convectively induced in the electron-positron sea. The transverse centrifugal force that occurs in cyclones is known as the Coriolis force, and there is also an axial equivalent to the Coriolis force that occurs in spinning gyroscopes that are undergoing precession. The electron-positron sea is the entire basis of Euclidean geometry, and it is the medium relative to which all absolute motion is measured. It is a rigid solid that is permeated with an aether juice, and its solenoidal alignment allows it to slide against itself in two adjustable planes. The background stars serve to mark out this frame of reference, but the physical interaction of moving bodies is with the electron-positron dipoles in their immediate vicinity. Centrifugal force, transverse Coriolis force, and axial Coriolis force are electromagnetic effects that propagate at the speed of light through the electron-positron sea. They are the pressures in space that determine the inertial path of moving objects, and so they might correctly be described as 'inertial forces'. The inertial forces are real forces, but in modern literature they have become confused with the inertial effect. The inertial effect is the apparent transverse deflection of a motion that is observed from a rotating frame of reference due to an object following its inertial path. While the inertial forces arise from a dipole field and obey the inverse cube law relationship, gravity on the other hand is a pure aethereal monopole field which therefore obeys the inverse square law relationship, and its propagation speed cannot be calculated from electromagnetic theory. This raises the question as to whether or not electrostatic forces and electromagnetic forces can really obey an inverse square law relationship as is commonly believed, based on Coulomb's law, the Biot-Savart law, and Ampère's magnetic force law. We need to consider the possibility that these electric and magnetic forces are all inverse cube law forces.[7] Such an inverse cube law relationship for magnetic force would satisfactorily explain the stability node that makes magnetic levitation possible.

## References

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