

# The Cause of Centrifugal Force

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**Abstract.** It is widely believed that centrifugal force does not exist. It will now be shown that centrifugal force is a dipole force field comprising of a sea of tiny rotating electron-positron dipoles which constitutes the luminiferous medium. Centrifugal force is the inverse cube law repulsion that emanates from the net positive charge that is generated in the dipoles when they are subjected to certain kinds of forces. These forces are, (1) the tangential stress that arises in conjunction with the motion of a body through the luminiferous medium, (2) the tangential stress which arises in conjunction with the flow of aether (electric current) through the luminiferous medium and which gives rise to magnetization, (3) the linear stretching (polarization) of the electron-positron dipoles which arises along the line of aether flow (electric current), and (4) the compression of the electron-positron sea on the windward side of a body in motion.

## The Dipole Field

I. Kepler's laws of planetary motion point to the fact that space is a dipole field in which tiny electric dipoles must exist at every point. It is an established fact that the force field surrounding an electric dipole drops off with an inverse cube law. Kepler's laws point to the fact that all objects in absolute motion experience an inverse cube law repulsive force perpendicular to their direction of motion, relative to every point in space. This inverse cube law relationship is deduced by substituting the Keplerian areal constant,  $I = \omega r^2$ , into the centrifugal force expression,  $r\omega^2$ , where  $r$  is the radial distance between the moving particle and the point, and where  $\omega$  is the angular speed. This results in an expression for centrifugal force in the form  $I^2/r^3$ . We might therefore draw the conclusion that absolute tangential motion in relation to every point in space and relative to the background stars induces a net positive charge and hence a repulsive force. The inverse cube law relationship points to the fact that this positive charge is the net positive charge in a dipole as opposed to a monopole. When an object moves in a straight line relative to every point in space, this straight line represents a hyperbola of

infinite eccentricity relative to every point that does not lie along its path of motion. This eccentric hyperbola is the solution to the planetary orbital equation for the special case in which the inward centripetal force is zero. If we consider the electric dipoles to constitute mutually orbiting pairs, then Ampère's Circuital Law, which is rooted in the Coriolis force, will ensure that the rotation axes of these rotating dipoles will align solenoidally around the moving particle as is the case when an electric current generates a magnetic field. The centrifugal pressure will therefore exist in the equatorial plane of the dipoles, and so we can conclude that the rotation of the dipoles regulates the balance between their positive and their negative charge, and that uniform motion of an object first induces a Coriolis force which aligns the dipoles solenoidally, and then induces a tangential acceleration on the neighbouring dipoles which is transmitted through space at the speed of light in the form of electromagnetic radiation. Centrifugal force is built into the geometry of space, and so it goes unnoticed most of the time. Straight line motion does not convince very many people of the existence of centrifugal force.

Few modern physicists can see the reality of centrifugal acceleration in the straight line motion context described above, never mind that an active force should be causing it. It is usually only in the context of circular motion that centrifugal force is ever discussed. Some physicists acknowledge a centrifugal force of sorts in the special case of constrained circular motion. When a terrestrial object is constrained to move in a circle, the outward centrifugal force,  $mr\omega^2$ , can be felt pushing or pulling against the source of the centripetal force. In fact, the centripetal force in these constrained situations wouldn't be acting at all if there were no centrifugal force, because it is the outward centrifugal force which pulls a string taut or which causes an object to push on the inside wall of a rotating cylinder. The outward centrifugal force is what induces the tension in the string or the inward normal reaction from the wall of the rotating cylinder. Nevertheless, those few who actually acknowledge that a centrifugal force of sorts exists in this situation, wrongly write it off as being merely a reaction to the centripetal force, even though it is in actual fact the other way around. If the string is cut, or if there is a hole in the wall of the cylinder, the object will fly off at a tangent. The outward radial motion vector will be rotating, and so the object will not fly off perpendicularly to the tangent at the point of departure. This fact can give the illusion that there is no outward radial motion, even though there clearly is, albeit that the radial vector is rotating. Even the few who reluctantly acknowledge that a centrifugal

force of sorts existed while the object was being constrained to move in a circle, will invariably maintain that this centrifugal force of sorts disappeared at the moment when the object was released from the circular motion. The centrifugal force has not however disappeared, but it has ceased to have any immediate physical significance that would convince modern physicists that it exists.

## Maxwell's Molecular Vortices

II. 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."* [1]

Bernoulli had no problem about the existence of centrifugal force at every point in space. But for most modern physicists, centrifugal force only exists as a fictitious force in rotating frames of reference. In modern physics, rotating frames of reference have confused the centrifugal force topic like a hall of mirrors. For a few modern physicists, centrifugal force is a quantity which can seem to mysteriously appear when centripetal force acts on an object, and then disappear again when the centripetal force is removed, and they generally overlook the fact that centrifugal force appears as an active element in the planetary orbital equation, independently of the existence of centripetal force. When the planetary orbital force equation is pointed out to them, they usually try to disguise the centrifugal force term either by using a suitable choice of language such as 'a component of the radial force', or by pointing to another integral version of the equation in which the centrifugal term is catered for by tangential kinetic energy. We therefore need to find a situation in which the full reality of centrifugal force is exposed beyond any doubt.

If we were to consider a four body problem involving two adjacent closed orbits rotating in the same direction and aligned in their mutual equatorial plane, we should be able to see if the centrifugal force as acting between the objects across the two orbits were to produce any measurable centrifugal repulsive effect between the two orbits which would leave the matter in no doubt. Unfortunately it is almost impossible

to set up such a scenario, and no such scenario is observable in nature on the large scale. Such a scenario should however occur between atoms and molecules and produce a repulsive force. A repulsive force does indeed exist between atoms and molecules at close range. See figure 1 on the next page,

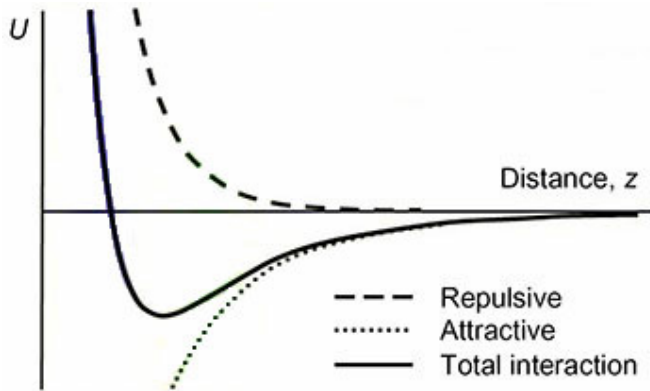


Figure 1. The inter-atomic force and planetary orbital force graph.

This graph is the same as the planetary orbital force graph. The stability node is a product of the fact that the repulsive force and the attractive force do not share the same power law. But as regards inter-atomic forces, it has never been officially acknowledged that the repulsive force is centrifugal in origin, even though the vortex nature of atoms should make it patently obvious that it is due to the centrifugal force. As regards planetary orbits, the involvement of centrifugal force is acknowledged in older textbooks.

Regarding Bernoulli's vortices, Maxwell used a similar theory of space to explain the magnetic field and the luminiferous medium. See part I of his 1861 paper 'On Physical Lines of Force' [2] at,

[http://vacuum-physics.com/Maxwell/maxwell\\_oplf.pdf](http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf)

and also 'Centrifugal Force in the Electric Circuit' at,

<http://www.wbabin.net/science/tombe42.pdf>

Maxwell considered that Faraday's lines of force are comprised of molecular vortices aligned along their mutual rotation axes, and that these lines of force repel each other laterally due to centrifugal repulsion in the equatorial plane of the vortices. Let us now consider that Maxwell's molecular vortices each constitute an electron in mutual

circular orbit with a positron. If we have two such rotating electron-positron dipoles side by side, we would expect them to repel each other due to the mutual tangential speeds across the two dipoles. This would follow by simply extrapolating the principles of the Keplerian orbit to the four body situation. However, for the layman, there would seem to be a major difference between the very passive centrifugal force that can be argued geometrically in the case of a cricket ball moving past a gate post on the one hand, and the very active centrifugal force that would be associated with two dipoles repelling each other on the other hand. Nevertheless, both scenarios involve the exact same mathematical principles. We need therefore to get to the root of the common physical cause that exists in both cases.

## **Tangential Stress**

III. If two rotating electron-positron dipoles repel each other, that tends to suggest that centrifugal force is associated with a pressure. Maxwell uses this centrifugal pressure throughout his 1861 paper in order to explain a number of important effects in electromagnetism. So where might the pressure be in a cricket ball moving in a straight line past a gate post? To answer this, it will now be proposed that centrifugal force is merely net positive charge as regulated by the rotation of an electron-positron dipole, or by the mutual tangential speed that exists between the particles of neighbouring electron-positron dipoles. An electron is an aether sink, and a positron is an aether source. The aether itself is space. But contrary to common perception, space is not a rigid nothing. Space is dynamical, compressible, stretchable, and rendered into tiny dielectric vortices that are aligned solenoidally in a double helix fashion, hence giving rise to the magnetic field. When an electron moves tangentially relative to a positron, the tangential shear stress in the aether leads to vorticity. This vorticity has the effect of congesting the electron sinks and widening the positron sources. Hence tangential force on an electron-positron dipole will generate excess aether pressure over and above the already existing equilibrium value. The equilibrium value in the absence of tangential force will be the mild negative charge associated with the tension of the all pervading gravitational inflow from every direction beyond.

Tangential force can be brought about in a number of ways. On the large scale it will occur when bodies move through the electron-positron sea

even with constant speed. We begin to see the significance when we write centrifugal force in the form  $\mathbf{F} = m\mathbf{v}\times\boldsymbol{\omega}$  in the likeness of one of the terms in the Lorentz force. The gravitational field of a large body that is in a state of translational motion will entrain a region of the electron-positron sea with the body. The body and its gravitosphere will move like an egg yolk with its surrounding egg white. The reaction at the shear region where this gravitosphere meets the gravitosphere of neighbouring objects will result in pressures and shear stresses in the electron-positron sea which will induce centrifugal force. As stated earlier, centrifugal force in the Keplerian orbit obeys an inverse cube law and it is dependent on the angular momentum. Gravity on the other hand is an inverse square law force which is not believed to be dependent on angular momentum even though the electron sinks at the shear region are being congested by the tangential stress. Gravity is the tension that is caused by large scale inflow of pure aether through the electron-positron sea from beyond, and therefore it is not so directly affected by stress at the shear region between the respective gravitospheres. Centrifugal force on the other hand is caused exclusively by shear stress in this region. The combined graph of gravity and centrifugal force is shown above in section II in figure 1. The stability node arises because the two power laws are different. If gravity should have happened to have been an inverse cube law force like centrifugal force, then stable elliptical orbits would not be possible. Circular orbits would be possible, but they would be unstable. The slightest disturbance to such an unstable circular orbit would result in that orbit collapsing in an inward spiral motion.

## **Magnetization**

**IV.** An increasing electric current will increase the corresponding state of magnetization in the surrounding electron-positron sea. This means that the electron-positron dipoles will be angularly accelerated leading to an increase in the state of centrifugal aether pressure in the vicinity of the electric circuit. A magnetic field is therefore a state of centrifugal aether pressure that is associated with an increased fine-grained vorticity in the electron-positron sea.

## Linear Polarization

**V.** Another method of centrifugal aether pressure generation which doesn't involve an increase in vorticity occurs with linear polarization of the electron-positron dipoles. See 'Electrostatic Repulsion and Aether Pressure' at,

<http://www.wbabin.net/science/tombe44.pdf>

Magnetic and electrostatic repulsion are both caused by fine-grained centrifugal pressure in the electron-positron sea, either by magnetization or by linear polarization. Magnetic levitation can occur and so the existence of the associated stability node would suggest that the power law involved in magnetic repulsion may not be an inverse square law. It is more than likely that magnetic and electric repulsive forces operate under an inverse cube law in line with the centrifugal force in the Keplerian orbit.

## Kinetic Energy

**VI.** Centrifugal aether pressure should also be induced on the windward side of a moving body. This effect should come about from the compression of the electron-positron dipoles along the path of the motion. Compression of these dipoles will result in an increased vorticity and hence an angular acceleration. The angular acceleration will induce the excess aether pressure in a similar manner to that which occurs when a wire moves in a magnetic field. In the case of the wire moving in the magnetic field, the induced aether pressure is then deflected at right angles along the wire in the form of an electric current. This Coriolis deflection would also act on a large moving body if that body is moving at right angles to a magnetic field, but the effect will be negligible.

Any aether pressure which surrounds a moving body as a consequence of its motion will be a measure of its absolute motion, and hence a measure of its linear momentum and kinetic energy. The component of kinetic energy which derives from motion which is purely tangential, serves as the potential energy function for centrifugal force of the kind that is induced by shear stress and which acts at right angles to the direction of motion. The aether pressure due to compression that should

exist in front of a moving body represents another kind of potential energy which should serve to retard the motion of that body.

Let us consider a two body elliptical planetary orbit. The tangential motion of one of the planets induces a radially outward centrifugal force. The radial motion is however being continually deflected in the tangential direction. This must be due to the centrifugal pressure that has been induced on the windward side of the motion during the downward stage of that motion, and which then recoils during the outward motion. However, the corresponding rarefaction of the electron-positron dipoles on the leeward side of the planet's motion during the downward stage will cause the electron sinks to widen, and the gravitational inflow will hence increase. Based on Kepler's laws, this tangential component of gravity mathematically cancels the tangential component of the centrifugal pressure, leading to the conservation of angular momentum. Interestingly, the two tangential forces don't cancel each other physically as they can both still be individually observed.

When we extrapolate the two body Kepler orbit to the multi-body terrestrial situations that we observe daily from a Cartesian perspective, there is no evidence that moving objects experience any kind of retardation along their path of motion in relation to the electron-positron sea. However, the Newton's cradle does supply evidence that linear momentum is associated with something physical which departs from the decelerated incoming ball and travels through the row of balls, causing the end ball to take off exactly where the incoming ball left off. And there are claims amongst modern physicists of experimental evidence which suggests that objects that are moving at very high speeds experience an increase in their mass which reduces the expected acceleration. This may actually be evidence that the retarding centrifugal aether pressure on the windward side of the motion becomes dominant over the rarefaction effect on the leeward side at high speeds.

It would seem that kinetic energy and linear momentum represent a kind of charge that is associated with pressure in the electron-positron sea due to motion. This positive charge will however be cancelled on the leeward side of a moving body by a corresponding tension. But that tension will immediately be filled in by gravitational aether inflow when the moving body loses its centrifugal positive charge due to deceleration. The centrifugal charge will be absorbed by the deceleration source while the leeward tension will be replenished by gravity.



The electron-positron sea of tiny aethereal vortices is the entire basis of Euclidean geometry and it is the medium relative to which all absolute motion is measured. The background stars serve to mark out this frame of reference, but the physical interaction of moving bodies is with the electron-positron dipoles and the aether in the immediate vicinity.

## Centrifugal Potential Energy

VII. It was shown in 'Gravitation and the Gyroscopic Force' at,

<http://www.wbabin.net/science/tombe5.pdf>

how aether hydrodynamics yields four fundamental forces. One of these four forces is the centrifugal force in the form  $+\text{grad}(\mathbf{A}\cdot\mathbf{v})$ , where  $\mathbf{A}$  is the aether field momentum. Maxwell identified the vector  $\mathbf{A}$  with Faraday's *electrotonic state*. Modern textbooks call the vector  $\mathbf{A}$  the magnetic vector potential. Centrifugal force is therefore a conservative force with an associated potential energy function of the form  $\mathbf{A}\cdot\mathbf{v}$  where  $+\text{grad}(\mathbf{A}\cdot\mathbf{v})$  is the missing fourth term of the Lorentz force. The centrifugal  $+\text{grad}(\mathbf{A}\cdot\mathbf{v})$  term caters for magnetic force and it more accurately caters for the  $-\partial\mathbf{A}/\partial t$  angular force of electromagnetic induction, since it is centrifugal pressure which actually causes the angular acceleration of the electron-positron dipoles in electromagnetic radiation. It is centrifugal pressure which causes radiation pressure.

## References

[1] ET Whittaker, A History of the Theories of Aether and Electricity; The Classical Theories (London; New York, American Institute of Physics, 1987) p.6

[2] Clerk-Maxwell, J., "On Physical Lines of Force", Philosophical Magazine, Volume 21, (1861)