The Physical Nature of the Coriolis Force

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Abstract. **The Coriolis force acts in a physically rotating system so as to induce a perpendicular deflection in a moving element. It can be caused inertially, by contact forces, or by both, and its action is restricted to the transverse and the axial directions. In cases where the Coriolis force is caused inertially, the precise physical nature of the inertial force varies according to the chosen point of origin. However, when we choose the origin to be at the centre of the rotating system, we can ascertain a distinct physical nature for the inertial Coriolis force that distinguishes it from the closely related centrifugal force. Centrifugal force arises from pressure differential, and the relevant causative motion in centrifugal force is directly tied up with the state of rotation. Inertial Coriolis force on the other hand is caused by an independent motion in a rotating system. This motion will induce an inertial aether pressure in the all pervading electron-positron vortex sea, and due to the asymmetry that this motion causes, the inertial pressure will give rise to a Coriolis force. Most of the well known phenomena that are believed to be caused by the Coriolis force are in fact caused by a complex mixture of illusion, general inertia, and dragging forces. Pure inertial Coriolis force in isolation can be observed where a comet is deflected sideways and prevented from collapsing into the Sun. Lesser known cases of the inertial Coriolis force arise in the reversing of the direction of a rattleback (Celtic stone), and in preventing a pivoted gyroscope from toppling under the force of gravity. Electromagnetic induction in a moving wire also involves a process which is identical in nature to that which is involved in the inertial transverse Coriolis force.**

Inertial Pressure

I. If we fix a pipe radially on a rotating platform and cause water to flow along the pipe, then the walls of the pipe will exert a transverse Coriolis force on the water. This is an example of a Coriolis force being caused non-inertially. Likewise, centrifugal force can be caused non-inertially such as in the case of when air pressure acts between the vortex air molecules.

However, the Coriolis force and the centrifugal force can also be caused inertially. Inertial pressure arises from the positrons in the all pervading electron-positron sea. Aether pressure emerges from within this dielectric luminiferous medium when it is disturbed from its equilibrium state [1], [2]. Such a disturbance can be caused by electric current flowing in a wire, by a body in large scale translational motion, or by a body in a state of rotational motion. In electromagnetism, Cartesian coordinates are satisfactory for the purposes of analyzing the inertial pressure. However, in cases where the

inertial pressure is caused by large scale translational motion relative to the electron-positron sea, the inertial effects are contained within Newton's first law of motion and so don't otherwise show up when we try to analyze the motion using displacement vectors in Cartesian coordinates. Nevertheless, translational motion always involves rotation relative to an arbitrary point origin that does not lie along the path of the motion, and so we can expose the inertial effects using polar coordinates. Polar coordinates will expose the centrifugal and the Coriolis components of the inertial pressure. This polar system of accountancy helps to enlighten us as to the underlying physical explanation for the inertial pressure. By yielding an inverse cube law for the centrifugal force in conjunction with the inertial path, we can then guess that the inertial pressure is dielectric in nature. But since we can use any origin, it follows that the centrifugal force and the Coriolis force are merely arbitrary systems of accountancy for the inertial aether pressure, and as such, a centrifugal force as viewed from one origin could be a Coriolis force as viewed from another origin. If we want to discover the more accurate physical details, then it is necessary to examine the inertial forces using the origin that is located at the centre of the physically rotating system. We must consider a real case scenario such as a two-body Keplerian orbit.

In doing so we will reveal the fact that the inertial transverse Coriolis force has a subtly different physical nature than that of the centrifugal force. With the inertial centrifugal force, the component of the motion that causes the force is directly related to the rotation, whereas with the transverse Coriolis force the component of the linear motion that causes the force is independent of the rotation. While it was shown in "The Double Helix Theory of the Magnetic Field" [3] that the inertial transverse Coriolis force arises in conjunction with a vortex gradient in the electron-positron sea, this is not the case for centrifugal force. Centrifugal force arises in connection with a pressure differential.

Electromagnetism

II. In electromagnetism, the force $\mathbf{F} = q\mathbf{v}\times\mathbf{H}$ arises in circumstances that preclude the use of the equation $\mathbf{H} = 2\boldsymbol{\omega}$, where $\mathbf{H}$ is aether vorticity and where $\boldsymbol{\omega}$ is angular velocity. The equation $\mathbf{H} = 2\boldsymbol{\omega}$ arises in situations were there is rigid rotation involved, and electromagnetism does not concern itself with the rotation of the electron-positron sea on the large scale.

Electromagnetism is only concerned with the hydrodynamics of the aether that is swirling around in the space between the electrons and the positrons. As such, the $\mathbf{F} = q\mathbf{v}\times\mathbf{H}$ force cannot be definitively described as being either a centrifugal force or a Coriolis force until we know more about the physical circumstances in which it arises. In electromagnetism, the $\mathbf{F} = q\mathbf{v}\times\mathbf{H}$ force arises in two important case scenarios. One of these case scenarios is when a force acts on a current carrying wire in a magnetic field. In this case, the electric current brings about the altered magnetic alignment which causes a differential aether pressure on either side of the wire, hence causing the motor force. In this respect, the phenomenon bears the hallmarks of the large scale centrifugal force when such centrifugal force is described from an origin at the centre of the rotating system. The pressure on either side of the wire is of course centrifugal aether pressure emerging from the positrons in the electron-positron dipoles.

The other electromagnetic case scenario arises when a wire, with no pre-existing electric current flowing in it, is moving at right angles through a magnetic field. In this case, the motion is independent of the state of fine-grained rotation in the electron-positron sea, and the motion causes a vortex gradient to arise which diverts the induced vitreous aether at right angles along the wire. Electromagnetic induction therefore bears the hallmarks of the inertial Coriolis force when such Coriolis force is described from an origin at the centre of the rotating system. See “Centrifugal Force in the Electric Circuit” **[4]**.

Electric Current

III. A modern myth is that two electrons will repel each other. The chances are that what has been passing for electrons in modern physics are in actual fact rotating electron-positron dipoles. Two electrons in isolation, if such a situation ever arises, will attract each other since they are both aether sinks. And if there are no positrons in the vicinity, there can be no aether pressure to provide any centrifugal repulsion, and so the two electrons will spiral into each other.

Electric current in a wire constitutes a one directional flow of pure aether pressure. This aether is the original vitreous electric fluid. The electric current will polarize the electron-positron dipoles in the wire since the

electrons will be sinking the vitreous aether at such a rate that they will eat their way backwards to the source, whereas the positrons will of course be repelled from the source. If the conducting wire forms a closed circuit, the electrons and positrons will then move against each other in an interlocking spiral motion. The two way interlocking spiral motion idea was suggested by Edward Leedskalnin [5] in the first half of the twentieth century. If the electric wire is broken and a capacitor is inserted, the conducting material will then behave like a dielectric insulator. The conducting material, when acting like a dielectric, will in fact be able to absorb a much higher concentration of aether than the dielectric material of the capacitor.

The Axial Coriolis Force

IV. As a comet approaches the Sun, the gravitational force increases even though the downward speed is decreasing. When the comet reaches perihelion where gravity is at a maximum, it begins to move back upwards again. The reason for this is that in a Keplerian orbit, centrifugal force and two mutually opposing transverse inertial forces act in addition to gravity. Gravity causes kinetic energy. Kinetic energy is the same thing as inertial pressure. It is aether pressure. When an object is free falling under gravity in the absence of any transverse motion, the induced inertial pressure and the vorticity in the surrounding electron-positron sea will be equal on all sides of the body apart from the top and the bottom sides. If we introduce a transverse component to the motion, this will cause a transverse vortex gradient in the electron-positron sea. The ongoing transfusion of swirling aether from positrons to electrons and the vortex gradient will give rise to the transverse inertial forces that deflect and then oppose gravity. The planets move in a sea of tiny wheels.

When an object spins about a symmetrical axis, there will be a centrifugal pressure field in the radial and the axial directions due to the alignment of the vortex molecules of the spinning material. This molecular alignment is caused by the electron-positron wind that will be blowing through the material due to the rotation. This alignment is modeled on Ampère's Circuital Law and it means that the rotation axes of the vortex molecules will be in the transverse direction of the larger spinning object, tracing out concentric circles, and their equatorial planes will be parallel to the axis of

the larger body, hence tracing out spokes in the equatorial plane of the larger body. This is described in “The Cause of Coriolis Force” [6]. If however we subject the spinning object to a forced precession, the electron-positron wind will change its angle of attack and the molecules will realign asymmetrically. Likewise in the case of rotation about an asymmetric axis, such as in the case of a rattleback (Celtic stone), it will not be possible for the molecules to exist in a stable symmetrical alignment. In both of these case scenarios vorticity will be induced in the centrifugal pressure field, and the inertial pressure arising from the motion that causes the vorticity will then cause an axial Coriolis force. Hence, when a pivoted spinning gyroscope topples under the force of gravity, the kinetic energy that is produced, which is the inertial pressure, causes the Coriolis force which deflects the gyroscope sideways. And this deflection is not merely a superimposition on top of the downward motion. It is instead of the downward motion. Just like in the case of the comet, the Coriolis force has actually undermined the downward effect of gravity. The inertial aether pressure that is generated from the positrons in the electron-positron sea pushes against the electron-positron sea as a whole and deflects the downward motion sideways. Without the all pervading electron-positron sea, there could be nothing for the falling gyroscope to push against in order to stop it from falling freely. And of course this anti-gravity effect could never happen if the gyroscope were already in a state of free fall, because we need the torque from the normal reaction at the pivot in order to create the vortex stress in the molecules of the gyroscope that induces the Coriolis force from the inertial pressure.

When we rotate a wire hook in a magnetic field, we screw aether out of the all pervading positrons. This aether flows back down into the electrons again, but if we screw the aether out at a faster rate than it can sink, we will end up with a flow of aether in a circuit which widens as it continues to inflate. This is an electric current, and it normally expands between two conducting wires.

Likewise if we cause a spinning gyroscope to precess we will screw aether out of the electron-positron sea. As explained above, this aether pressure will cause a Coriolis force that will induce another torque perpendicular to the applied torque. If however, we resist this induced torque, we will feel the pure aether pressure in a similar fashion to that which we feel when we push two ‘north pole’ magnets together. If we continue with this double forced precession of the spinning gyroscope we will be doing work against an

aethereal resistance pressure. This leads us then to ask whether or not we will be transmitting electromagnetic radiation at the rotation frequency.

The Foucault Pendulum

V. The Foucault pendulum experiment involves a complex mixture of illusion, real inertia, and real dragging forces. In this experiment, the plane of swing of a pendulum precesses relative to the Earth's surface due to the rotation of the Earth. While the real inertia associated with the swing motion involves an Earth centred Coriolis force relative to the inertial frame of reference for the special case of north-south alignments of the plane of swing, this Coriolis force is not the cause of the illusory precession of the plane of swing that is observed from the Earth's rotating frame of reference. The precessional illusion is solely a consequence of the Earth's rotation. The situation is further complicated by the dragging forces that cause the pendulum to co-rotate with the Earth. These dragging forces, in conjunction with the inertia, cause a real effect which can be observed from the inertial frame of reference, while at the same time undermining the illusory effects in the Earth's rotating frame of reference. The real effects are maximum at the equator but taper off to zero at the poles. Hence from the Earth's rotating frame of reference, the observed precession of the pendulum's plane of swing is at its maximum at the poles, with a period of twenty four sidereal hours, and no Coriolis force is involved. This topic has been badly messed up in modern physics due to attempts to use polar coordinates in conjunction with a rotating frame of reference. The illusory rotation is then wrongly analyzed in terms of a fictitious Coriolis force which has been set free to act in any direction.

The Double Helix

VI. In Ampère's Circuital Law, the axial Coriolis force is fundamental. Electric current is a solenoidal loop surrounded by solenoidal magnetic lines of force. Ampère's Circuital Law is written into the fundamental building unit of electromagnetism, which is the rotating electron-positron dipole. In a single electron-positron dipole, the electric current swirls around the

magnetic axis. These dipoles bond together in double helix rings (Fig. 1 below) around a larger electric current, and so the large scale picture is in the likeness of the primitive rotating electron-positron unit.

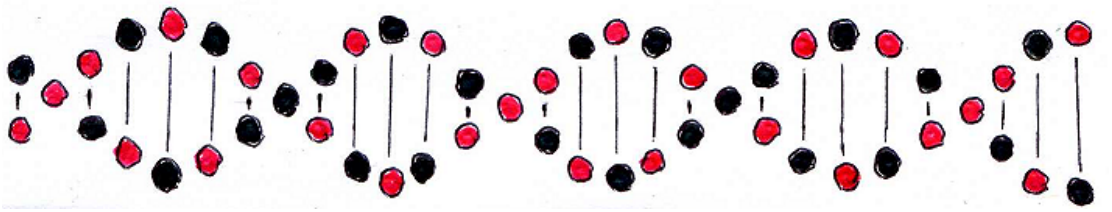

Fig. 1 Close-up view of a single magnetic line of force. The electrons are shown in red and the positrons are shown in black. The double helix is rotating about its axis with a prodigious angular speed, and the rotation axis represents the magnetic field vector H. The diagram is not drawn to scale since the relative dimensions remain unknown.

When an electron-positron dipole becomes unaligned within the double helix, aether pressure emerges from the positrons and restores it to its aligned position. This is the most fundamental Coriolis force of all. The best example of this is when electromagnetic radiation is propagated along the direction of magnetic lines of force. When an electron-positron dipole is caused to become unaligned due to a torque from a pulse of aether pressure, this will have the effect of inducing more aether pressure such as to restore it to its equilibrium position, but in doing so, a torque will be applied to the neighbouring electron-positron dipole and the cycle will repeat. Meanwhile, the original pulse of aether pressure will sink into the electron of the first dipole. The pulse that was induced in the first dipole will of course sink into the second dipole. Hence a net flow of aether will spiral along the double helix. The mechanism will be reminiscent of a compression propagating in spiral fashion along a helical spring.

Conclusion

VII. The public at large are quite familiar with the concept of centrifugal force. They know that it is the force that causes an outward acceleration in connection with rotation. They have known this since they first swung an object on the end of a rope and let go. Despite the modern teaching that things don't fly off radially when released, but rather tangentially, the public know that this is not true, because they know that when they let the rope go,

the object will move further away from them. Objects released from constrained circular motion will in fact fly off both tangentially and radially. But how do we go about explaining the Coriolis force to the public? The simple answer is,

"The Coriolis force is a perpendicular force that deflects an inward or an outward motion in a rotating system."

It can of course also be the axial force that acts on a transverse motion in a spinning gyroscope, hence preventing the gyroscope from toppling under the force of gravity. The idea of the Coriolis force originated with a mathematical term of the form $2m\mathbf{v}\times\boldsymbol{\omega}$ which the French scientist Gaspard-Gustave Coriolis identified in 1835, and named 'the compound centrifugal force' [7]. Radial centrifugal force, transverse Coriolis force, and axial Coriolis force can all be caused by convectively induced aether pressure from positrons in the electron-positron sea, and in all cases, the emerging aether deflects the motion perpendicularly due to the presence of vorticity. In electromagnetic induction, it is the aether itself that is deflected. With centrifugal force, the relevant causative motion is intricately connected with the rotation, whereas with the two Coriolis forces the relevant motion is independent of the rotation but causes an asymmetry in the pressure field which results in the Coriolis force. With the transverse Coriolis force, the asymmetry is in the form of a vortex gradient in the electron-positron sea, whereas with the axial Coriolis force the asymmetry is in the form of the vorticity in the centrifugal pressure field in the rotating object.

The Coriolis force explains how comets end up with no downward motion at the point of maximum gravity, and how pivoted spinning gyroscopes defy gravity. The reversal of the rattleback (Celtic stone), which is indeed the most mysterious of all phenomena in classical mechanics, is also explained by the Coriolis force. The force involved in electromagnetic induction $\mathbf{F} = q\mathbf{v}\times\mathbf{H}$ does not involve the equation $\mathbf{H} = 2\boldsymbol{\omega}$, where $\mathbf{H}$ is vorticity and where $\boldsymbol{\omega}$ is angular velocity, and so it cannot be technically referred to as a Coriolis force. However, from a physical perspective it possesses sufficient similarities such as to make it a very close relative of the transverse Coriolis force, so much so, that it will now be considered to be a Coriolis force. There are strong analogies between using a wire hook to screw aether out of a magnetic field as in electromagnetic induction, and using a spinning gyroscope that is being subjected to a double forced precession in order to

screw aether out of the electron-positron sea. Kepler's second law of planetary motion also has strong analogies to these two phenomena.

References

[1] Tombe, F.D., "Inertia and the Electric Sea" (2009)
http://wbabin.net/science/tombe61.pdf

[2] Tombe, F.D., "Lenz's Law" (2009)
http://wbabin.net/science/tombe54.pdf

[3] Tombe, F.D., "The Double Helix Theory of the Magnetic Field" (2006)
http://wbabin.net/science/tombe.pdf

[4] Tombe, F.D., "Centrifugal Force in the Electric Circuit" (2008)
http://wbabin.net/science/tombe42.pdf

[5] Leedskalnin, Edward, "Double Helical Electromagnetic Interaction"
http://www.magneticuniverse.com/

[6] Tombe, F.D., "The Cause of Coriolis Force" (2008)
http://wbabin.net/science/tombe55.pdf

[7] Coriolis, Gaspard-Gustave, "Sur les équations du mouvement relatif des systèmes de corps", J. de L'Ecole Royale Polytechnique, 24th cahier, p142 (1835)