Rotational and Irrotational Forces

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Abstract. If we consider space to be dynamical, aether hydrodynamics yields four fundamental forces. These four forces are divided into two groups of two. We have the rotational (or tangential) forces, and we have the irrotational (or radial) forces.

Bernoulli, Maxwell and Tesla all believed that space/aether is rendered into tiny whirlpools. As such we need to make a further distinction between forces that arise from aether hydrodynamics on the large scale, and forces that arise through the fine-grain aether vortices on the microscopic scale.

The Irrotational Forces

I. Gravity, electrostatics, and centrifugal force are the irrotational forces. Gravity is the mutual attraction of sinks and it is normally considered on the large sale. Mutual repulsion occurs between two sources, but in most cases of mutual repulsion we are actually dealing with centrifugal force. Mutual repulsion occurs in planetary orbits. Fine-grain centrifugal force in the sea of tiny aether whirlpools occurs in both electrostatic repulsion and magnetic repulsion. See 'Gravity Reversal and Atomic Bonding' at,

http://www.wbabin.net/science/tombe6.pdf

In fact, fine-grain centrifugal repulsion may ultimately be what is occurring in large scale planetary orbits, hence avoiding friction in the electron-positron sea. See 'Aether causes anti-Friction in the Planetary Orbits' at,

http://www.wbabin.net/science/tombe21.pdf

Magnetic attraction is caused by the tension in magnetic lines of force. This can be accounted for by the irrotational Coulomb force acting along the axes of the electron-positron double helices that comprise the lines of force. The Coulomb force causes the *'pull'* force in magnetism, whereas the centrifugal force causes the *'push'* force. See 'The Double Helix Theory of the Magnetic Field' at,

http://www.wbabin.net/science/tombe.pdf

In the case of the force acting on a current carrying wire, when the force is a repulsive force, it is caused exclusively by centrifugal force acting laterally between adjacent vortices in the magnetic lines of force that are spreading outwards and away from each other in the region between the repelling objects. When it is an attractive force, it is a combination of the Coulomb force of attraction acting along the axes of the magnetic lines of force, and also of centrifugal repulsion pushing the wire from behind as the lines of force hook around the wire.

Maxwell linked the centrifugal force in this situation with the mathematical form $\mathbf{E} = \mathbf{v}\mathbf{X}\mathbf{H}$ which appeared as the third and fourth parts on the right hand side of equation (5) in part 1 of his 1861 paper 'On Physical Lines of Force' at,

http://vacuum-physics.com/Maxwell/maxwell_oplf.pdf

See also his physical explanation at page 172 (page 12 of the pdf link).

The mathematical form $\mathbf{v}\mathbf{X}\mathbf{H}$ is normally associated with the Coriolis force. However, in the paper entitled 'Centrifugal Force in the Electric Circuit' at,

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

it has been discussed how the mathematical form **vXH** could refer to a centrifugal force as well as to a Coriolis force. When it refers to a Coriolis force, the **v** term will be totally independent of the vorticity term **H**. As such no work will be done in a constant **H** field. The Coriolis force will act only to change the direction of the particle in question, and the kinetic energy will be conserved.

However, when **vXH** refers to a centrifugal force, the **v** term and the angular velocity term **H** will be inter-connected. As such we can have an associated potential energy term **A.v**, and work can be done by the **vXH** force in this case. Work is indeed done when a magnetic force attracts or repels a current carrying wire, and the net **H** field is indeed dependent on the magnitude of the current in the wire. As such, the term **vXH** when applied to the force on a current carrying wire is undoubtedly the irrotational centrifugal force acting on the fine-grain level.

It is customary nowadays to use the **vXH** term to account for the force on a current carrying wire. But nobody has been able to reconcile the fact that in practice work is done, whereas in theory a force of the form **vXH** shouldn't do any work if **v** and **H** are independent of each other. The official approach is to ignore the magnetic field of the current carrying wire itself, and in doing so **v** and **H** will indeed be independent of each other.

This dilemma has been ignored in modern science. Maxwell on the other hand didn't ignore the magnetic field of the current carrying wire. He considered the superimposition of the two magnetic fields to be of crucial importance as regards determining the role of the centrifugal force. Nowadays they neither believe in Maxwell's molecular vortices nor in centrifugal force. They have completely lost everything that would account for the physical meaning of the term **vxH** in the context, and so we are left wondering how **vXH** can explain the force on a current carrying wire when work is done, even though the term **vXH** seems to imply that no work should be done.

The Rotational Forces

II. The rotational forces are the Coriolis force and the angular force $\partial\mathbf{A}/\partial t$. They occur in electromagnetic induction and electromagnetic radiation. The Coriolis force also occurs in precessing and nutating gyroscopes, while a general convective force which is neither clearly Coriolis nor centrifugal occurs in rattlebacks. See 'Fundamental Torque and the Rattleback' at,

http://www.wbabin.net/science/tombe37.pdf

The precessing and nutating pivoted gyroscope in a gravitational field is a large scale manifestation of the Coriolis force. Electromagnetism is a fine-grain microscopic manifestation in which case the Coriolis force becomes **F** = q**v**X**H**. The angular $-\partial\mathbf{A}/\partial t$ force in electromagnetism may also be caused ultimately by the Coriolis force. See the attempted description of electromagnetic radiation at section **VI** in 'The Link between Electric Current and Magnetic Field' at,

http://www.wbabin.net/science/tombe7.pdf

The Kepler Rotationally Elastic Sponge

III. An aether inflow theory for gravity necessarily implies that space will have vorticity in planetary orbital situations, yet Kepler's law of areal velocity unequivocally tells us that there is no large scale vorticity.

The only solution to this dilemma can be that all the vorticity has been sponged up into the fine grain microscopic vortex structure of electromagnetic space.

When large scale irrotational aether flow occurs, the aether will be constantly leaking into the tiny swirling vortices that permeate electromagnetic space. This leakage factor determines the magnitude of the universal gravitational constant/electrical permittivity of free space. The swirling nature of the tiny vortices also substantially absorbs any build up of large scale vorticity, hence leading us to Kepler's law of areal velocity for

large scale celestial mechanics. No Coriolis force of the form $\mathbf{F} = \mathbf{v}X\mathbf{H}$ acts in the gravitational field apart from a cyclically reversing case which is always cancelled by an equal and opposite angular $\partial\mathbf{A}/\partial t$ force.

The large scale gravitational field determines the shape of the magnetosphere around large planetary bodies. The Earth's magnetosphere, with its long tail represents the region in which the Earth's gravity dominates over the solar gravity. This gives rise to the null result of the 1887 Michelson-Morley experiment.

Einstein's theories of relativity have ignored these considerations, and as such his theories of relativity should never have come into existence.