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The Pendulum and the Magnetic Connection

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***Abstract*. When analyzing pendulum motion, textbooks avoid invoking centrifugal force. All upward acting forces are accounted for by the tension in the rod. This tension must however be greater in magnitude than gravity in order for a net upward force to be possible. The role of centrifugal force in both the simple pendulum and the conical pendulum will therefore be re-examined, and a connection with magnetic repulsion will be suggested.**

The Simple Pendulum

I. When a pendulum is hanging vertically in the static state, the downward force of gravity acting on the bob is exactly balanced by a reactive upward acting tension in the rod. When the pendulum begins to swing, unless the rod snaps, the bob will rise upwards, hence indicating that the tension in the rod is now greater in magnitude than the downward force of gravity. The additional tension can only have been caused by centrifugal force pulling on the moving bob.

Levitation and the Inversion of a Conical Pendulum

II. In the case of a conical pendulum, the centrifugal force relative to the fulcrum is no longer acting in the plane of motion. It has become one of two mutually perpendicular components of the horizontal centrifugal force that acts on the bob perpendicularly to the vertical axis. This resolved centrifugal force is cancelled when it causes a reactive tension in the rod. The other component that is perpendicular to it acts tangentially to the rod and in an upward direction, hence opposing the downward effect of gravity. When the horizontal speed of the bob is caused to increase, the bob will rise upwards.

It is not however expected that the conical pendulum would ever undergo a sustained inversion whereby the cone points downwards and the bob circles above a horizontal plane that contains the fulcrum. The reason why is because above this plane the tangential acting centrifugal force component would now be acting downwards.

There is however another component of the horizontal centrifugal force, this time acting along the line to the centre of the Earth. This is very much weaker due to the large size of the Earth's radius in comparison to the apparatus. Nevertheless, if the bob should exceed 8km/sec, being the speed above which the centrifugal force exceeds gravity, this will take the bob above the fulcrum's plane. If this happens though, the tangential acting centrifugal force that is resolved from the horizontal centrifugal force, now acting downwards, will very rapidly dominate and will severely limit the height that the bob can levitate above the fulcrum plane.

Conclusion – The Centrifugal Field is a Magnetic Field

III. In general when a body moves in a straight line, there will be a centrifugal force relative to every point in space, **[1]**. This is an indisputable geometrical fact. Consider the moving body to be surrounded by concentric rings in a plane that is perpendicular to the direction of motion. If these rings are solenoidal magnetic field lines, then according to Maxwell, they would be vortex rings pressing against each other with centrifugal force while striving to dilate **[2]**. We should therefore consider the likelihood that the centrifugal force field (or inertial field) that surrounds a moving body is just another manifestation of Ampère's Circuital Law **[3]**. If so, then it seems that a body moving in a straight line is being squeezed from all sides, resulting in an inertial pressure (kinetic energy) which increases with speed, while dropping off with distance as we move away from the body. From orbital theory we can conclude that the drop off will obey an inverse cube law in distance. When the moving body encounters a physical constraint, or when the centrifugal pressure field is undermined by a gravitational tension field, a pressure imbalance will occur and the path of motion will curve.

The magnitude of any centrifugal force relative to a point on a tangent to any of the concentric circles (field lines) will be a resolved component of the centrifugal force at the point where the tangent touches the circle. Likewise the centrifugal force to any point on a cylinder extended from any circle will be a resolved component of the centrifugal force to the original circle.

References

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After equation **(16)** in section **VI**
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