A FEW NOTES ABOUT GYROSCOPES AND ANTIGRAVITY

by *Mario Ludovico*

Abstract. Classic mechanics does not provide explanation for certain lifting and/or lowering effects observed in spinning gyroscopes. A possible interpretation might rely upon the hypothesis of velocity/acceleration fields associated with vortices of cosmic *plenum* and relevant "velocity circulations". In an analogy, the magnetic field created by a coil conducting continuous electrical current might also be viewed as a special "gyroscopic behavior" of the *plenum* involved.

There are several experimenters who try to challenge the gravity force upon the study of physical effects that still remain not adequately explained. Among other effects of various kind there are those that regard the behavior of gyroscopes.

A famous experience was carried out in 1974 by **Eric Laithwaite**[1] at the Royal Institution London, where he delivered a lecture about gyroscopes. On that occasion, Laithwaite could demonstrate that gyroscopes, when spinning, can lose a remarkable part of their weight. He showed that an 8kg flywheel spinning on a vertical plane around a 2.7kg horizontal pivot-shaft (10.7kg the whole system) could very easily be supported ad lifted with the small finger of one of his hands, i.e., by the application of a counterforce of less than 1kg, entailing at least 90% loss in the weight of the gyroscope-shaft system.

In 1987 and 1989, a team of Japanese scientists – led by **H. Hayasaka** and **S. Tackeuchi**[2]– reported on experiments that confirmed the findings of a long series of tests concerning a detectable loss of weight in *clockwise* spinning gyroscopes. When a gyroscope (that spins around a vertical pivot) is dropped in a vacuum at 18,000rpm (the spin is viewed from above, in the Earth's north hemisphere) its weight loses one part in 7,000 per every 160cm fall in vacuum.

More recently, in 2008, USA engineer **William S. Alek** has carried out experiments on gyroscopes, showing that the spinning direction matters. I mention these experiments because they are quite clearly visible in Internet, thus facilitating the understanding of the observed effects. Videos in his web-page www.intalek.com/Index/Projects/EGPE/EGPE.htm show a gyroscope that spins on a vertical plane around a horizontal shaft and undergoes an upward pull if it spins clockwise and a downward push if it spins counter-clockwise, also according to the position of the system's centre of mass. However, Alek's interpretation of his experiments seems questionable, to the extent to which he describes the observed gyroscope's motions as "precession cases" only. Ahead, I will try to justify this comment of mine in reporting on the description of *precession* given by classic mechanics for gyroscopes.

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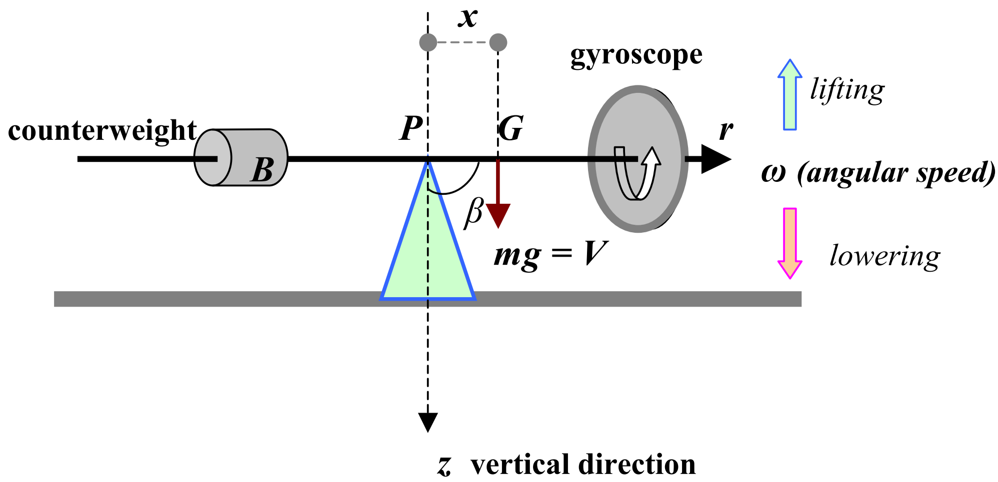
[1] Eric Robert Laithwaite (1921-1997) was a renowned engineer and professor of electrical engineering at the Imperial College London. He is the inventor of linear induction motors. His 1974 performance at the Imperial College Christmas Lecture was considered as a scandal, in spite of all quite clear evidence, upon the pretext offered by the "imprudent" comment, made by Laithwaite, that the showed experiment was challenging Newton's dynamics.
The unjustified rejection of Laithwaite's demonstration is a token of the dominant academic mentality, according to which what has no clear explanation within the accepted scientific paradigms either cannot exist or can somehow be proved by means of that which is already known. For the first time, in the history of the traditional Christmas Lectures of the Imperial College London, the Christmas Lecture remained unpublished.

[2] H. Hayasaka, S. Tackeuchi, *Anomalous weight reduction of a gyroscope's right rotation around a vertical axis on the Earth,* Physical Review Letters 63:25, 1989, pp. 2701-2704.
H. Hayasaka & al., *Possibility of the existence of antigravity: Evidence from a free-fall experiment using a spinning gyro,* Speculation in Science and Technology n. 20, 1989, pp. 173-181.

As to Laithwaite, he could not find any appropriate objection against the scandalized comments of the academic observers when these heard from him that his experiment was challenging Newton's dynamics. Actually, classic mechanics gives a rigorous description of gyroscopic *precession* and *nutation*, with no mention at all of possible *lifting* or lowering *effects* to be associated with the spin of gyroscopes.

The general analysis of gyroscopic *precession* and *nutation*[3] is rather complicate, but a few simplifying assumptions do not invalidate the correctness of the mathematical description. In this connection, it is important to bear in mind that the classic description of gyroscopic motions is given in *vector analysis*. Let's now refer to Figure 1 here below.

FIGURE 1



The sketch above represents a gyroscopic balance in horizontal position before starting any spinning motion of the gyroscope. Point ***P*** represents the fulcrum of the balance and the pivot around which axis-shaft ***r*** of the gyroscope can freely move in all directions. Point ***G*** is the centre of mass of the system in which the resultant vector $V = mg$ of the gravity forces acting on the system is applied, ***m*** being the mass of the system and ***g*** the local gravity acceleration. The distance between fulcrum ***P*** and centre of mass ***G*** is represented by ***x***, and the angle between axis ***r*** and vertical line ***z*** is represented by β. In Figure 1, β=90°.

Set apart the description of *nutation*, which is an effect of a lesser importance but much more difficult to describe, the equation given by classic mechanics for the *precession* of a spinning gyroscope is as follows:

[1] $$\vec{w} = \frac{d\vec{r}}{dt} = \left(\frac{xmg}{I\omega}\right)\vec{z} \times \vec{r}$$

in which ***I*** is the system's moment of inertia with respect to centre of mass ***G,*** symbol "×" represents the *vector product* between *direction* vectors $\vec{z}$ and $\vec{r}$, and dt is the observation time unit. Equation 1 expresses the vector product $\vec{w}$, *which is a velocity vector orthogonal to the*

[3] *Nutation* is a slight oscillation (vibration) of the gyroscope's axis, orthogonal to the circle line described by the gyroscope's precession. I will neglect the consideration of this particular motion for it is of a secondary importance with respect to precession and other observed effects.

plane identified by the two straight lines ***r*** *and* ***z***. This implies that the centre of the spinning gyroscopic disk starts rotating around vertical line ***z***, either clock-wise or counter-clockwise according to the direction of the gyroscope's spinning angular velocity $\vec{\omega}$. In simpler terms, whatever $\vec{\omega}$, the gyroscope starts rotating around fulcrum ***P*** while keeping its rotation path (*precession*) on a horizontal plane.

The *module* of vector $\vec{w}$, i.e., the *scalar quantity* that expresses the *vector's intensity*, is given by

[2]
$$w = \frac{xmg}{I\omega}\sin\beta.$$

In the case of Figure 1, sinβ =1**;** in any case, whatever angle β, the *precession path* develops on a horizontal plane. It is important to bear this fact in mind, because the neglect of the *vector* aspect of the classic analysis might be misleading, as it seems happening with the interpretation Alek gives of his experiments. In my opinion, lifting and lowering of the spinning disk on the vertical plane, as shown by Alek's gyroscope, cannot be interpreted as *precession* motions.

Now, according to classic mechanics, factor $\frac{xmg}{I\omega}$ in Equations 1 and 2 is a *constant value***;** such an assumption excludes any possibility of relatively stable rotation path of the gyroscope's centre in the same vertical plane that contains straight lines ***r*** and ***z***, as well as any possibility of alterations in the gyroscope's weight, if a fixed value is accounted for gravity acceleration ***g*** (and, therefore, also for ***I*** and ***x***). In other words, Equation 1 of classic mechanics implicitly states that a loss of weight is *in principle* impossible for a gyroscope. Whereas gravity acceleration ***g*** is just the point in question.

In fact, loss of weight can only mean there is a diminution either in the local gravity acceleration ***g*** or in the mass ***m*** of the gyroscopic system, or both things. If ***g*** and/or ***m*** decrease, then also the position of the system's centre of mass ***G*** changes, shifting towards pivot/fulcrum ***P*** or beyond towards counter-weight ***B***, thus causing a lift of the spinning disk.

I incline to hypothesize that it's an opposition to (or, to the contrary, a strengthening) of local gravity acceleration ***g*** caused by the spinning disk to determine its lifting (or lowering) effect. This in the light of my gravitational theory, according to which gravitation and gravity are special velocity fields of the cosmic *plenum*, the basic fluid undetectable substance in which the universe's physical space - and every thing in it - consists.[4] The spinning motion of the disk entails the dragging of the relevant portion of physical space into the same spinning, so creating a temporary local *circulation* of the physical space velocity around the disk. Such a circulation of velocity opposes or, to the contrary, strengthens the existing circulation established by the pre-existing gravity vortex around any element of matter immersed in the gravity field.

The circulation of *the gravity field manifests as a central (either centripetal or centrifugal) acceleration*, which affects any material element confined in the velocity field of the relevant gravity vortex as well as any other physical event interfering with it.

From a mere scientific standpoint, what only matters is proving, by any kind of appropriate dynamometer, that there is a change in the weight of any spinning gyroscope. Theory will follow.

Looking at the gyroscope assembled by Alek, it seems worth suggesting a simple modification to the two vertical parallel pillars that support and constrain the pivot of his gyroscopic balance. The balancing pivot, which should also host the system's centre of mass,

[4] See my essay *Vacuum, Vortices and Gravitation,* www.mario-ludovico.com/pdf/part_II.pdf or else www.mario-ludovico.com/pdf/Vortices&Gravitation_Summary.pdf

could be accommodated-in and made easily slide along two parallel vertical grooves, one in the central line of each vertical support. The same pivot-pawl could somehow rest over a scale, in order to record any minimal change (if any) in the weight of the gyroscopic balance during the test, according to any possible orientation of the spinning disk. To note, in particular, that if the distance ***x*** between pivot ***P*** and centre of mass ***G*** is zero no precession motion should occur (refer to Equation 1).

For the time being, as a banal conclusion, the observed lifting and lowering effects in spinning gyroscopes do still require an adequate explanation.

A simple experiment to interpret as a possible anti-gravity effect

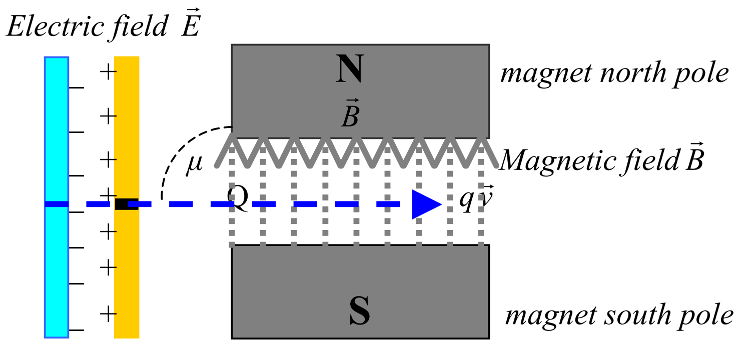
Recalling a few basic notions of classic electromagnetism may help understand the nature of the hypothesis that supports an experiment I had the occasion, about fifty years ago (1961-1962), to carry out at the *Centre Européen pour les Recherches sur la Gravitation* (CERG) in Rome (Italy).

The behavior of electrons entering a magnetic field is described by **Lorentz force**, according to the following vector equation

[3] $$\vec{F}_L = q\vec{E} + q\vec{v} \times \vec{B}$$

where $\vec{E}$ is the electric field that generates electron charge *q,* which enters magnetic field $\vec{B}$ with velocity $\vec{v}$, and symbol "×" represents, as usual, the vector product. From this equation it is immediately evident that no force is exerted by the magnetic field on electric charge *q* if the velocity of the charge is nil. The experimental test that proves Equation **[3]** may consist of the association of an electric field with the magnetic field of a magnet. Refer to Figure 2 below.

FIGURE 2



The electric charge *q* generated by the electric field enters the magnetic field at point Q with non-nil velocity. It is the condition fixed by Lorentz force equation to obtain a dynamic interaction between the electric charge and the magnetic field. The interaction results in an acceleration of the charge and in the transformation of its trajectory into a circular curve that lies on a plane orthogonal to that identified by vectors $\vec{v}$ and $\vec{B}$. The increment in the speed of the charge is expressed by the following scalar equation, as easily obtainable from Equation **[3]:**

[4] $$v = v_o \exp\left(\frac{qt}{m_q} B \sin\mu\right),$$

where v_o is the charge's speed at point Q (the "threshold" of the magnetic field), m_q is the charge's mass, μ is the angle between the direction of the magnetic field and the initial direction of v_o , and t is time. It is important to remark that speed v_o is a "relative" speed, in that Lorentz equation applies also if it is the magnetic field which moves at that initial speed with respect to a *steady* electric charge. In such a case, adopting a relativistic view, v_o can be considered as proper to the electric charge, and both Equations **[3]** and **[4]** apply regularly.

Allowing for the above premise, a natural spontaneous question arises as to the electric charges, the electrons, which are permanently roaming the metal of the magnet. Experience proves that such electrons, though steadily subject to a magnetic field, are not accelerated into any stream of electric current. What does it happen there? What kind of effect the metal's electrons undergo in the stable presence of the magnet's magnetic field? Or else, what the magnet's magnetic field consists of?

Set apart natural magnets, we have first to consider that usual magnets are artificially created by winding a conductor bearing continuous electrical current around an iron bar. We know that the current running in the coil determines a magnetic field that is transferred to the iron with all the characteristics of the field, which persists in the iron also when the electrical current in the coil ceases. This apparently means that the magnetic field artificially generated by the electrical coil has influenced the roaming electrons inside the iron in a substantial way, though no electrical current is transported by the iron bar.

A second consideration regards the random roaming of electrons in the metal bar before the relevant magnetization. It shall naturally be supposed that the roaming disorder has somehow been converted into an order, in the distribution of the electrons, compatible with the *structure* of the magnetic field brought by the electrical coil. It is now clear, however, that the *structure* of the magnetic field is not the *motion* of electrons of the electrical current in the coil, otherwise also the electrons in the magnetized metal bar should form an electrical stream, which is not. The alternative is that the coil's electrical current has set in motion something else, most probably the *physical space* within which the electrical current runs. In this connection, we know that any electrical current in a linear conductor generates a magnetic field whose intensity decrease with the distance from the conductor.

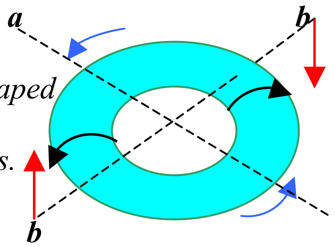
This was one of the reasons why the founders of modern physics could accept the idea that the *physical space* consists in a subtle undetectable substance initially dubbed "ether". Therefore, it seams reasonable supposing that the *structure* of the magnetic field consists just in the *motion* of the physical space as it is induced by the *dragging* motion of the electric particles of the current. Once the electrons roaming the iron have adjusted their behavior (shape, relative position and oscillation) to the invading flux of the magnetized physical space, such a magnetic flux can persist and even be strengthened by the order intervened in the behavior of the metal's electrons. The absence of electrons in the magnetic field straight-lines present in the "vacuum" between two opposite poles of a magnet indirectly confirms the nature of the *structured* flux crossing the physical space also in absence of matter.

The third consideration regards the *shape* of electrons. In my philosophical meditation about space and gravitation, I have re-introduced and reformulated the traditional concept of "ether" by the concept of "plenum", assuming this as the fluid and continuous undetected substance in which the whole physical universe consists, matrix of all known and unknown physical phenomena. In the mentioned essay on the subject, I have argued how the simplest and most spontaneous motion of fluids, different from a mere flowing, is in the formation of annular or ring vortices, both at infinitesimal and at gigantic cosmic scales.

In connection with the formation of magnetic fields that involve “static” electrons I had to conclude that it is reasonable to think of electrons as of ring-vortices of *plenum* of a minimal size. **Any fluid ring-vortex** (or “vortex-ring”, according to other authors) **is in itself a *dipole*** that conveys a flux of the medium of which it consists from one of its pole to the opposite one. Such a characteristic of fluid dipoles predisposes electrons to match well the flux of magnetized plenum mobilized by the electrical current in the coil. The electron rings *polarize*, i.e., they align their polar axes to the direction and sense of the magnetized flux of plenum, so as to oppose minimum “resistance” to the flux, in this way stabilizing the process of magnetic field formation and preservation also in absence of metal and electrons. Because of the impossibility of undergoing Lorentz force in a uniform way, due to their random vibration/oscillation around points of virtual equilibrium, the electrons in the magnetized metal limit themselves to stabilize and uniformly align their positions and polar axes. In the sketches below I try images of that I mean.

FIGURE 3

An image of electron shaped like a micro ring vortex, with its inherent motions.



*A “vibration” of electron might consist of the combination of the two components of the fluid ring motion (blue and black arrows) with a rotation of the ring about axis **a-a** (red arrows).*

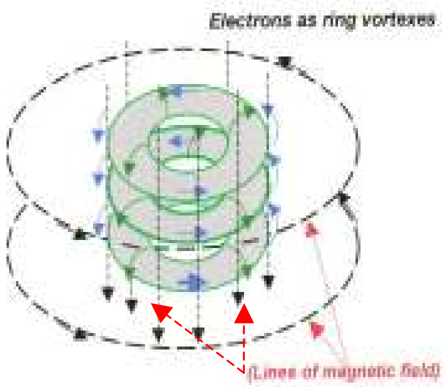
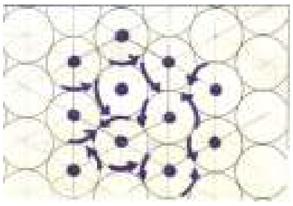


FIGURE 4

This sketch suggests an example of possible polarization of electrons in an aligned chain. The resulting magnetic field is a combination of circular field lines with orthogonal straight lines, giving an idea of the plenum’s flux that passes through the magnet. Actually, each chain of polarized electrons reproduces the motion of the plenum dragged by a continuous electrical current in a coil: The plenum moves through like a swift continuous thread screw.

In a magnet, the polarization of the electrons must take place in a *natural* way which be apt to facilitates the passage of the plenum magnetic flux**:** the chains of polarized electrons align parallel to each other in a kinematical disposition of their field circular lines that makes the co-presence of parallel chains compatible with the plenum’s flow. Since the polarized electrons achieve an immediate “static” equilibrium, it seems almost obvious to figure out parallel chains of polarized electrons in mutual contact whose circular rotations around the respective chain-axes have opposing motions. Inside the magnet, the combination of the kinematical lines of flux do actually neutralize the effect of the *circular* lines of the magnetic field, *while strengthening the parallel straight lines of the field* in the final result of the detectable field lines between the two opposite poles of the magnet.



The *cross-section* of a set of parallel chains of polarized electrons should likely show an hexagonal pattern, with the points indicating the chains' axes at the vertices of the hexagons. The sketch illustrates the cross-section of a bunch of polarized chains of electrons in a magnet. Each chain rotates around its own axis, all the chains with equal angular velocity vector. However, this component of the motion inherent in each electron is in every chain opposed by every other parallel adjacent chain, so that the rotation of electrons around their chain-axes is substantially blocked. Analogous "friction" intervenes between individual electrons that belong to the pile forming a chain, though the *dipolar* rotation (see the black curved arrows in Figure 3) of all electrons is kept secured by the homopolarity of all the electrons that belong to the same chain. The "friction" between electrons is a probable source of *photon rings* that wrap every electron.

By an analogy, the suggestion expressed through Figure 4 leads to think of the plenum dragged by a continuous electrical current in a coil as of the dragging effect associated with the wire of each turn of the coil. Again, the resulting motion of the plenum's flux is similar to that of a swift continuous screw. In other terms, both the chain of polarized electrons and the electrical current in a coil form a sort of *multiple* ring-vortex that works like a fluid dipole in a three-dimension geometrical space.

At variance with any single chain of polarized electrons inside the magnet, the current in the coil has no parallel counter-coil to balance the circular components of its magnetic field. Therefore, the macro-dipole of plenum fluid so determined does simultaneously turn and shift along the central linear axis of the coil. The speed of the dragged plenum decreases with the distance from the coil.

The lines of flux of the coil's magnetic field do necessarily interfere with the flux lines of the gravity vortex. The resulting effect depends on how the interference occurs.

A short step back to linear parallel conductors may also help make the situation clearer. Everybody knows that the continuous flow of two parallel electrical currents in two linear conductors cause a mutual attraction force between the conductors. See the sketch below.

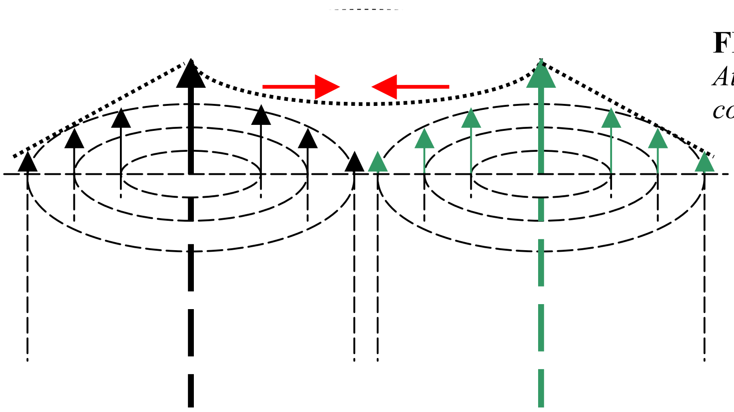


FIGURE 5
Attraction between two electrical conductors with parallel currents

A simple interpretation of the attractive force between the two electrical conductor relies upon a universal principle of fluid-dynamics, according to which any "object" immersed in a fluid flow characterized by a non-uniform distribution of the fluid velocity moves towards the speedier strata of the flow. From a technical point of view, this effect is defined and calculated through a mathematical operator named "*circulation* of the fluid's velocity vector around the object". In the case of the two electrical conductors represented in Figure 5, the velocity distribution is that of the plenum dragged by the electrical current in the conductors.

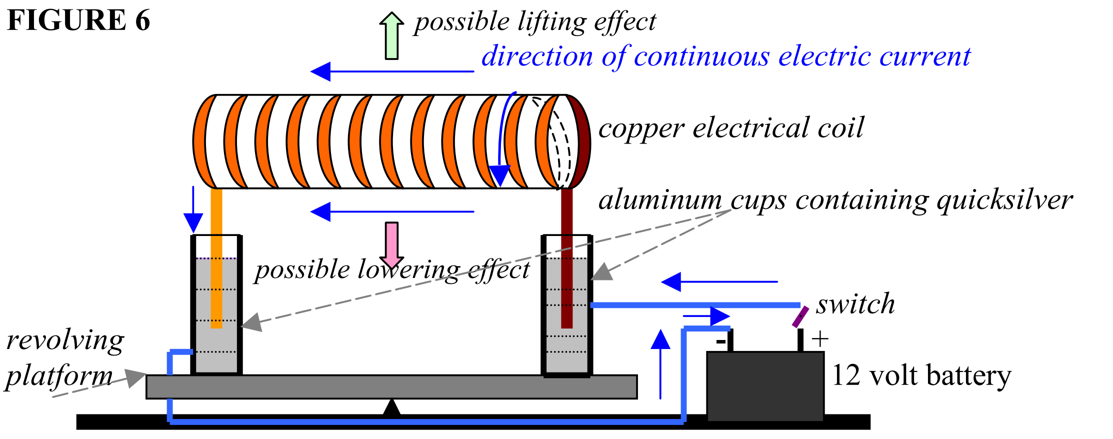
The plenum's velocity decreases with the distance from each conductor and distributes uniformly on co-axial cylindrical surfaces.

The flux velocities between the two conductors, while individually decreasing, add-with and reinforce each other, so that a non uniform distribution of the plenum's velocity surrounds the conductors. The flow's speed is higher between the conductors and lower elsewhere. Thus, the two conductors move toward each other**:** perhaps, it is the simplest example of fluid-dynamic effect due to the interference between different fluid flows.

Going back to the coil, its magnetic field is nothing else than a particular field of velocities of the plenum, which cannot avoid interfering fluid-dynamically with the velocity field of the gravity vortex.

The long-time-ago experience I have previously mentioned can easily be replicated in the way I am suggesting with the sketch that follows:

FIGURE 6



The draft above illustrates the basic concept that promoted the test. The rigid extremities of the electrical coil are immersed in quicksilver and tend to float. The aluminum cups are well connected to the electrical circuit.

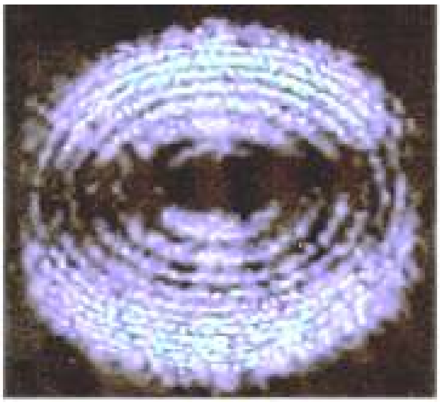
The electrical circuit wires external to the coil-platform system, along with the battery, should be kept as far as possible away from the testing system and in such a way so as to minimize the detectable disturbance induced by the relevant magnetic fields.

Against our expectation, the experienced effects were well visible**:** that is why – at least on a first attempt - I deem it not necessary to apply any dynamometer.

The effects seemed also associated with the orientation of the platform**:** beside lifting effects, also lowering effects and no-effect were observed.

Actually, a "short circuit" occurs when the electrical switch is on, which may be interrupted by jumps of the coil out of the quicksilver. However, the use of a battery for the generation of continuous electric current does remarkably limit the number of tests. It would be more appropriate using a generator of high potential continuous current, with the introduction of a convenient electrical resistance in the circuit. What matters is a sufficiently swift current in the coil (say 2,500 km/sec). As for the copper coil, it is advisable to use a wire whose section is at least 2 sqmm (~ 1.6 mm diameter). The effects obtained are open to other interpretations.

February 2008 - The electron's portrait



By the end of February 2008, the news was spread by European media concerning what could be considered as a major achievement of micro-technology. According to the news, physicists of the university of Lund in Sweden have been able to shoot a film of one single electron, after having pulled it away from its atom.

The image of the electron published by press as well as by www.livescience.com is shown here below. Scepticism might be expressed as a first reaction to the news. According to quantum physics, the probability of localising and imaging an electron is nearly nil, because both of the extremely small size of this particle and of the not negligible distorting effects caused by the impacting photons used to see it.

Therefore, some might be of the reasonable opinion that the regarded image doesn't show an electron, but instead the effect of the impact of photons on the electron.

The technical explanation that is so far available reports on a laser technique which is usual in ionising atoms. Laser fields with electromagnetic waves of an appropriate frequency can produce a resonance effect in atoms, which causes the scattering of electrons away from the atoms. The point is to keep a freed electron under control, in order to drive and keep it within the visual field of an optical detector, accounting for the extremely high speed of the electron's motion. Lund's physicists avoid speaking of "image of electron", since instead they prefer to point out that the filmed sequence shows the "electron's momentum distribution in space". The sequence of the film, however, shows a series of almost identical images, caught and impressed through a stroboscope-like effect. A stroboscopic sequence can fix, for instance, a series of images of the blades of a propeller in motion: in such a case we might also speak of distribution of the blades' momentum in space, though it would probably be simpler to state that each image portrays a propeller.

In this connection, it seems also worth considering that any electron is a continuous source of electromagnetic waves (i.e., a source of photons). The image proposed as that of an electron could be a genuine one, if the physicists have been able to synchronise and "fine-tune" appropriate instruments in the electron radiation frequency. If a technique of this kind has been implemented, then the figure here below reflects the image of a free electron to a credible approximation. To use a coarse similarity: if one wants to take a photo-picture of the filament of a bulb (provided that the bulb is on) it's not necessary to floodlight the filament, the incandescent filament itself being the source of the portraying light. This is - in any case and for the time being – a personal conjecture of mine, which is obviously biased by my own idea about the structure and shape of electrons.

(*The image of electron is taken from* www.livescience.com - *February 2008*)