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Technological Applications of the New Theory of Dynamic Interactions

By Gabriel Barceló

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The method utilized in the development of this theory, and its applications, consists of a scientific analysis of the dynamic fields that are generated in bodies subjected to simultaneous non-coaxial rotations.

The results obtained in the development of this dynamic theory allow an innovative approach to significant scientific and technological applications, for example, in orbital dynamics, orbit determination, and orbit control.

As a conclusion, under the Theory of Dynamic Interactions various new assumptions have been elaborated based on the analysis of inertial fields generated. A new criteria has been found applicable in the understanding of the coupling of velocity fields. The innovative dynamic theory that has been developed, based on new concepts such as rotational inertia or field's coupling, has numerous technological applications in accelerated rotation systems.

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TECHNOLOGICALAPPLICATIONSOFTHENEWTHEORYOFDYNAMICINTERACTIONS

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Technological Applications of the New Theory of Dynamic Interactions

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I. Theoretical Background

We have been involved in a research project on the behaviour of bodies with intrinsic angular momentum[1], when are exposed to new rotational non-coaxial accelerations. As a result of this investigation, we have proposed a new theory in order to explain the dynamic behaviour of these bodies, insisting in the need of extending our studies on non-Newtonian dynamics.

On the analysis of the fields generated within rigid solid bodies equipped with rotational movement, it is necessary to take into account inertial reactions. We understand to date that the inertial behaviour of the rigid body mass, when exposed to these rotational accelerations, has not been studied sufficiently.

It is possible to find new fields of research in new rotational dynamics of non-inertial systems. The foundations of rotational dynamics might be relevant to unsolved significant problems in physics.

Systems in the universe are in motion, in constant dynamic equilibrium. In the real universe, the general dynamic behaviour of rigid solids is characterized by its dynamic equilibrium. Through time, orbitation coexists with the intrinsic rotation. This aporia, and also the professor Miguel A. Catalán conjectures[2] were our initial speculation.[3]

We conducted experimental tests that confirmed our hypothesis. These tests were video recorded and can be accessed in different Internet portals[4]. Additional experimental tests have been carried out by other investigators. These other tests and experiments have been published[5] and also video recorded. The video with this other evidence can be accessed online[6].

As a result of all these tests, we arrived the following conclusion*: These experimental references, and many others which can be suggested, infer the existence of a different non-Newtonian rotational dynamics, which is necessary for identifying the behaviour of rotating bodies, when they are exposed to new non-coaxial stimulations, and the behaviour of which is nowadays often interpreted as anomalous, paradoxical or chaotic, as the laws at our disposal do not allow to identify and predetermine it.[7]*

II. Motion Equation

On the basis of the principle of conservation of motion[8], we have obtained the motion equation which is described in other texts[9]. This motion equation finally can be written:

$$\vec{v} = \vec{\vec{\Psi}}\,\vec{V}_0 = \begin{pmatrix} cos\ \ M'\ t/\ I\omega & -sen\ M'\ t/\ I\omega & 0 \\ sen\ M'\ t/I\omega & cos\ M'\ t/I\omega & 0 \\ 0 & 0 & 1 \end{pmatrix} \vec{V}_0 . \qquad (1)$$

In a single rotation, the rotational operator $\vec{\vec{\Psi}}$ *transforms the initial velocity* $\vec{V}_0$ *into the velocity* $\vec{v}$ *, both situated in the same plane. We find that the rotational operator* $\vec{\vec{\Psi}}$ *is a function of sine or cosine of* $\vec{\Omega}$ *t, which clearly indicates the relation between the angular velocity* $\vec{\Omega}$ *of the orbit and the torque* M*' and the initial angular velocity* $\vec{\omega}$ *Thus, I have derived a simple mathematical*

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relation between the angular velocity $\vec{\omega}$ *of the body and its translational velocity* $\vec{v}$ *. Equation (1) is a general equation of motion for bodies with angular momentum that are subjected to successive non coaxial torques. For this equation, the rotational operator* $\vec{\vec{\Psi}}$ *serves as a matrix that transforms the initial velocity, by means of rotation, into the velocity that corresponds to each successive dynamic state*[10]*.*

Based on this principle of conservation of motion, and establishing certain axioms, we obtain the equation of motion referred to bodies subjected to simultaneous non-coaxial rotations. This equation and the aforementioned axioms give rise to a series of laws for dynamic behavior of bodies under these assumptions rotational accelerations.

III. Field Analysis

By analyzing the dynamic fields created, we deduced that does not apply the discriminating Poinsot hypothesis[11], admitted in classical mechanics, which supposes that the angular momentums were coupled between each other and separate from the linear dynamic momentums. For example, in case that the body has a translational velocity $\vec{v}$, *we propose a new dynamic hypothesis which states that the field of translation speeds couples to the anisotropic field of inertial speeds generated by the second non-coaxial momentum acting, forcing that the center of masses of the mobile modifies its path, without an external force having being applied in this direction*[12]*.* As such, we obtain an orbiting movement, which is simultaneous with the constant intrinsic rotation of the moving body $\vec{\omega}$.

We can observe in nature many examples of bodies which behave according to the equation of motion. For example, in the case of a coin rolling on a flat surface, one can observe that a non-homogeneous field of speeds is generated as a result of the overturn momentum created by the weight and the fulcrum: when falling, the variations of the non-homogeneous field of speeds also generate an anisotropic field of accelerations, which we can be identified by the inertial forces that are generated (Figure 1). The figure shows the drop velocities distribution generated in the perimeter of the coin. But it has to be stressed that, according to the proposed theory, the non-homogeneous field of speeds couples to the field of translation speeds, generating a new trajectory of the mass centre.

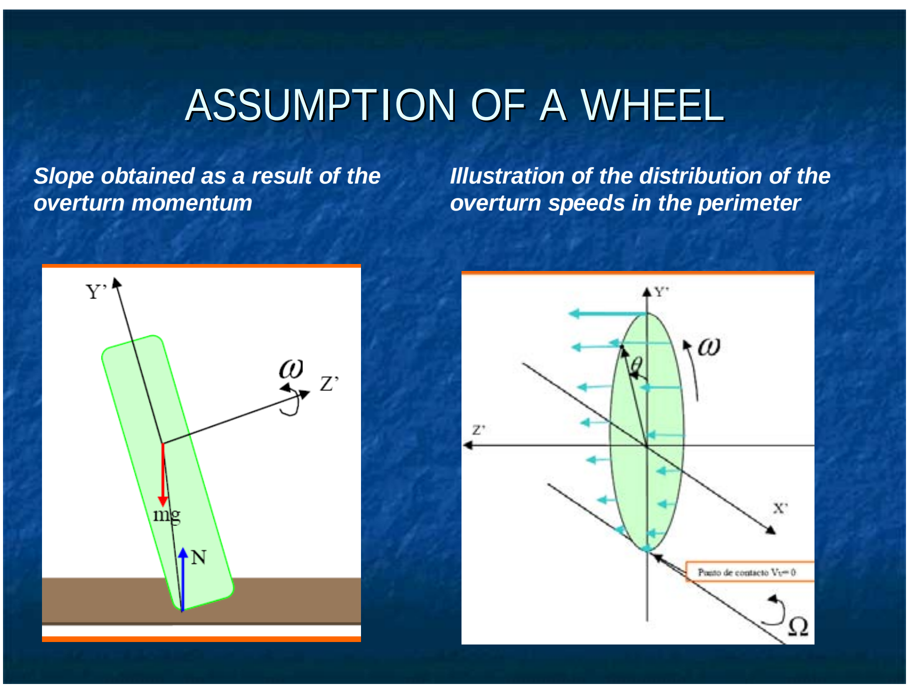

Figure 1 : Example of the dynamic behaviour of a wheel turns

This example can be applied to many other cases, like the hoop or the wheel. Also occurs in the case of balls with spin effect. In sports where balls are used, this phenomenon can be observed when the ball acquires an intrinsic rotation: the ball takes a curved path and fails to maintain its linear path. In these cases, in our opinion, non-homogenous speed and acceleration distributions are generated, which can be represented in a section of the mobile body. In the assumption of a football with intrinsic rotation, when being kicked eccentrically, a new non-coaxial momentum with the existent rotation can be generated, the speeds' distribution of which couples, according to our hypotheses, to the field of transfer speeds, causing a curvilinear trajectory (Figure 2).

The figure 2 shows as it generates a homogeneous distribution of velocities and accelerations in a section of the ball, with rotation, transforming its linear path in another orbital.

In our opinion, the curvilinear trajectory of the ball is not caused by aerodynamic Magnus effect, however, and according to the *Theory of Dynamic Interactions*, the real cause is the coupling of dynamic fields that occur. In this way the ball can change its trajectory, without an external force. It is only necessary that the ball has intrinsic rotation and be subjected to a new torque that is not coaxial with intrinsic rotation.

Another example of the theory is the feared Roll Coupling of the planes. It happens when a plane, which is flying a screw or any other kind of air acrobatics which implies, for example, a turn around its main inertia axe, starts a new steering manoeuvre with curved trajectory.

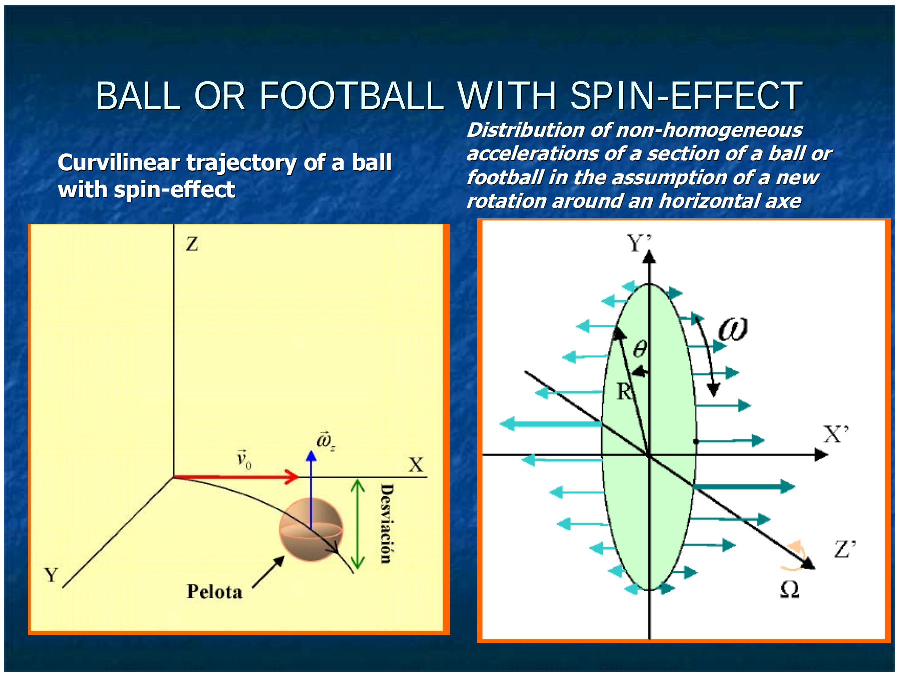

Figure 2 : Example of the dynamic behaviour of a rotating ball

It is also another example of the theory the feared Roll Coupling of the planes. This occurs when an aircraft is flying a screw or any other type of aerial acrobatics involving, for example, a rotation about its principal axis of inertia, if its begins a new steering maneuver with curved path. In this case, the pilot can lose control of the plane.

Again we can apply the proposed dynamic hypothesis. Thus, the inhomogeneous distribution of resultant speeds generated by the new rotation around a new non-coaxial axis, couples with the field of transfer speed, causing an unintentional deflection of the trajectory, as well as a possible loss of control of the aircraft.

The figure 3 shows the inhomogeneous distribution of velocities generated in the new rotation of the plane. In our opinion, the *Theory of Dynamic Interactions* can justify the dynamic behavior of many other examples.

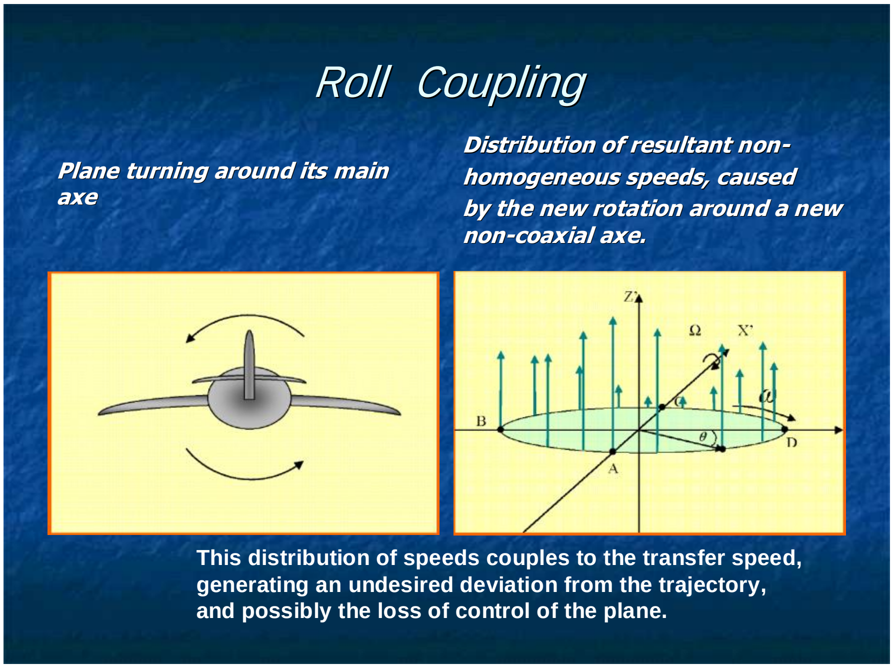

Figure 3 : Dynamic analysis of roll coupling in Planes

IV. Mathematical Model

This new rotational dynamics develops a mathematical model, from which we have performed simulations of dynamic behavior through computer.

This model incorporates inertial phenomena within a unified structure of a new rotational dynamics. Its backgrounds and fundamentals have already been exposed in a book[13]. This text is an essay on physics, which incorporates a portion of "inquisitive thinking". The work concentrates on the dynamics of rotations. It starts describing the main milestones in the evolution of scientific concepts which deal with, or are related to, the study of rotations. It then presents the historical evolution of the theories of the rotational dynamics and continues with a critical analysis of the different formulations of these problems during the consecutive development stages of what we usually call *rational mechanics*. In these two parts the peculiar nature of the dynamics of rotations is focused on, which certainly shows peculiar behaviours, not always coinciding with ordinary intuition, or even not always well understood.

The final part of the book is an essay which presents an alternative proposal invoking the freedom of "inquisitive thinking". This essay contains proposals of new dynamic hypotheses which would allow something like an "imaginary nature", as a suggestion of a new path for interpreting nature from a new point of view, for what could be interpreted as the keys for a new physics.

This proposal of "*imaginary nature*", has led to a new physical theory in the course of time, once the initial dynamic hypotheses were sufficiently checked by means of experimental tests, and once the designed computer simulation model qualitatively coincided with numerous examples in nature. This was the way how the *Theory of Dynamic Interactions* was designed, which helps us to understand the cosmos in constant dynamic equilibrium; in a universe in which the celestial bodies simultaneously rotate on its axis and orbit.

V. Simulation Models

Simulation studies have been carried out, obtaining traces equivalent to the trajectories of real bodies in space, open or closed. We can compare results and confirm this similarity, as for the case of the boomerang, or the dynamics of the galaxies (Figure 4). Hence we can propose that, in the assumption of dynamic systems in which simultaneous movements of intrinsic rotation and orbitation can be observed, one can infer the possibility of the existence of *dynamic interactions* and a mathematical model composed of that new and simple motion equation (1).

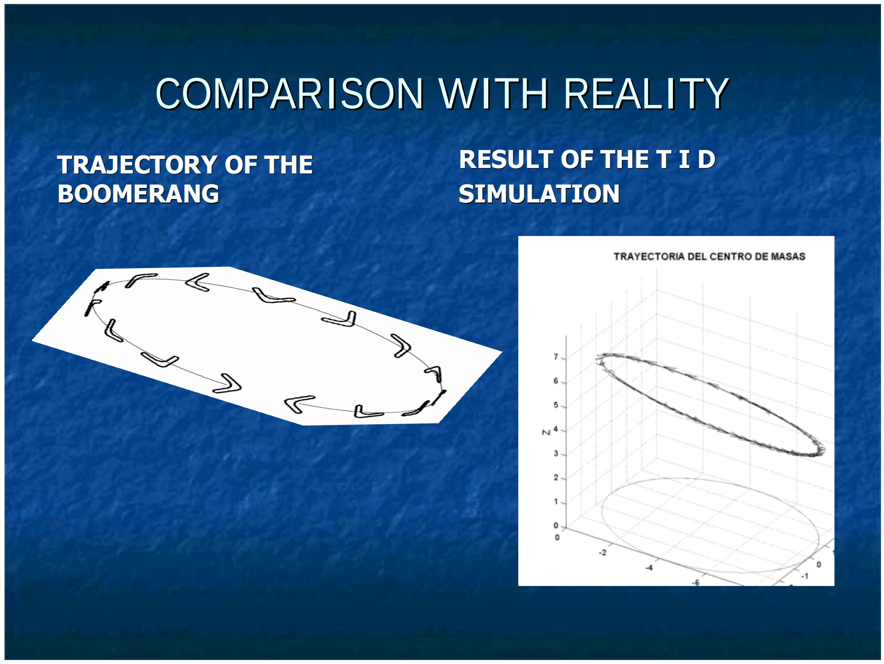

Figure 4 : Comparison between the flight trajectory of a boomerang and the path obtained by computer simulation model

The proposed theory generalizes dynamics concepts which remained unstructured within the classical mechanics. Apart from allowing us a better understanding of the equilibrium of the universe, it makes it possible to conceive the dynamics of the galaxies, and to explain the ecliptic or the rings of Saturn. According to the tenth law proposed in chapter eleven of the book, and its third corollary, the vectors of the speed and of the acting momentum determine a plane, which has to contain the described orbits. So we deduce that the rings may respond to the effect of a constant external momentum, within the scope of this theory.

Through multiple experiments the text proves the supported hypotheses of rotational dynamics of the theory, and proposes numerous behaviours as tangible examples of the theory, arguing that the laws of classical mechanics, fully valid and tested, exclusively refer to assumptions of translation movements in inertial systems, non-accelerated, when in the universe and in nature the movement occurs with accelerations, especially in the assumptions of rotational dynamics.

The theory also allows to give an answer to an initial aporia: allows us to be aware and come to understand the *physical and mathematical correlation between orbitation and intrinsic rotation,* and therefore, the rational casualty that we have day and night on earth, as our theory reflects a clear correlation between the intrinsic turn of earth and the route within its orbit.

VI. Technological Applications

There are numerous possible technological applications, especially in orbital dynamics, orbit determination and orbit control; one application would be to be able to calculate the trajectory of any solid in space, with intrinsic angular momentum.

Within the technological scope, the theory allows to propos a new steering system independent from a rudder or any other external element. Also, many innovating hypotheses, as for example the analysis of internal strains in moving bodies, due to internal efforts. The concept of dynamic coupling suggests the possibility of performing a power conversion between the terms coupled and in both directions. We can assume that the rotational kinetic energy can be converted into translational kinetic energy, or vice versa, which leads, for example, to conceive the concept of dynamic lever.

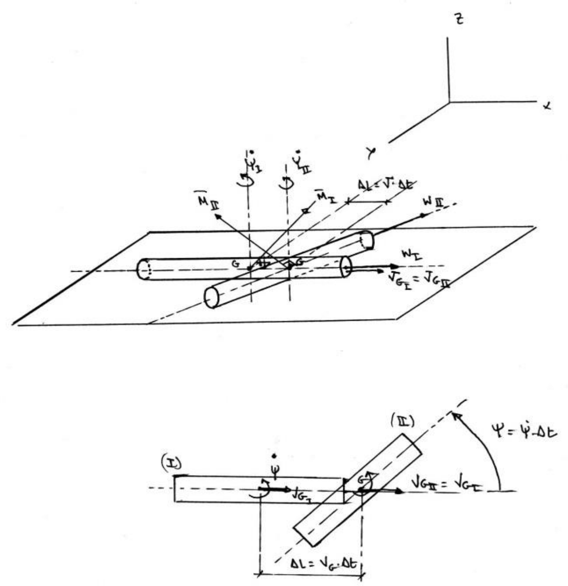

Figure 5 : Coupling speed of a body, in space with translational velocity V_G, with angular momentum about its vertical axis, and subjected to an external no-coaxial torque

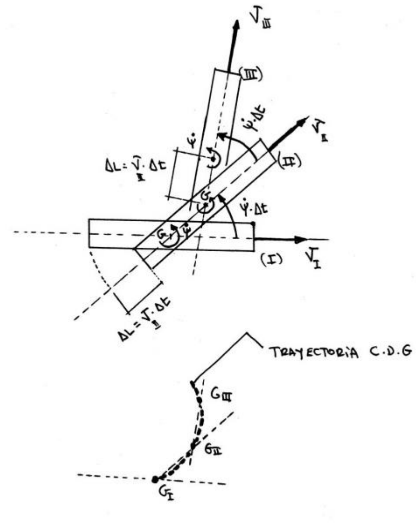

Figure 6 : The position of the center of mass varies depending on the coupling between the field of the linear velocity and the velocity field caused by the non-coaxial torque

As a result, one application would be a *dynamic lever* with technological uses and practical effects. This *dynamic lever* would allow to design mechanisms in which the result of its action could be obtained without any energy consumption, thus the provided energy being recoverable. As the example, in Figure 5 shows the dynamic lever can be applied in a dynamic rocket catapult.

The pitcher would have as its primary mission to give to the aircraft or rocket the initial thrust to overcome the attractive field, reducing the amount of fuel carried. The launching mechanism would consist of a fixed structure and tractor train supported on earth. Using an electromagnetic system, the spacecraft levitates with its longitudinal axis parallel to the ground. This initially is submitted to pairs of action and would generate a rotational movement about its longitudinal axis. Finding the rocket in the catapult rotating and with magnetic levitation will be subject to a strong initial impetus, imposed by the recoverable drive train. The aircraft, powered with the initial velocity in the direction of its longitudinal axis, is subject to a new electromagnetic torque, in this case a vertical axis perpendicular to the initial (Figure 5).

The action of a second torque, electromagnetic or mechanical, will maintain the time required for the rocket to initiate a curved path, describing a circumference arc (Figure 6). This trend will continue until it turns its longitudinal axis 90 °.In this way, the mobile has changed its relative position in 90 °, remaining standing with its longitudinal axis perpendicular to the ground.

Through this system, the mobile will have reached an initial boost due to the effect of Dynamic Lever, proportional to its rotational speed, to its moment of inertia, and the final pair received. This initial momentum will allow you to overcome the gravitational pull, and rise, using their own engines only to maintain the initial velocity. The system will allow significant energy savings. There is no necessary to carry the fuel needed to overcome the gravitational field.

Apart from designing a dynamic lever or energy conservation devices, this theory gives way to applications in the steering of mobiles in space, e.g. aircrafts, ships or submarines. A dynamic steering system for navigating a craft, comprising means to provide within the vessel with an intrinsic rotational movement around a principal axis of inertia of the craft. This is characterized by the fact that it also comprises a device for displacing the relative position of the centre of gravity of the craft, along a path that is substantially parallel to said principal axis of inertia. So that, the vessel is provided with angular momentum, that is substantially orthogonal to said principal axis of inertia, whereby it is induced to follow a curvilinear path. The dynamic steering applicable for vessels government proposed replaces traditional rudder by incorporating dynamic device.

The technological development of this theory allows also, in our opinion, the determination of the devastating effect of hurricanes. The theory will be applicable for predictions and control of dynamic systems which nowadays might be understood as chaotic, but the trajectories and behaviour of which can be determined with the Theory of Dynamic Interactions.

VII. Conclusions

We have developed a new dynamic theory applicable to accelerated rotation systems, based on new concepts such as rotational inertia or field's coupling. Various assumptions have been elaborated based on the analysis of the inertial field's generated and new criteria on the coupling of these velocity fields.

Our hypotheses have been confirmed by experimental tests made by ourselves and by independent third parties. A clear correlation between the initial speculations, the starting hypotheses, the mathematical simulation model, the deduced behaviour laws, the realized experimental tests and the mathematical model corresponding to the movement equations resultant of the proposed dynamic laws, has been obtained.[14]

The results obtained allow us to propose a new vision of the dynamics, based on the analysis fields for bodies subjected to rotational accelerations.

To end, we can remember Isaac Newton: *We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances*[15].

Anyone interested in cooperating with this independent investigation project is invited to ask for additional information from Advanced Dynamics S.A. or to look up at www.advanceddynamics.net

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