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Theory Of Dynamic Interactions: Synthesis

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ABSTRACT

In this text, we carry out a brief summary of the Theory of Dynamic Interactions developed by the author in the new book: New Paradigm in Physics. Certain keys are provided to better understand the dynamic hypotheses proposed, conclusions are drawn from the studies carried out and ideas for future development are proposed in this area. The author believes that with this new model proposed, the understanding of our observational universe will be facilitated, as well as that of the physical phenomena we notice.

This paper is based on ideas and excerpts from other texts by the author or his team, which are mentioned in the references. Nevertheless, some paragraphs may not be duly referenced.

Keywords: Paradigm in Physics; Rotational Motion; Rotational Dynamics; Dynamic Interactions; Inertial Fields; Generalization of mechanics .

1 Keys to understand the Theory of Dynamic Interactions

Taking as a starting point the aporia between rotation and orbit, a Theory of Dynamic Interactions, has been developed by Advanced Dynamics team (See figure 1), that I explain on the book: New Paradigm in Physics[1]. The writing of this book is described by Professor Merino[2], and it incorporates a prologue of great interest of Francisco Dalby[3].

This theory is based on the inertial incapacity of matter to vector add, under certain conditions, the resultant angular momenta and, in general the angular magnitudes of the rotating bodies. The dynamics of rigid solid bodies is not a closed discipline, particularly in the field of rotational dynamics. From the observation of bodies with intrinsic rotation in our universe, our research group proposed new dynamic hypotheses that explain the behavior observed when these bodies are subject to new simultaneous non-coaxial rotations.

The findings of the Bernoulli's, Riccati and especially D´Alembert and Euler, followed by that of Lagrange, Laplace and Hamilton, meant that from the 19th century Mechanics could be considered a mathematically defined and fully modelled science. However, if we analyses Rotational Dynamics specifically, we cannot be satisfied or share that same approach.

It was in fact Euler who established the equations of motion of rotating solid bodies4. His studies on rotational dynamics culminated in the publication of his work Theoria motus corporum solidorum seu rigidorum5. In said work, he expresses the rotation of the main axes of the body in relation to the other

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three fixed axes, through the use of three variable angles, which determine new angular coordinates, and through very similar formulas to those currently known.

The orientation of a rigid solid body can be determined from Euler's angular coordinates. If these coordinates are known depending on time, we will be able to deduce the temporal evolution of its orientation. These are Euler's equations, based on which we should be able to determine the trajectory of a body subjected to multiple momentums.Euler's equations are to rotational dynamics what Newton's second law is to translational dynamics. The problem is that those equations, which are consistent and formally correct, do not allow a general solution apparently both from the physical and purely mathematical point of view, because they generate complex equations that in most cases can only be solved approximately.

Figure 1. Advanced Dynamics Team in 2008: From left to right: F. Dalby, M. Cano, R. Gómez-Olea (†), G. Barceló, J. Cano, A. Álvarez and E. López.

Even if we analyze the trajectories calculated with these equations, we note that not correspond to observable reality. In figure 2 we see estimated trajectory with the formulation of Classical Mechanics, and on figure 3 the real trajectory observed.

By observing in nature the constancy of the relationship between orbiting and intrinsic rotation, Gabriel Barceló deduced the principle that: Everything that orbits, rotates7; or rather, everybody that moves through an orbit simultaneously rotates on an intrinsic axis. He deduced this principle from observing the planetary system, the rings of Saturn and also the behavior of the spinning top.

He understood, however, the need for empirical checks to confirm or rectify the new dynamic hypotheses deduced from the aforementioned principle and, where appropriate, to be able to explain that behavior by formulating a new dynamic theory that would simultaneously resolve other Rotational Dynamics phenomena and generalize inertial phenomena. The Theory of Dynamic Interactions allows developing a specific dynamic for rotating solids, submitted to successive torques in which the sequence of the forces' action and its behavior do not coincide exactly with the laws of classic mechanics.

The statement of behavior laws of mobiles in space, and therefore the development of the Theory of Dynamic Interactions, has been carried out after experimentally verifying the previsions of this theory and the real inertial behavior of the rotating matter.

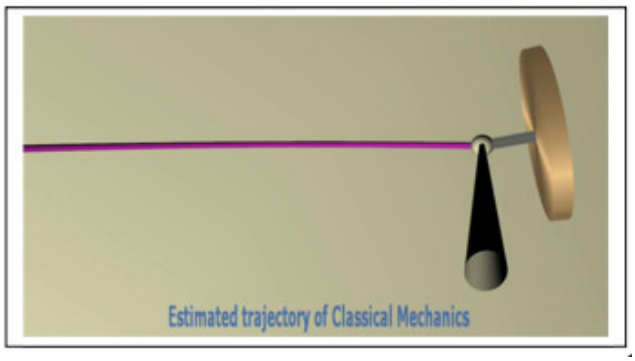

Figure 2. Estimated trajectory of Classical Mechanics.

The incorporation of this theory in the field of rational mechanics is achieved, not only by speculative and mathematical reasons, as well as being a result of the realized experimental tests, and even through the extrapolation of the experimental behavior with specific tests.

In line with these previous experiments we have been able to observe that the knowledge of these behavior laws11 will allow the development of new dynamic technologies, unknown to date.

Through this model different results are obtained, for certain assumptions, basing ourselves exclusively on the new interpretation of the coupling concept. We propose new criteria in the composition or superposition of the motions originated by the acting forces.

I strongly believe that this exposure corresponds to the real dynamic behavior of bodies subjected to acceleration by rotation.

Up to now, I have not been refuted by any logical argument or experimental evidence that allows us to suppose that my proposal is wrong.

I proposed that from a relativistic point of view, an intrinsic rotation can be seen as a fixed mobile and a rotation of the space of events which contains it. In this assumption, different experiments can be carried out, and the resulting observations be noted. By way of illustration we could

propose:

1 Multiple rotations. A mobile exposed to successive non coaxial torques might react with two simultaneous non coaxial rotations.
2 Inertial reactions of the mass (Gyroscopic momentum). The successive action of noncoaxial torques, generates an inertial reaction, which does not correspond to Newton's laws, and that is not structured in classical mechanics.

From these experimental references, we can reiterate that we infer the existence of a different rotational dynamics, non-Newtonian, necessary for the identification of the behavior of rotating bodies, when exposed to new non-coaxial stimulations, and the behavior of which, in many cases, nowadays is considered to be anomalous, paradoxical or chaotic, because the laws that we have at our disposal do not allow to identify and predetermine it. Based on the Principle of Conservation of the Momentum, we can infer that the field of inertial reactions generated in the rotating space by a new non coaxial momentum, upon a moving body with a rotational movement ω and an inertial momentum I upon that rotation axis, and thus with an angular momentum *L,* will oblige the moving body to acquire a orbitation rate Ω.

This orbitation rate Ω can be observed simultaneously to the initial ω, which stays constant within the body. Further, and as discriminating hypothesis, in the case of transfer movement of the body, we propose the dynamic hypothesis of the linear speed field, coupling to the anisotropic field of inertial speeds created by the second non-coaxial momentum, obtaining as resultant movement, a simultaneous orbiting with the intrinsic rotation of the moving body. This new orbiting movement, generated by a non-coaxial momentum, defines itself through the rotation of the speed vector, the latter being kept constant in module.

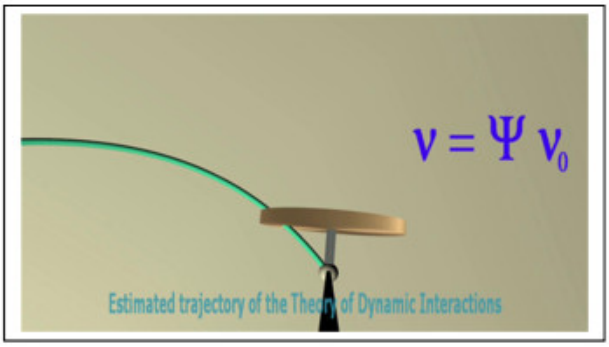

Figure 3. Real trajectory of the Pendulum of Dynamic Interactions.14

As a result of this analysis we obtained as motion equation:

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

The rotation operator $\underset{\Psi}{\Rightarrow}$ with angular displacement, transforms the initial velocity $\underset{V_0}{\rightarrow}$ into $\underset{\nu}{\rightarrow}$, both of which are situated on the same plane. We find that the rotation operator is $\underset{\Psi}{\Rightarrow}$ perpendicular to the velocity (See Figure 4.) and a function of the sine or cosine Ωt, which clearly indicates the relationship between the angular velocity of the orbit Ω, torque $\underset{M}{\rightarrow}$ and the initial angular velocity $\underset{\nu}{\rightarrow}$ (…)

Accordingly, we have obtained a simple mathematical relationship between the initial angular velocity of the body and its translation velocity . (…) Dynamic effects can be associated with velocity and a clear mathematical correlation between rotation and translation. This mathematical coupling enables us to identify a physical relationship between the transfers of rotational kinetic energy and translational kinetic energy and vice versa.

With this analysis, we believe to have given a full answer to our initial aporia between constant turn and orbital movement, being justified the coincidence in nature where mobiles are rotating and orbiting simultaneously, based on the peculiar inertial behavior of mass.

Throughout our exposition, we have tried to avoid the concept of inertial force and we have substituted it by inertial reactions. No existence of real forces can be inferred from the observation of matter. Although we can infer the existence of the non-homogeneous ddistributions of velocities whose derivative

generates an inertial field of accelerations that neither is homogeneous, but can be interpreted as a field of inertial forces.

Quite a number of examples can be thought of for checking these dynamic hypotheses, which would allow us to interpret many assumptions in nature, which still remain unexplained.

This new non-inertial rotational dynamics based on the Theory of Dynamic Interactions, we have developed in laws and corollaries, allowing a number of new, unknown scientific and technological applications. The Theory of Dynamic Interactions was first exposed at the XXX Physics Biennale held in Orense (Spain) in 2005,16 and published in the book: The flight of the Boomerang, with prologue of Professor Garcia Moliner17, and analyzed later by Almudena Martin.

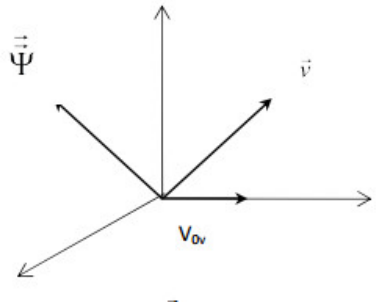

Figure 4. The rotation operator $\underset{\Psi}{\Rightarrow}$ will be perpendicular to the successive velocities $\underset{v}{\rightarrow}$, all of equal module and tangential to the path of the moving object.

2 Generalization of mechanics

We live in a physical world based on the fact that everything rotates, though for the simple observer it seems as something is just moving there in the sky. In reality, we are living in a physical world based on the intrinsically movement on axes of symmetry: The planets rotate on their axis and orbit, as well as their satellites, the planetary systems and galaxies.

As we expressed, the classical mechanics has been formulated for inertial reference frames, and not for rotating spaces of events. Nevertheless, it is possible to think of a new mechanics for any type of space, adding their inertial reactions and defining a dynamics of inertial fields. Thus, the not inertial phenomena would also be structured, and get incorporated in a unified mechanics.

In order to incorporate the inertial phenomena into the structure of physical knowledge, it is necessary to analyze the motion in non-holonomous coordinates and the resulting axial reactions, in the understanding that a mechanics, as the classical mechanics, based on holonomous coordinates and polar reactions, will only represent a limited and partial view of nature.

We have already said that the proposed generalization does not say that classical mechanics is obsolete or wrong, but simply that it is partial and limited, as it refers to the specific assumption of inertial systems. We wish and are able to be more ambitious, looking for more general dynamic laws, which establish the behavior of moving bodies when rotating, or even when they are exposed to multiple non-coaxial rotations of the space of events.

The Theory of Dynamic Interactions generalizes the concept of gyroscopic momentum, and of other inertial phenomena, incorporating them into the unified structure of a new non inertial rotational dynamics.

According to the defended Theory of Dynamic Interactions (See figure 5 and video referred), we can conceive a universe in a constant dynamic balance, in which a force momentum, with a zero resultant, will generate, as long as it works, a movement of constant orbiting, within a closed path.

The importance of this mathematical model is obvious, we have already said that it is not only the forces leading players, but also the momentums of forces which, while staying constant, will generate orbiting and constantly recurrent movements, generating a system in dynamic balance, and not in unlimited expansion.

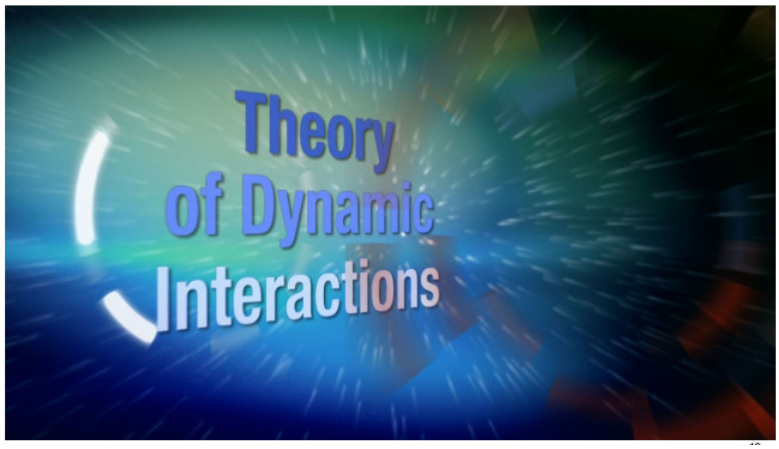

Figure 5. Numerous experimental tests can be observed in videos and can be easily repeated

At the 1930 annual meeting of the Society of German Scientists and Physicians, the Czech mathematician Kurt Gödel tentatively announced the first expression of his incompleteness theorem: There are things we know are true, but we cannot prove.

In my opinion, in our case: There are things we know are true and can prove!!!

3 Justification

The theory justifies and explains many scientific unknowns that could not be understood using classical mechanics. TDI fully justifies the flat orbits Kepler proposed: Bodies provided with intrinsic angular momentum and submitted to one single torque will not orbit in a space formed by possible spherical paths, but in a plane containing the torque.

But this feature is not stated, but it is implicit in Kepler's first law: The orbiting motion is configured in a plane. On the contrary, they are not expressly specified in Newton´ laws.

However, our theory specifically proposed: The mobile's path will be situated on the plane determined by the vector of the initial velocity $\overrightarrow{V}_0$ and an axis parallel to the momentum $\overrightarrow{M}$

And also on the third corollary of the tenth Law, in absence of nutation: Rigid solid bodies equipped with intrinsic angular momentum and translation speed, subject to momenta of constant force, will describe

closed paths in a plane determined by the vector of initial velocity and that will possess an axis parallel to the acting momentum.

The resultant movement, even if we are situated in a three dimensional space, will be a flat orbit, and all the interaction movements resultant of the same torque, will be situated on a plane containing the torque.

This means that, if the variables are kept stable, the orbital movement will be flat. But neither Kepler and Newton laws mentioned in the coincidence of the rotation and orbiting in our universe.

In the laws of classical mechanics, there does not exist a mathematical correlation which relates the movements of orbit and rotation of the planets around the Sun. However, the question of theexistence of a physical relation between both movements, which has to date not been mathematically shown can be raised.

Also to justify how rings with multiple satellites such as the ones of Saturn22 (See figure 6), are formed many times in our solar system. Newton neither explains the reason for the rings of Saturn nor many systems of flat rings in our solar system like the asteroid belt, the Kuiper belt or the diffused disc.

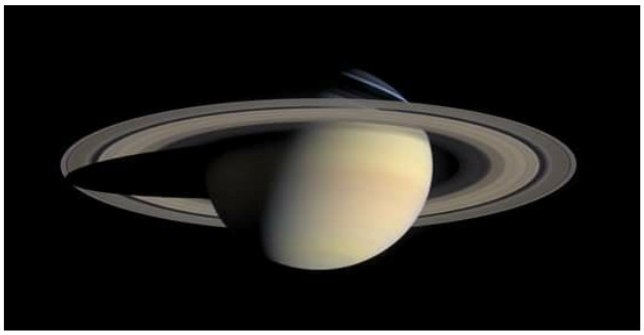

Figure 6. In accordance with the Theory of Dynamic Interactions, the ecliptic or Saturn's discs trace flat orbits.

Our theory may also justify the ripples that occur in the rings of Saturn, and in general in all the ring systems: may be due to changes or disturbances moment acting. For example, by fluctuations of

gravity of Saturn itself, in its rotation, or due to the masses of other planets or satellites affecting

the movement of the rings.

It also justifies the configuration of spiral galaxies, whose arms must consist of celestial bodies in rotation and accelerated traslation speed (See figure 7).

According to the General Theory of Relativity, we can estimate that the mass of the Earth distorts space-time in its surroundings. In this case, we can assume the analogy that the Moon makes a rolling movement on the curved surface of the space-time deformed by the Earth, generating a new rotation of the satellite, which we can suppose is not coaxial to the intrinsic rotation that it already has. In this case, the dynamic interactions predicted by the TDI would be generated, resulting in the closed and flat orbit of the Moon that we see. In this way, we justify the behavior of the celestial bodies, in accordance with the criteria of relativity, without needing torques or forces.

In this same area, the second Law of Kepler can also be justified, since, in the case of an elliptical orbit, it must have a cause according to the TID, in a variation of the orbital velocity, which is consistent with the greater distortion of space-time in the vicinity of the central mass.

Also, the same or analog reasoning could be applied to understand the behavior of so many rotating solid elements like the boomerang, the hoop or the wheel.

4 New paradigm

New Paradigm in Physics, and the accompanying videos, provides only a brief summary of the works and studies carried out over the last thirty-five years, to propose a Rotational Dynamics of Interactions applicable to bodies subjected to multiple successive non coaxial torques. Theinitial hypotheses are based on new criteria about speed coupling and rotational inertia, and have been confirmed by experiments and by a mathematical model allowing the simulation of the real behavior of bodies submitted to these excitations. In this study, I found a clear correlation between the initial speculations, original hypotheses, simulation model, deduced physical laws, the realized experiments, and mathematical models corresponding to the equations of motion that result from the proposed dynamics laws.

Figure 7. The spiral galaxy whose arms, in accordance with what the TDI predicted, will be constituted by celestial bodies in rotation and accelerated traslation.

As a result of this dynamic investigation work we can propose the following conclusions:

1 There is a wide subject area not yet developed in rotational dynamics inasmuch as rigid bodies are subjected to accelerations caused by simultaneous non coaxial rotations.
2 This area of knowledge can be analyzed under relativistic and non-relativistic mechanics. Hypotheses are based on new criteria about speed coupling and rotational inertia.
3 In the exposed experimental non relativistic tests carried out, we have concluded that new general laws of behavior can be obtained, based in the analysis of the dynamics fields created.
4 We have obtained an equation of motion for rigid bodies in translational motion with intrinsic angular momentum, when subjected to non-coaxial pairs, which defines the dynamic behavior of rigid bodies in these cases.
5 We find a clear mathematical correlation between rotation and translation. This mathematical connection allows us to identify a physical relation between transfers of rotational kinetic energy to translational kinetic energy and vice versa.

6 The mathematical model implies that it would be possible that moving bodies subjected to successive non coaxial torques would initiate orbital motion as a result of inertial dynamic interactions.

7 While maintaining constant initial angular momentum and the second torque constant, the center of mass of the moving bodies would follow a closed orbit without requiring any centripetal force.

8 The theory also allows to give an answer to an initial aporia: to be aware and to understand the physical and mathematical correlation between orbitation and intrinsic rotation.

The result of this project is the conception of an innovative dynamic, and also the demonstration of a rational field theory, that gives a new understanding of the behavior of matter. In my opinion, the application of these dynamic hypotheses to astrophysics, astronautics, and other fields of physics and technology will allow new surprising, and stimulating advances in investigation and in the innovation of an unprecedented Rotational Dynamics of Interactions.

Also has numerous and significant scientific and technological applications, especially in orbital dynamics, orbit determination, and orbit control. For instance:

- Variation of the affecting torque, arises when subjecting intrinsic angular momentum bodies to new non-coaxial momentums.
- To conceive an intrinsic rotating mobile solid, which could be exclusively controlled due to Dynamic Interactions.
- To calculate the trajectory of any intrinsic angular momentum solid in space.
- To propose a new steering system independent from a rudder or any other external element.

We can suggest advances in the studies and application related to orbital mechanics, guidance, navigation, and control of single or multi-spacecraft systems as well as space robotics and rockets.

This theory has also had numerous technological applications26 in the control of moving objects, in astronautics27, in nuclear fusion plants or for interpreting climate phenomena with rotating fluid masses, such as typhoons or tornadoes.28 Indeed, we will even consider numerous technological applications, for example, dynamic confinement in nuclear fusion reactors to generate clean electricity, which has been described in two already published articles.

We would like to note that in our deductive reasoning, we have introduced a discriminating hypothesis, in the case of the body's translation movement, when we propose that the field of translation speeds will be coupled to the anisotropic field of inertial speeds created by the second non-coaxial torque, with an orbit simultaneous to the initial intrinsic rotation of the mobile as the resulting movement. This new orbital movement generated by a non-coaxial momentum, will be defined by the rotation of the velocity vector of translation, the latter kept constant in module.

In previous texts, we have proposed that, through this analysis, the nature of any movement in space can be determined and predicted, defining its relativity. The movement equation that is proposed, and the laws that are formulated, permit the initiation of the structuring of a rational mechanics and of a rotational dynamics based on principles and axioms, for bodies submitted to accelerations by rotations, clearly differentiated from classical mechanics.

In this new rational structure, phenomena that are paradoxical or alien to the main structure should not be present as happens in classical mechanics with the so called gyroscopic torque or fictitious forces.

The Theory of Dynamic Interactions is a logical-deductive system constituted from some dynamic hypotheses. By means of the observation of nature, the establishing of some initial hypotheses, and starting from axioms and postulates, we have constructed a structure of knowledge in relation to rigid solid bodies, when submitted to successive accelerations by rotation. The physical-mathematical model obtained allows us to interpret the observable behavior of these bodies, subject to successive non coaxial torques, according to deduced laws, as well as to extract new consequences, inferences and predictions. For example, the theory allows justifying the deviation that undergoes the horizontal curvilinear trajectory of a ball, when it is submitted to non-coaxial moments (See figure 8).

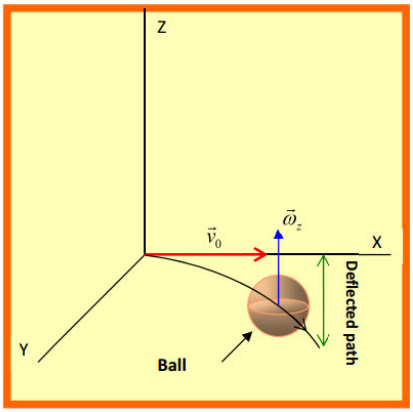

Figure 8. Horizontal curvilinear trajectory of a ball with effect, whose deviation can be justified by the Theory of Dynamic Interactions.

This theory has been checked and confirmed by experimental tests. This text does not pretend to challenge the laws of Newton; what has been developed is a conceptual structure complementary to classical mechanics for systems accelerated by rotations. We propose a theory based on a specific rotational algebra for non-inertial environments where the starting hypotheses that the laws of translational classical mechanics are based on, are not respected. We propose the exploration of a new niche of knowledge for some very specific, but not trivial dynamic conditions that are repeated in our universe.

Also noteworthy is that, through the development of these studies, full coherence has been obtained between the hypotheses of the beginning, the applied principles and axioms, the developed physical-mathematical model, the obtained movement equation, the deduced laws, the reached simulation models and the conducted experimental tests. We also have referred to examples in nature which support the Theory of Dynamic Interactions, all endorsing the laws proposed in this text.

It is necessary to admit the existence of a rotational dynamics of interactions with real results and which modifies the behavior of bodies in accordance with some specific and universal dynamic Laws.

This research can be extended with the Field Theory and a relativistic deep analysis, and may allow the physical knowledge of new space systems and brings potential applications for the future, along with numerous relevant technology developments.

We want to suggest that interest should arise in physics in the exploration of non-inertial accelerated systems, and also to express a call for the need to develop scientific investigation projects for their evaluation and analysis, as well as technological projects based on these hypotheses. In our opinion, these hypotheses suggest new keys to understanding the dynamics of our environment and the harmony of the universe. A universe composed not only of forces, but also of their momentums; and when these act constantly upon rigid rotating bodies, with an also constant translation speed, the result is a closed orbiting movement, thus a system which is moving, but within a dynamic equilibrium.

The application of these dynamic hypotheses to astrophysics, astronautics and to other fields of physics and technology possibly allows new and stimulating advances in investigation.

The result of this project is the conception of an innovative dynamic theory, which specifically applies to rigid rotating physical systems and which has numerous and significant scientific and technological applications, The Theory of Dynamic Interactions establishes new conceptual criteria, of a more general description, to understand the behavior of nature, meaning that the current laws of dynamics could

be considered special and specific cases of this theory. For example, Newton's laws would apply to the case of a physical model of behavior, without force momentums.

5 Other suggestions

The Theory of Dynamic Interactions has led to suggestions that the Theory of Relativity should be reviewed and doubts have been raised over Einstein's Equivalence Principle. This theory should give rise to a review of the current concepts of astrophysics. There should be special analysis of the fascinating history of human knowledge of the universe, while also proposing, developing and explaining the application of the Theory of Dynamic Interactions to afford us a better understanding of the dynamic enigmas that surround us.

The Theory of Dynamic Interactions It is fully described in the book New paradigm in physics (See figure 9).

We can remember how Max Planck used the term "quanta" in his thermodynamic studies. He proposed the concept of the quantization of radiation in 1900 by studying the emission of blackbody radiation by suggesting that energy can only be absorbed or released into discrete packets, which he called elements of energy. Planck also deduced the numerical value of h, later named after him as Planck's constant, being understood in physics as the smallest amount of energy that can be transmitted.

In 1905, Albert Einstein suggested generalizing this concept for energy radiation, and even for electromagnetic radiation, proposing the existence of light quanta. This concept was generalized until it was accepted as the minimum value that any physical quantity can take. In this way, it turns out to be the least possible variation of any physical quantity.

This constant is still assumed today, but its nature or justification is unknown. Nevertheless, this Quanta or minimum value of physical magnitudes, could have its origin in atomic physics, and in particular, in atomic particles, being related to their spin, and therefore, with the possible angular momentum of the particle.

We suggest exploring and analyzing this possibility, and determining if there maybe a correlation between the atomic particle spin and the Planck constant, based on the criteria established by the Theory of

Dynamic Interactions. On the other hand, before proceeding with the structuring of a physics developed from logical configurations resulting from mathematical deductions, which have not been experimentally contrasted, and therefore with no observational result, such as black holes, axions, dark matter,

dark energy, etc ..., we reiterate the need to incorporate the postulates of the theory we propose, ina review of the Theory of Relativity, that allows us to reach a Theory of everything that is consistent with physical reality.

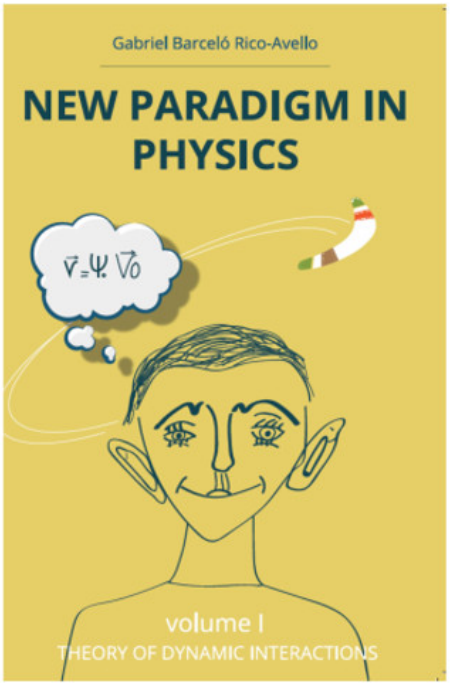

Figure 9. New paradigm in physics

We believe that with this new model that we propose, the understanding we have of our observational universe will be facilitated, as well as that of the physical phenomena we notice in it.

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.

6 Final note

According to the information we have, only our team of Advanced Dynamics has investigated actually in this field, and has published on these researches.I have presented here a synthesis of our Theory of Dynamic Interactions, after more than forty years of research. Perhaps I have to repeat concepts and arguments from previous texts.

Our practice of careful elaboration and possible repetition of our own texts is explained by our desire to overcome, as efficiently as possible, difficulties in spreading our ideas and also, to avoid possible misinterpretations.

The text refers to other papers published by the same author, or other texts of his research team, understanding that this repetition, in a synthesis text, is necessary and convenient for clarity in the dissemination of the results obtained.

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