Research Project on Rotational Dynamics Orbiting and Rotation of Celestial Bodies

Gabriel Barceló Rico-Avello

ABSTRACT

We will attempt to summarize in this text the private scientific research that our team has conducted on rotational dynamics over the past forty years. The document analyses the rotation and orbiting of rigid solid bodies, and specifically of celestial bodies, arriving at a Theory of Dynamic Interactions (TDI) as a solution to the problems not resolved by Kepler's and Newton's laws, by taking into account the simultaneous orbital and rotational movements of planets.

The text describes experiments that demonstrate how a body in rotation and translation can alter its trajectory, thus challenging the classical Newtonian model. The TDI explains the behaviours of bodies that simultaneously orbit and rotate, and it can be applied to dynamic phenomena that meet those conditions, such as the case of boomerang flight, gyroscopes, or the anomalies observed in the Pioneer probes, offering a new interpretation of these behaviours.

Keywords: theory of dynamic interactions, tdi, rotational dynamics, dynamic interactions, rotation acceleration, solar system dynamics, dynamic equilibrium, momentum, orbiting, rotation, gyroscopic effects.

Classification: LCC Code: QB351–QB355

Language: English

Great Britain Journals Press

LJP Copyright ID: 925610
Print ISSN: 2631-8490
Online ISSN: 2631-8504

London Journal of Research in Science: Natural & Formal

Volume 25 | Issue 10 | Compilation 1.0

Research Project on Rotational Dynamics Orbiting and Rotation of Celestial Bodies

Gabriel Barceló Rico-Avello

ABSTRACT

We will attempt to summarize in this text the private scientific research that our team has conducted on rotational dynamics over the past forty years. The document analyses the rotation and orbiting of rigid solid bodies, and specifically of celestial bodies, arriving at a Theory of Dynamic Interactions (TDI) as a solution to the problems not resolved by Kepler's and Newton's laws, by taking into account the simultaneous orbital and rotational movements of planets.

The text describes experiments that demonstrate how a body in rotation and translation can alter its trajectory, thus challenging the classical Newtonian model. The TDI explains the behaviours of bodies that simultaneously orbit and rotate, and it can be applied to dynamic phenomena that meet those conditions, such as the case of boomerang flight,[1] [2] gyroscopes, or the anomalies observed in the Pioneer probes,[3] offering a new interpretation of these behaviours.

The text suggests that this theory provides new insights into understanding rotational dynamics and the harmony of the universe, proposing a defined mathematical model for modern physics and for certain natural phenomena.

Keywords: theory of dynamic interactions, tdi, rotational dynamics, dynamic interactions, rotation acceleration, solar system dynamics, dynamic equilibrium, momentum, orbiting, rotation, gyroscopic effects.

Author: Advanced Dynamics CB, España, Madrid E.T.S.I. Industriales de Madrid, L. C. Physics. U. Complutense, Madrid, (Spain).

I. INTRODUCTION

Driven by our interest in observing the universe—both the dynamics of the cosmos and the interactions of atomic particles—we began an investigation into the dynamic behaviour of rotating rigid bodies. We carried out the necessary experimental tests, subjecting these bodies to new, non-coaxial rotations, ultimately developing a new theory: the so-called *Theory of Dynamic Interactions* (TDI),[4] supported by a specifically conceived mathematical framework.

In the solar system, all planets rotate on their own axes and orbit around the Sun. The first modern scientist to study the motion of the planets was the German astronomer Johannes Kepler in the 17th

[1] Barceló, Gabriel; *Theory of Dynamic Interactions: The Flight of the Boomerang*, Journal of Applied Mathematics and Physics, 2, 569-580. (2014) doi: 10.4236/jamp.2014.27063.

[2] Barceló, Gabriel*: Theory of Dynamic Interactions: The Flight of the Boomerang II*, Journal of Applied Mathematics and Physics, Vol.3 no.5, Mayo 2015. DOI: 10.4236/jamp.2015.35067, https://www.youtube.com/watch?v=mGfrGW5 fhOg&feature=youtu.be

[3] Barceló Rico-Avello, Gabriel: The Pioneer probes. http://dinamicafundacion.com/wp-content/ uploads/2014 /02/ ANOMAL%C3%8DAS-DIN%C3%81MICAS-EN-LAS-SONDAS-PIONEER1.pdf

[4] Alvarez Martínez, Alejandro: *Theory of dynamic interactions: innovations*. World Journal of Mechanics. Special issue: Rotational Dynamics: Theory of Dynamic Interactions. 7, 101-119. Vol.7 No.3, March, 2017. DOI: 10.4236/wjm.2017.73010

century. Kepler formulated three fundamental laws for understanding celestial mechanics, which laid the foundation for the development of orbital physics.

Later, Newton explained these behaviours through his *Law of Universal Gravitation,* which Einstein accepted and incorporated into his *Theory of Relativity*. However, Kepler's laws referred exclusively to the orbiting of planets and did not analyse their axial rotation.

The Theory of Dynamic Interactions (TDI)[5] that we propose, offers an update to this problem, and provides justification for the simultaneous rotation and orbiting of celestial bodies—an aspect not previously considered, as I have already presented in other articles and developed through various cases and assumptions.[6] Therefore, the TDI we present justifies this behaviour, and its application allows us to understand the simultaneous rotational and orbital movement of planets and other celestial bodies.

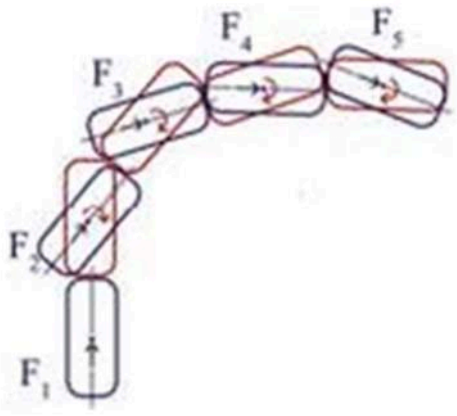

Figure 1. Trajectory of a body with translational velocity and rotation around its main axis, when subjected to a new rotation not coinciding with the existing one.

TDI[7] explains that a body in space, following a rectilinear trajectory and possessing translational and rotational velocity around its main axis, when subjected to an external torque not aligned with its intrinsic rotation, does not generate a new rotation, but rather modifies its trajectory.

In our experimental tests,[8] we concluded that the velocity field generated, for example, by a torque resulting from buoyancy and weight—when not aligned with the intrinsic rotation of the object—causes the object to rotate around a vertical axis perpendicular to the external torque (Figure 1), thereby altering its trajectory.

In that figure, the displaced object is shown in red (with its previous orientation), and in black is the new orientation of the object due to the resulting dynamic coupling. We concluded that under these conditions, a coupling occurs—an interaction between two velocity fields (the translational field already present and the anisotropic one generated by the new torque). As a result, the object's trajectory changes, initiating an orbit similar to that of Earth around the Sun, which would be closed if the external conditions remain constant.

[5] Gauna, J: Theoria Dynamics Interaction's A New Paradigm in Physics. – Alf Gauna
[6] Barceló, Gabriel: *Analysis of the Orbitation and Rotation of Celestial Bodies*, Journal of Applied Mathematics and Physics (September, 2023).
[7] Sierra Márquez, Jordi: *Teoría de Interacciones Dinámicas* El libre pensador, 06/07/2012, https://ellibrepensador.com/2012/07/06/teoria-de-interacciones-dinamicas-por-gabriel-barcelo/
[8] Merino, Justo: *The works and days of Gabriel Barceló*. WJM. Vol.7 No.3. 3, 2017, DOI: 10.4236/wjm.2017.73006.

With that initial experimental test, we concluded that the accepted model attempting to explain Earth's behaviour around the Sun was incorrect, and that it is not solely the Law of Universal Gravitation that enables the observed orbital trajectory simultaneous with Earth's rotation.

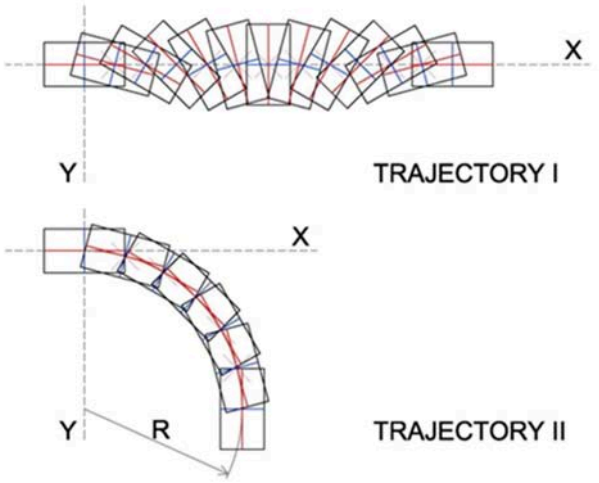

Figure 2: Trajectory I is the one predicted by classical mechanics, while trajectory II is the result of the Theory of Dynamic Interactions that we propose and which has been verified in numerous trials and tests.[9]

II. INTERPRETATIVE ERROR

For me, all of this began many years ago when I wanted to investigate the research of my professor Miguel Catalán.[10] Miguel Catalán[11] was a spectroscopist and, in the 1920s, in the laboratories of Imperial College London, he discovered multiplets in the manganese spectrum — groups of lines with characteristic regularities. Catalán demonstrated that the study of multiplets led to a better understanding of the energy states of atomic electrons and allowed for the definition of the structure of matter. However, the rotational and orbital behaviour of an atom's outer electrons remained a mystery in those years.

[9] Barceló, Gabriel: *New Paradigm in Physics*. Volume I and II. Amazon. 1917/1918.
[10] Barceló, Gabriel: *Miguel A. Catalán Sanudo: Memoria Viva*. Editorial Arpegio, 2.012. http://advanceddynamics.net/en/memoria-viva/
[11] Barceló, Gabriel: *Miguel A. Catalán's CXXV Anniversary*. December 10, 2019. Advances in Historical Studies Vol.8 No.5 December 10, 2019 , DOI: 10.4236/ahs.2019.85017

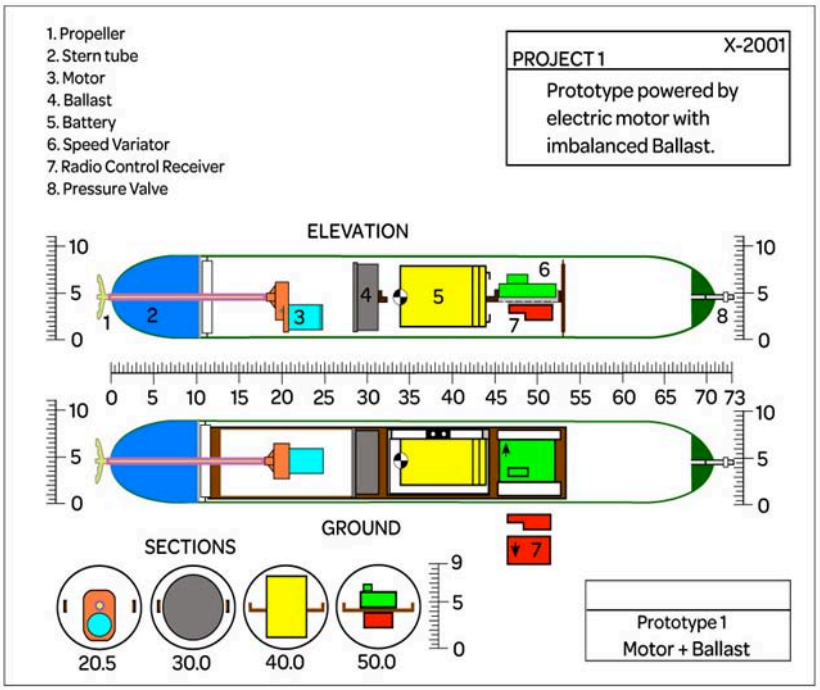

Figure 3: Model of a ship-submarine prototype with water tanks at the stern and bow, which demonstrated its trajectory change without the need for a rudder, as predicted by TDI.[12]

In this context, we concluded that Newton's laws could be valid under assumptions without accelerations, but not when dealing with moving bodies that rotate. To test this, we conducted an experimental trial with a waterborne vehicle, designed according to the scheme shown in Figure 3.

As shown in the video https://advanceddynamics.net/wp-content/uploads/2014/ 02/31Submarino_ Prototipo_I.mp4, we can assume the vehicle follows a straight-line trajectory, equipped with translational velocity and intrinsic rotation around its principal axis of inertia, which is subjected to a new torque not coaxial with the intrinsic rotation — for example, the buoyancy/weight pair, contained in the drawing plane, as in our experiments.

In such a case, the anisotropic velocity field generated by this buoyancy/weight pair forces the vehicle to perform a turn around a vertical axis, perpendicular to the external torque acting upon it.

We repeated the experiments with other vehicles (see Figure 5) and came to the conclusion that the model proposed by Newton to justify the Earth's orbit — which was later upheld by Einstein — was, in our opinion, clearly flawed and needed to be replaced by the model conceived by the TID (Theory of Dynamic Interactions).

Moreover, Newton's statement would necessarily produce a variable or undulating orbit for both the Earth and the Moon: their trajectories would be influenced by gravitational forces at each point of their orbits. In the case of the Moon, its orbit would fluctuate depending on the relative positions of the Sun and the Earth with respect to the Moon. The resulting orbit would not be the same if these bodies were in conjunction or in opposition.

On the other hand, the *Theory of Dynamic Interactions* not only justifies the orbits of Earth, the Moon, and celestial bodies, but also provides insight into other natural dynamic phenomena, such as: the

[12] Barceló, Gabriel: *New Paradigm in Physics*. Volume I and II. Ed. Amazon. 1917/1918.

flight of the boomerang,[13] the spinning top's dance, the gyroscope, the gyroscopic pendulum, epostracism, atmospheric vortex phenomena,[14] dynamic confinement,[15] the dynamic anomalies of the Pioneer probes, dynamic lever mechanics, steering of vehicles without rudders, spinning balls and curveballs, roll coupling in airplanes, bouncing bombs from World War II, the Euler disk, or soda cans that lift off without an upward force — among many other dynamic examples we can observe in bodies with intrinsic rotation.

A multitude of cases whose behaviour, in our opinion, had not been correctly explained until now.

All of these examples, and many more, are described in the second volume of the book:

NEW PARADIGM IN PHYSICS,[16] and can also be explored via the portals:

https://advanceddynamics[17].net/http://www.dinamicafundacion.com/and in various videos.

The experimental tests carried out are easily reproducible according to the scientific method. Advanced Dynamics has announced three successive contests for possible refutation or antithesis of the proposed theory, without receiving any response. The presentation videos of the TID can also be found at:

https://youtu.be/keFgx5hW7igor http://www.youtube.com/watch?v=k177OuTj3Gg&feature=related.

This strange behaviour of rotating bodies is due to the phenomenon of *precession*, which occurs when a rotating body in motion is forced to perform a new rotation around a new axis. Newton's mechanical model of the Universal Law of Gravitation should be considered an approximation — although it has endured for centuries in our scientific paradigm.

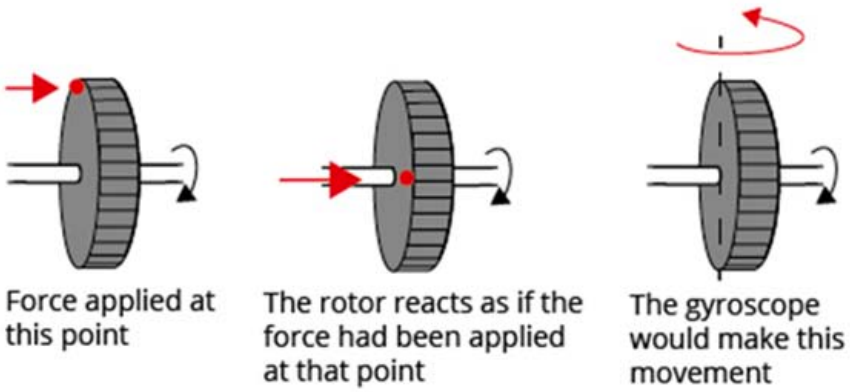

Figure 4: Precession in rotational dynamics is generated when a force is applied to a rotating body, forcing it to perform a new rotation around a new axis. The body's response is not that new rotation, but rather a reaction as if the force had been applied at another point, forcing it into an orbital motion — due to the coupling of the new induced rotation, with the existing translational velocity — thereby generating the orbital trajectory of celestial bodies.

[13] Martín, Almudena: *The Flight of the Boomerang: Comments*. WJM, Vol.7 No.3, March 30, 2017. DOI: 10.4236/wjm.2017.73007

[14] Barceló, Gabriel: Dynamic Interactions in the Atmosphere, Atmospheric and Climate Sciences, Vol.4 no.5, November 20, 2014, DOI: 10.4236/ACS.2014.45073

[15] Barceló, Gabriel: *Dynamic Interaction: A New Concept of Confinement*, Global Journal of Science Frontier Research: A Physics and Space Science, Vol 16 no.3 , Junio 2016.

[16] Barceló, Gabriel: *New Paradigm in Physics: Assumptions and applications of the theory of dynamic interactions*, Volume II: Theory of Dynamics Interactions, Amazon, 2018. http://advanceddynamics.net/

[17] Barceló, Gabriel*: On Motion, Its Relativity and the Equivalence Principle*. Journal of Modern Physics, Vol.5 no.17, November 14, 2014, DOI: 10.4236/jmp.2014.517180

Our TID hypotheses are based on the coupling of translational velocity fields at each point of the moving object — even if these fields are caused by translational movements or generated by external actions that could create new rotations not aligned with any other preexisting ones in the body.

We believe that our proposals and the results obtained from our experimental tests suggest new horizons for *rotational dynamics* and new keys to understanding the harmony of the universe. The universe is made up not only of forces but also of their effects, as they constantly act on celestial bodies in rotation with constant translational velocity, resulting in a closed orbit. Thus, it is a system in motion, yet also in a constant state of *dynamic equilibrium*. Isn't this very equilibrium we observe in the cosmos the essence of celestial mechanics?

The orbital movements we observe in celestial bodies are the result of dynamic coupling not foreseen in Classical Mechanics, as expressed in the TID, enabling a secular dynamic equilibrium. Consequently, we believe the TID mathematical model we propose is of great conceptual importance.

Furthermore, we think it is not only necessary to understand the dynamics of rotating bodies, but also that of the cosmos — with bodies that orbit and have constantly recurring motions — which make possible systems that have been in dynamic equilibrium for centuries, and are not necessarily in a process of unlimited expansion.

We even believe that this new dynamic theory improves our understanding of the universe and the matter from which it is made.

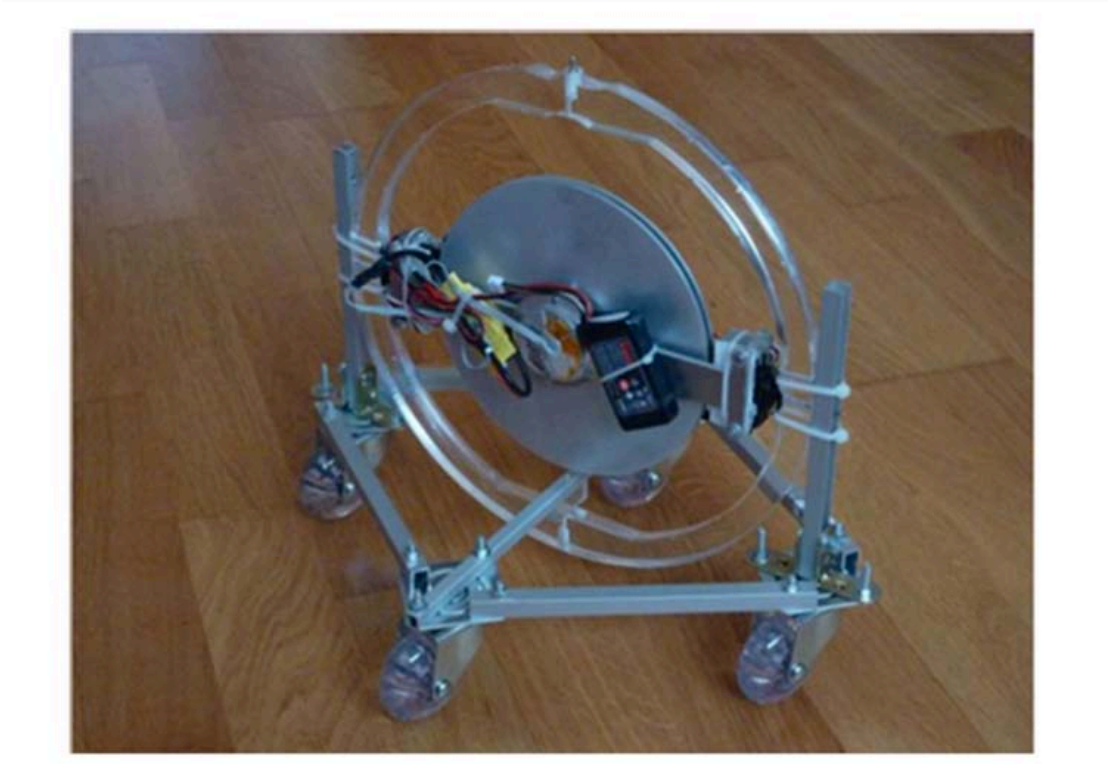

Figure 5: Terrestrial Prototype II with rotating wheels, which allowed directional control, with results similar to those of the submarine.[18]

[18] Pérez, Luis Alberto: *New evidence on rotational dynamics*. WJM, DOI: 10.4236/wjm.2013.33016

III. MATHEMATICAL FORMULATION

Non-coaxial moments generate an anisotropic distribution of velocities, which, when coupled with the translational velocity field, causes a rotation in the velocity of the center of mass.[19] The variation in the direction of the velocity can be obtained by applying the mathematical formula of our model:

$$\vec{v} = \vec{\vec{\Psi}}\,\vec{V}_0$$

The operator matrix $\vec{\vec{\Psi}}$ will be:

$$\begin{pmatrix} \cos\alpha & -\text{sen}\,\alpha & 0 \\ \text{sen}\,\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

So, the velocity vector will rotate by an angle alpha due to this dynamic coupling. The velocity vector will be in the form, in the body frame:

$$\vec{V}_0 = V_{0x}\vec{i}\,'$$

The proposed mathematical formulation has been subsequently complemented and developed by Arturo Rodriguez Palenzuela in his book: *Rotational Field Theory*. [20]

The author proposes a new description of two types of motion already known in physics, namely *rotation* and *precession* of objects, which, according to the theory presented, experience them in a unified manner.

These rotational and precessional movements would be generated, starting from rest, by the action of new macroscopic forces, whose associated fields would be dynamically related by equations similar to Maxwell's equations of Electromagnetism.

In his book, and in his writings,[21] Rodriguez Palenzuela also describes the connection with the *Dynamic Interactions Theory*. As a demonstration of the validity of the *Rotational Field Theory,* he presents the result of a simulation of Chandler's motion developed from the postulated model.

These proposals result from private scientific research carried out by Advanced Dynamics team for over 40 years, seeking nomological relationships of non-inertial systems. The objective of these investigations was to understand the dynamic laws of rotating bodies in space, by analyzing their behavior.

As a result of this research project, dynamic behavior laws have been found in environments where Classical Mechanics laws are not applicable. A new dynamic and mathematical theory for bodies with intrinsic rotation has been proposed. Through repeated experimental tests, this dynamic theory has been confirmed with certainty, revealing how to conceive the true development of scientific knowledge in this area of nature.

[19] Barceló, Gabriel (2019) *Rotational Mechanics. Generalization of Movement in Space*. International Journal of Innovative Studies in Sciences and Engineering Technology, https://ijisset.org/storage/Volume5/Issue12/IJISSET-051119.pdf

[20] Rodríguez Palenzuela, Arturo: *Teoría de Campos Rotacionales: La Teoría de Interacciones Dinámicas, Campos Rotacionales y el movimiento de Chandler*, Editorial Amazon, 2022.

[21] Palenz, Arthur: *Theory of Gyroscopic Fields. An introduction*. GMAERO 2024, 2Nd, Madrid, 5 august, 2024.

This new paradigm suggests new keys to understanding the cosmos and posits celestial mechanics equilibrium as a logical and rational result of these new dynamic hypotheses, but also allows us to imagine the poetry of our universe, comparing the movement of celestial bodies to the flight of a boomerang.[22]

New Paradigm

In our opinion, this represents a substantial shift in the basic assumptions or models within the dominant theory of dynamic science. We are truly proposing a paradigm shift.

This new physical framework defines a new image of the world and makes it possible to justify behaviours that, until now, were considered chaotic or insufficiently understood. Our objective is to share the surprising results obtained and to attract interest toward the research of this new area of knowledge — rotational dynamics — and its many remarkable scientific and technological applications. The Theory of Dynamic Interactions (TDI) is a fascinating concept. We believe our proposal offers entirely original content, and that the conclusions we present constitute a new paradigm in physics, one that had not been formulated until now.

IV. SUMMARY OF CONCLUSIONS

As a result of this dynamic research work, we propose the following summary of our conclusions:

1. There is a broad area of research, still insufficiently developed, in rotational dynamics for rigid solid bodies subjected to accelerations caused by simultaneous non-coaxial rotations.
2. This area of knowledge can be analysed under both relativistic and non-relativistic mechanics frameworks.
3. The hypotheses are based on new criteria regarding velocity coupling and rotational inertia.
4. After conducting the non-relativistic experimental tests presented, we concluded that new general behavioural laws can be deduced based on the analysis of the dynamic fields generated.
5. We have also derived an equation of motion for rigid solid bodies undergoing translational movement with intrinsic angular momentum, when subjected to new, non-coaxial torques or moments. This defines their dynamic behaviour and has led to a deep mathematical analysis and development of the behaviour of bodies with intrinsic rotation and orbitation.
6. We found a clear physical and mathematical correlation between rotation and translation. This mathematical connection allows us to identify a physical relationship between the transfer of rotational kinetic energy and translational kinetic energy, and vice versa.
7. This mathematical model implies that bodies with intrinsic rotation and translational movement, when subjected to successive non-coaxial forces, will begin an orbiting motion as a result of the dynamic interactions generated.
8. As long as the initial angular momentum remains constant and a second non-coaxial torque or moment acts, the center of mass of the moving body will follow a closed orbit, without requiring the existence of any centripetal force.
9. There is no need to include unstructured effects, fictitious forces, or supposedly deduced expressions such as dark energy or dark matter in order to conceive a model of the cosmos and a dynamic behaviour of nature that is coherent with observational experience.
10. A revision of the mathematical models derived within the framework of General Relativity is advisable, incorporating the equation of motion we propose and the dynamic criteria of the TDI.

[22] García Moliner, F. (2017) *Physical-mathematical models in rotational movements*. WJM, 7, 35-38. doi: 10.4236/wjm.2017.73004 .

11. The Theory of Dynamic Interactions also allows us to answer the initial aporia: to become aware of and understand the physical and mathematical correlation between orbitation and intrinsic rotation.

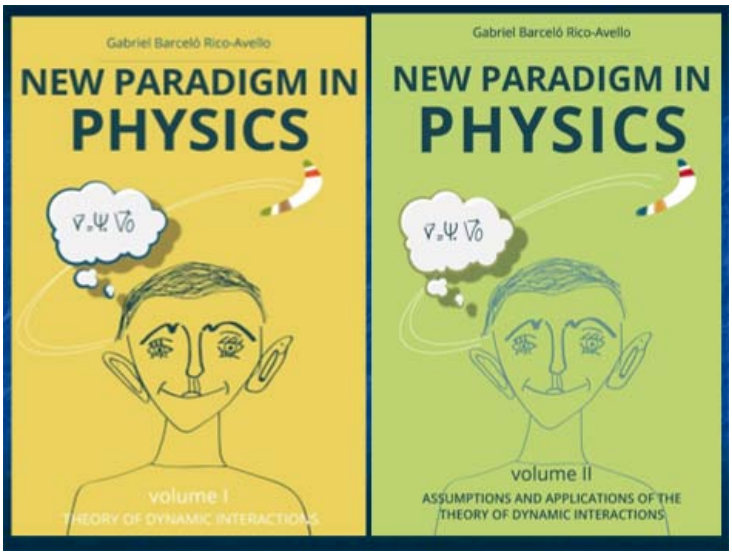

Figure 6: Cover of the Two Volumes of New Paradigm in Physics

Several books have been published on the results obtained, in Spanish or in English, as well as over seventy articles throughout the course of the research.

We recommend reading Section 5.4 of Volume I of *New Paradigm in Physics*, as well as the book *Theory of Rotational Fields* by Arturo Rodríguez Palenzuela (2022), which proposes the mathematical development of the Theory of Dynamic Interactions, rotational fields, and the Chandler motion.

An antithesis prize for the TDI was announced three times, and on all three occasions, it remained unawarded.

To access more complete documentation on the Theory of Dynamic Interactions, please visit:
http://www.advanceddynamics.net/
http://www.dinamicafundacion.com/

V. EXPERIMENTAL TESTS AND VIDEOS

Over recent years, various experimental tests have been conducted with fully satisfactory results. These tests confirm the dynamic hypotheses on which the Theory of Dynamic Interactions is based.
Videos of these experiments can be seen at the following links:

Theory of Dynamic Interactions_1
http://www.youtube.com/watch?v=P9hGgoL5ZGk&feature=related
Theory of Dynamic Interactions_2
http://www.youtube.com/watch?v=XzTrGEtJGXU&feature=related
Theory of Dynamic Interactions_3.avi
http://www.youtube.com/watch?v=dtMqGSU9gV4&feature=related
Theory of Dynamic Interactions_4.avi
http://www.youtube.com/watch?v=qK5mW2j2nzU&feature=related
Barceló, G.: *Theory of Dynamic Interactions*.

Videos, 2002.
http://www.youtube.com/watch?v=P9hGgoL5ZGk&list=PL3E50CF6AEBEED47B
http://www.youtube.com/watch?v=XzTrGEtJGXU&list=PL3E50CF6AEBEED47B
http://www.youtube.com/watch?v=dtMqGSU9gV4&list=PL3E50CF6AEBEED47B
http://www.youtube.com/watch?v=qK5mW2j2nzU&list=PL3E50CF6AEBEED47B
http://www.youtube.com/watch?v=vSUkd4slHGQ
http://www.youtube.com/watch?v=P9hGgoL5ZGk&feature=c4-overview-vl&list=PL3E50CF6AEBEED47B
Bauluz, E.: *New Dynamic Hypotheses*. Madrid, 2011.
http://www.youtube.com/watch?v=vSUkd4slHGQ
Sánchez Boyer J.: *Imago Universi*. Video, Madrid, 2013.
https://vimeo.com/62247544
Pérez, L. A.: *Reflecting New Evidence on Rotational Dynamics*, 2013. Video.
http://vimeo.com/68763196
Pérez, L. A.: *The Dance of the Spinning Top*. [23] Video, Valladolid, 2015.
www.advanceddynamics.net/spinning-top-video/
Pérez, L. A. *The Pendulum of Dynamic Interactions*. [24] Video. 2015
www.advanceddynamics.net/the-pendulum-video.
https://www.dropbox.com/s/rrjb1786ub75a8h/PIDing_m.mp4?dl=0
Sanchez Boyer J.: *The Flight of the Boomerang II*, Video. 2015
https://www.dropbox.com/s/stng5b2co1441hk/Boomerang_ENG_mini.mp4?dl=0
https://www.youtube.com/watch?v=mGfrGW5fhOg&feature=youtu.be

We have tried to summarize in this article, for the first time, a summary of the research work developed in Rotational Dynamics, proposing a new model to understand the behaviours of rigid bodies, planets, or celestial bodies when they have intrinsic rotation and orbit.

[23] Alvarez Martínez, Alejandro & Martín Gutiérrez, Almudena: *The Dance of the Spinning Top*. Global Journal of Science frontier Research: A physics & space science. GJSFR A Volume 16 Issue 3, 2016. Video.
https://globaljournals.org/GJSFR_Volume16/3-The-Dance-of-the-Spinning.pdf
[24] Cano Lacunza Julio: *The pendulum of dynamic interactions*. JAMP, sep. 2015
https://www.scirp.org/journal/paperinformation?paperid=60019