

RESEARCH BLOG

Behaviour of Rotational Bodies

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1. Briefs about of research

The object of our study is the behavior of rotational rigid bodies.

Although we barely realize, we live in a physic world in which everything rotates, a world with intrinsic movement in symmetrical axes.

In this universe, which is characterized by a rotational dynamic behavior, the scientific thought has mainly developed a dynamic based on the lineal translation. This is, therefore, contradictory. In our opinion, this dynamic is not always applicable to bodies with angular momentum.

Traditionally, we have believed that the Earth was a flat surface where we were subjected exclusively a dynamics based on lineal translations. In fact, we find ourselves in a stage formed by bodies in constant rotation and orbiting: the Earth is rotating while it orbits; however, the Sun rotates while it is moving drawing its own trajectory around our galaxy.

From determinate dynamics assumptions and based on a new interpretation of the bodies with intrinsic angular momentum, when they are supporting successive non-coaxial torques, we have developed new dynamics hypothesis which allow us to reach the conclusion to create a new mathematical model in the rotation dynamics fields.

This new model would allow us to justify dynamic natural behaviors that until now have not been sufficiently understood. With this new conceptual model, new results for determinate cases are obtained based on a new interpretation of the composition of movements originated by external momentums.

We think that the obtained results allow us to have a new dynamic point of view which was unknown until now. This new dynamic perception gives us the possibility of transforming the considered chaotic trajectories into other deterministic and modelling trajectories. We have concluded that a new scientific field exists. However it has not been structured in dynamic terms and, specifically, in rigid solid bodies with multiple non coaxial simultaneous rotations.

For this goal, we have deducted that analysis is necessary of the velocity and acceleration fields which are generated in bodies with intrinsic angular momentum. It is necessary as well to consider new coupling criteria of the dynamics magnitude. In this context, dynamic reactions and inertial fields appear, and they cannot be justified by Classical Mechanics.

We have aimed to develop these researches and to inform about the surprising obtained results. We have also the objective to apprehend the interest of this new area of knowledge: the rotational dynamics and its multiple and remarkable scientific and technological applications.

We have not found any scientific literature along the 20th and 21st centuries with similar studies on rigid solid bodies supporting external actions which generate spatially mismatched simultaneous accelerations; therefore we believe that our study is innovative and the proposed conclusions have not been presented up till now.

One conclusion of our analysis is the suggestion that in some cases the matter is unable to add vertorially the angular momentum of rotational bodies.

Classical Mechanics has been formulated for inertial references and it does not say anything and it does not relate to rotation cases. Nevertheless, creating a mechanics available for any stage is possible if we include their inertial reactions and we define a *Fields Inertial Dynamic*. In this way

http://www.coiim.es/forocientifico/FORO%20CIENTFICO/Documentos/DeMSET 2011 GBarcelo.pdf

Barceló, G.: Analysis of Dynamics Field Systems Accelerated by Rotation. Dynamics of non-inertial systems. DeMSET-2011 Congress, Miami. USA.

the inertial phenomena would be structured rationally, and incorporate a unified mechanics.

In order to include the inertial phenomena in the physics knowledge structure, it is necessary to analyze the movement in non holonomous coordinates and the axial reactions which are produced. We understand that a classical mechanics based on holonomous coordinates and polar reactions, will only represent a limited and partial natural view.

The proposed generalization does not say that the classical mechanics is outdated or wrong, but it that it is limited and partial, because it is only referred to inertial systems. We can be more aspiring and search more general dynamical laws which regulate the movement bodies behavior under rotations or, supporting multiple and non-coaxial rotations.

The Theory of Dynamic Interactions generalizes the *gyroscopic couple* concept and other inertial phenomena concepts and it includes into a unified structure of the new rotational non inertial dynamic.

According to the Theory of Dynamic Interactions we can understand a new universe in constant dynamic balance where, the torque which results null, will generate, a constant orbiting in a close trajectory. This mathematical model is very relevant. In this model, the principal effects are the forces and also the torques. This effect will produce orbital motions, and repetitive movements, generating a balance dynamical system and not on ilimited expansion.

2. Source of inspiration

It is possible in nature to find simultaneous intrinsic rotation and orbiting movements. However, a physical or mathematical model which explains a scientific correlation between both movements when they appear simultaneously does not exist. It is strange. Also, the existence of a constant coincidence between the orbit simultaneity and spin in atomic physics is relevant.

However, the existence of these physical and mathematical relations between both simultaneous movements of rotation and orbiting could be proposed intuitively.

Moreover, we can ask if the actual dynamic laws provided to define the behavior of the bodies in the space, have enough precision or they do not reflect exactly all possibilities in our world.

We do not know about other type of analysis which study both simultaneous phenomena and could determine a possible interaction between both phenomena. But the fact is that in universe, all orbiting body has intrinsic rotation.

For this reason, I decided to investigate if any physical correlation between both movements exists and, in that case, I would try to obtain its mathematical formulation.

If it were true, the dynamic laws which have been accepted in order to determine the rotational bodies' behavior until now, would be insufficient to describe the physical reality of the rotational bodies' movements exactly.



Figure 0. Miguel A. Catalán. Spectroscopist (Zaragoza 1894- Madrid 1957)

In our study, we research non inertial systems in order to better understand the behavior of rigid bodies supporting non coaxial and simultaneous rotations. As the result of this analysis, I have suggested new hypotheses which oblige to apply these studies to the theory of fields with the objective to explain the dynamic of those bodies.

With this explanation provided, the observation of the universe caused new questions: its secular dynamic balance does not seem to adapt to a Newtonian physics in which the force cause translational accelerated movements continually. The universe balance and its dynamic, does not

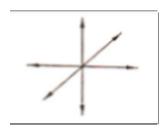
seem to sympathize with this conceptual structure of classical mechanics.

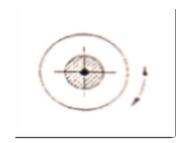
The analysis of the superposition and composition of the simultaneous movements were done by Galileo ² in order to explain the trajectory of a cannonball. The understanding or correct interpretation of the fields superposition with dynamic magnitudes generated by momentums or torques, is essential to analyze these phenomena correctly.

In my studies, I have researched the movement of the objects which are supporting multiple rotations, like the spinning top, the boomerang, the hoop and others whose peculiar behavior has been intriguing to the human mind. I think that the conclusions that I show in my texts, change the rational dynamic bases, and incorporate new significant and high impact criteria in rotational dynamics.

Around 1956, the scientist and professor Miguel Catalán ³ proposed to his students, some conjectures about the rotational dynamic by observing the gyroscope behavior and its reactions ⁴. In his text books he proposed a possible correlation between the atom structure and the rotational classical dynamic. These conjectures generated in me a scientific curiosity during many years. ⁵ Catalán suggested us to experiment with a gyroscope whose rotor had constant rotation around its Z axis. He invited us to take this device with only one hand and perform the following movements:

A) Interactions do not exists





Translation in any direction

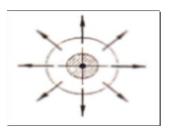
Other rotation around the same axis

Figure 1A. Conjectures of Miguel A. Catalán.

In other case:

B) An inertial reaction appears





Rotation around their X or Y axis

Rotation around their X and Y axis at the same time

Figure 1B Conjectures of Miguel A. Catalán Sañudo.

² Appell, P.: *Traité de Mécanique Rationnelle*, Gauthier- Villars, París, 1909.

Miguel A. Catalán (1894-1957). He was one of the great spectroscopists in the twentieth century. In order to remind him, his name was given to a crater lunar impact, which is located through the southwest tip of the Moon.

⁴ Barceló, G.: *El vuelo del bumerang*, Ed. Marcombo 2006, Barcelona. Page 256 and also: G. Barceló, *Un Mundo en rotación*, Editorial Marcombo Barcelona. 2008. Página 56. http://www.dinamicafundacion.com/

Catalán, M. A. y León, A: *La órbita de los átomos fundamentales*, en ASEFQ, 21, 162 y 165 de 1923, W. y en: *Física y Química* (séptimo curso), Madrid, 1945.

The results of these experimental proofs are the following:

- 1. **Translation in any direction:** we take a gyroscope with our hand when it is rotating and we move it in a straight line in different directions, maintaining its axis parallel to Z axis or the principal gyroscope axis. No interaction reaction is produced (Look at Figure 0.1A).
- 2. Additional rotation around the rotation axis: if the device is also rotated around its rotation Z axis, no interaction appears. (Look at Figure 0.1A)
- **3. Rotation around other axis:** if the gyroscope is rotated around any other axis, a resistance to movement is felt in the hand that supports it. (Look at Figure 0.1B)

After these observations, professor Catalán explained us that, in that moment physics had not the answer for these strange phenomena in which we recognized a force which acts on our hand, generating and evident resistance to displacement when we executed a simple rotational movement around any different axis to Z axis.

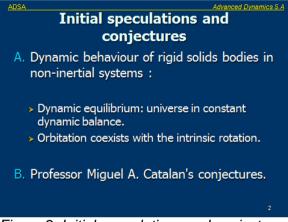


Figure 2. Initial speculations and conjectures

Our initial speculation and conjectures appeared for the first time in those years, when we endeavored to understand the true dynamic behavior in the rigid solid bodies in non inertial systems (See figure 0.2):

- Understanding the dynamic universe balance.
- Justifying the simultaneous coexistence in the universe, of orbiting and intrinsic rotation phenomena.

Of course, I wished to be able to give an answer to the conjectures that Miguel A. Catalán had set out to us, and be able to model the real behavior of the gyroscope. In his memory, and proof of gratitude, I wrote two biographies on our professor.⁶

With all these questions in mind, I started in the early eighties of the last century, an exhausting historic study on rotational classical dynamics, to get to know the background and what had been written about the subject and other related issues like inertia, magnitude conservation, etc.

I was able to verify that some studies initiated in the nineteenth century, had been later on forgotten. For example, Esprit Jouffret (1831-1904), in the late nineteenth century, had already started to analyze the dynamic of the caused reactions in a particle of a rigid body, when it is supported successive non coaxial torque, and M. Hirn had concluded that in these situations, non-homogeneous distributions speeds are generated.

Barceló, G.: *Miguel A. Catalán Sañudo. Memoria Viva.* Ed. Arpegio. Sant Cugat. 2012 and Barceló, G.: *El Sr. Catalán, profesor del Colegio "Estudio"* ADANAE, Madrid 2009.

Jouffret, E: *Théorie élémentaire des phénomènes que présentent le giroscopio, La toupie et le proyectil oblongo*, Revue d'Artillerie, Berger-Levrault et Gauthier-Villars, París, 1874. También en Gilbert, P.: *Problème de la rotación d'un corps solide autour d'un point*. P. 316. Annales de la Société Scientifique de Bruxelles, 1876. Referido en Barceló. G.: *Un Mundo en Rotación*, pág. 208. Marcombo, Barcelona, 2008.

Hirn. M.: *Théorie analytique élémentaire du giroscopio*; en los Annales de l'Observatoire de París, t. IX, citado en Gilbert, P.: *Problème de la rotación d'un corps solide autour d'un punto*. Anales de la société scientifique de Bruxelles. 1876.

As a result of this historical study, I carried out a compendium of all these studies and an abstract, which I published like a summary book about the rotational classical dynamic. In this book the different published works which had referred to rotational bodies during the Physics history, were analyzed and commented.

Later on, I defined some differentiated dynamic hypothesis which suggested a rotational alternative dynamic. From these new hypotheses, I established a new specific mathematical formulation in order to determine the movement equations of these bodies by doing experimental positive testing in order to confirm these initial hypotheses.

Therefore, the origin of the Theory of Dynamic Interactions (TDI), arises from the physical observation and the reflection on the validity of mathematical models which accept the vectorial addition of angular magnitudes, with no differentiation on their priority:

- The mathematical model for the development of classical movement equations admits the differential vectorial addition although the physic rotational non-coaxial phenomena are neither commutative nor associative.
- Classical Mechanics admit, since L. Poinsot¹⁰ (1777-1859), the principle of discriminated superposition between movements of translation and rotation; both for the case of movements as well as for the case of separation of force equations and momenta.

Some questions arise from the above mentioned:

- When submitting bodies which are supporting an angular intrinsic momentum to a new momentum, dynamic interactions are produced which allow a variation of the effect of the torque.
- In bodies with kinetic momentum consisting of intrinsic angular momentum and quantity of movement, when non coaxial momentums are applied, the solid will change its trajectory.

After the initial conjectures and the dynamic hypothesis, we developed a mathematical simulation model based on the Quantity movement conservation principle, and we obtained this following movement equation¹¹:

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

Some behavior laws ¹² were deduced and suppositions and application phenomena were conceived in addition to the experimental testing which has been done. With a conceptual structure confirmed, I published a new text¹³ in which I showed, for the first time, the developed theory and some scientific articles.¹⁴

3. How much time spent

Although our physics professor, Miguel Catalán managed to pass on to me this curiosity and the excitement of the study of physical phenomena over sixty years ago, it has been for the last thirty five years that I have managed to carry out a systematic investigation with a group of collaborating friends. The purpose has been throughout the better understanding of the behavior of rigid solid bodies simultaneously submitted to non-coaxial rotations, over the latest 35 years. This research

⁹ Barceló, G.: El vuelo del Boomerang. Ed. Marcombo: Barcelona, 2006.http://www.dinamicafundacion.com/

Poinsot, L.: Connaissance des temps. Théorie nouvelle de la rotation des corps. París 1852.

Barceló, G.: Technological Applications of the New Theory of Dynamic Interactions. Global Journal of Researches in Engineering: Mechanical and Mechanics Engineering-G, Volume 13, Issue 5, 2013.https://globaljournals.org/GJRE_Volume13/E-Journal_GJRE_(G)_Vol_13_Issue_5.pdf

Barceló, G.: *Theory of Dynamic Interactions: Laws of Motion*. WorldJournal of Mechanics, 3, 328-338. (2013) http://dx.doi.org/10.4236/wjm.2013.39036

Barceló, G.: *A Rotating World* (Un mundo en rotación). 2008, Editorial Marcombo: Barcelona. http://www.dinamicafundacion.com/

Barceló, G.: *Analysis of Dynamic Fields in Non-inertial Systems*. World Journal of Mechanics, Vol. 2, No. 3, 2012, pp. 175-180. http://dx.doi.org/10.4236/wjm.2012.23021

has allowed us to propose new hypothesis about the field's theory in order to explain the dynamic behavior of the bodies which support non-coaxial accelerations.

Our initial goals in this project were (look at figure 3):

- Analysis of non-inertial systems.
- Research on Fields Theory.
- Study of the behavior of rigid bodies exposed to simultaneous non-coaxial rotations.
- Study of the inertial reactions of the mass exposed to multiple non-coaxial rotations and gyroscopic momentum.

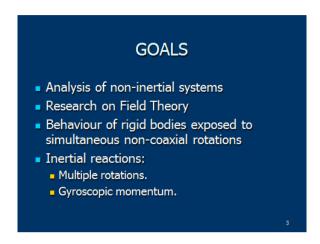


Figure 3. Goals

The main goal of our research has been to develop a dynamic and kinematic analysis of the solid rigid bodies with angular momentum which would allow us to establish the reasons for their behavior, and to formulate a proposal of new hypothesis in rotational dynamic briefly.

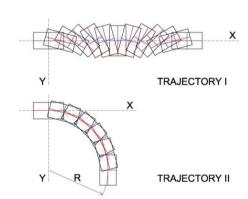


Figure 4. Classical trajectory and trajectory predicted with the Theory of Dynamic Interactions (TDI). The position of the center of mass changes as a result of the coupling between the field of the linear velocity and the velocity field caused by the non-coaxial torque¹⁵

In our experimental line and logical argumentation, in the first place we studied the concept of rotation in Classical Mechanics; but also in Einstein's studies and in the modern theories of relativity. Upon completion of this analysis, we concluded that proposing new specific hypothesis for the movements of the intrinsic rotational bodies is possible. For that purpose, we only needed to reinterpret, in a determined moment of the logical argumentation, the exact dynamic justification of the special behavior of the bodies with angular momentum.

In our opinion, there exist certain evidences in nature which allow us to propose hypothesis which have not been raised in Classical Mechanics. There are some clues to believe that the rotational dynamic classical model for rigid solid bodies has not evolved, when the physics of the twentieth

Cano, J.: *The Pendulum of Dynamic Interactions*. Journal of Applied Mathematics and Physics, <u>Vol.3 No.9</u>, <u>September 2015</u>, 1186-1198. Published Online: DOI: <u>10.4236/jamp.2015.39146.http://www.scirp.org/journal/jamp.</u>

century has substantially changed.

We aimed to define with precision these new hypothesis and to develop some new experimental testing which allow to corroborate them, with the goal to enunciate the idealized behavior laws, and based on them, establishing a mathematical model which let us develop a computer aided simulation. Finally and based on the theoretical abstractions, we understand that it is possible to conceive practical applications and develop a new specific technology.

4 Ideas for future work

We have proposed a conceptual structure for a new *Rotational Interactions Dynamic* which is applicable to bodies exposed to multiples and successive torque.

The initial hypotheses have been confirmed with the studies and experimental testing, and with a new mathematical model which enable us to simulate the real behavior of bodies exposed to these stimulations. This has allowed us to propose the existence of certain general behavior laws in rotational dynamic, different to those of translational dynamic laws.

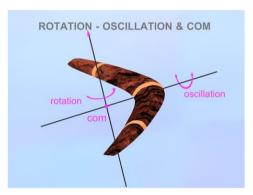


Figure 5. Boomerang rotation axes

A clear correlation has been obtained, among the initial conjectures, the hypothesis, the simulation mathematical model, the behavior deducted laws, the experimental texting done and the mathematical model corresponding to the equations of movement which are the result of the proposed dynamic laws.

As we have indicated, our proposals aim at being coherent with the dynamic defined by the theory of relativity, but we understand that, our conclusions, could be applied also in a revision of theory relativity¹⁶ too.

The hypothesis and axioms which constitute our proposal, explain the initial question about the simultaneous rotation and orbiting movements of the celestial bodies in the universe and provide explanations about the behavior of the general celestial bodies. They will also let us justify other dynamic phenomena which are poorly understood in this moment, for example the flight of the boomerang ¹⁷ ¹⁸. Some articles were published about the flight of the boomerang with an explanatory video of the proposal theory¹⁹.

Barceló, G.: On the Equivalence Principle AC-10-A.2.1.1. 61st International Astronautical Congress, Prague, CZ. Copyright © 2010 by Advanced Dynamics. Published by the American Institute of Aeronautics and Astronautics, Inc.http://www.coiim.es/forocientifico/FORO%20CIENTFICO/Documentos/ON_THE_EQUIVALENCE_P RINCIPLE.pdf

Barceló, G.: *Theory of Dynamic Interactions: The Flight of the Boomerang*. Journal of Applied Mathematics and Physics, 2014, 2, 569-580. Published on line in June 2014 in SciRes. http://www.scirp.org/journal/jamp http://dx.doi.org/10.4236/jamp.2014.27063

Barceló, G.: *Theory of Dynamic Interactions: The Flight of the Boomerang II.* Journal of Applied Mathematics and Physics, 2015, 3, pp. 545-555. Published Online May 2015 in SciRes. http://www.scirp.org/journal/jamp DOI: 10.4236/jamp.2015.35067.

Sanchez Boyer J.: The Flight of the Boomerang II, Video. 2015https://www.dropbox.com/s/stng5b2co1441hk/Boomerang_ENG_mini.mp4?dl=0 https://www.youtube.com/watch?v=mGfrGW5fhOg&feature=youtu.be https://vimeo.com/129383447

We have also published some works about the application of the TDI in the Dynamic Interaction Confinement²⁰ in the fusion nuclear reactors; in the study of satellite trajectories, like the article titled *Dynamics anomalies in the Pioneer space probes*²¹; or, in the analysis of the atmospheric phenomena with rotation ²². In these cases, we understand that Important improvements can be obtained based on the dynamic hypothesis proposed.

The dynamic proposals allow to understand some effects of the rotational bodies easily, like dynamic interactions. The applications of these dynamic hypothesis to other physics and technology stages, probably allow new and suggestive research advances.

The possible application of this alternative physic-mathematical model to rotational bodies and systems in astrophysics and astronautics deserve special mention, because new dynamic hypothesis of work can be achieved.

Also the development of a specific technology, like a dynamic lever, energy saving systems or new ship steering systems for ships is possible.

There exist therefore ample fields of study in science and technology in this new focus of rotational dynamic.

5. Publishing experience

In 2013 Global Journal of Researches in Engineering, published an article about the theory called: *Technological Applications of the New Theory of Dynamic Interactions.*

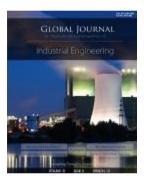


Figure 6. Front page of Journal of Researches in Engineering: Mechanical and Mechanics Engineering-G.²³

It can be consulted in:

https://globaljournals.org/GJRE_Volume13/E-Journal_GJRE_(G)_Vol_13_Issue_5.pdf

The experience of this publication was really interesting because the journal demanded different and strict control requirements before the edition.

In this text some technological applications of the theory are proposed, for example, the feared Rollo 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.

Barceló, G.: Dynamic Interaction Confinement. World Journal of Nuclear Science and Technology Vol.4 No.4, October 29, 2014DOI: 10.4236/wjnst.2014.44031 http://www.scirp.org/journal/PaperInformation.aspx?paperID=51026& http://dx.doi.org/10.4236/wjnst.2014.44031

Barceló, G.: Dynamics anomalies of the Pioneer space probes, (Pioneer Anomaly). (Anomalías dinámicas en las sondas Pioneer), RSEF's 2005 biennial, the summary of which was published in the biennial's Summary Book, http://dinamicafundacion.com/wp-content/uploads/2014/02/ANOMAL%C3%8DAS-DIN%C3%81MICAS-EN-LAS-SONDAS-PIONEER1.pdf http://www.solociencia.com/fisica/teoria-interacciones-dinamicas-justificacion.htm

Barceló, G.: *Dynamic Interactions in the Atmosphere*. Atmospheric and Climate Sciences. Vol.4 No.5, November 20, 2014.DOI: 10.4236/acs.2014.45073.

http://www.scirp.org/Journal/PaperInformation.aspx?PaperID=51584#.VHB4YTSG_To http://dx.doi.org/10.4236/acs.2014.45073

Barceló, G.: Technological Applications of the New Theory of Dynamic Interactions. Global Journal of Researches in Engineering: Mechanical and Mechanics Engineering-G, Volume 13, Issue 5, 2013.https://globaljournals.org/GJRE_Volume13/E-Journal_GJRE (G) Vol 13 Issue 5.pdf

6. Related media links

Some videos²⁴ have been created in order to present this theory. In addition, some confirmation experiments²⁵ have been performed; and some experimental videos on the gyroscopic pendulum²⁶ or spinning top²⁷ have been completed, and they are been able to watch.²⁸ These experiments and the studies done, have been published in articles in specialized journals and conference papers.

Other experiments have been also completed for other independent²⁹ researches. There is access to these other experiments in the Internet. ³⁰

The resultant deductions of this rotational dynamic can be relevant to solve general dynamic problems, but also to astrophysics and cosmos dynamic.³¹ In the universe, the common and repeated movements of the celestial bodies are accelerated by rotations, except in the case of freefall. Nevertheless the Einstein theory general of relativity, the special relativity, the Galileo-Newton relativity and in general Classical Mechanics, are based on the translational relativity proposal. These theories considered transformations in translational holonomous coordinates, therefore, when they have rotational movements, angular transformation coordinates should add to the translational coordinates transformations.

The Theory of Dynamic Interaction allows to identify in a more real and simple way the behavior of the rotational and orbiting celestial bodies.

In the standard cosmological model there exists a widespread work field in relativistic mechanics by applying a rotational Theory of Relativity, ³² which would allow to better understand the behavior of the Universe.

In the observation of the dynamic systems with simultaneous intrinsic rotation and orbiting, we can deduce the possible existence of dynamic interactions.

The Theory of Dynamic Interactions allows us to better understand the universe balance to conceive the true galaxy dynamic and to know why the plane of the ecliptic or Saturn rings³³ exists.

²⁴ 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.voutube.com/watch?v=dtMqGSU9qV4&list=PL3E50CF6AEBEED47B

http://www.youtube.com/watch?v=qK5mW2j2nzU&list=PL3E50CF6AEBEED47B

http://www.voutube.com/watch?v=vSUkd4sIHGQ

http://www.youtube.com/watch?v=P9hGgoL5ZGk&feature=c4-overview-

vl&list=PL3E50CF6AEBEED47B

- Cano, J.: *The Pendulum of Dynamic Interactions*. Journal of Applied Mathematics and Physics, Vol.3 No.9, September 2015, 1186-1198. Published Online: DOI: 10.4236/jamp.2015.39146. http://www.scirp.org/journal/jamp
- Pérez, L. A. *The pendulum of Dynamic Interactions*. Video. 2015. www.advanceddynamics.net/the-pendulum-video. https://www.dropbox.com/s/rrjb1786ub75a8h/PIDing m.mp4?dl=0

Pérez, L. A.: *The dance of the spinning top.* Video, Valladolid, 2015.www.advanceddynamics.net/spinning-top-video/

Bauluz, E.: Nuevas hipótesis dinámicas. Este video mostraba los experimentos llevados a cabo por Advanced Dynamics S.A. para probar la teoría de interacciones dinámicas: www.advanceddynamics.net. El video también está disponible en: http://vimeo.com/62601974 y en:

http://dl.dropbox.com/u/48524938/VTS Ingles.mov;

- http://www.youtube.com/watch?v=vSUkd4sIHGQ&feature=c4-overview&list=UUgDHgaGi2I2rmZNoanNbVWQ
- Pérez, L. A.: *New Evidence on Rotational Dynamics*. World Journal of Mechanics, Vol. 3, No. 3, 2013, pp. 174-177, doi: 10.4236/wjm.2013.33016. http://www.scirp.org/journal/wjmhttp://dx.doi.org/10.4236/wjm.2013.33016
- Pérez, L. A.: Reflecting New Evidence on Rotational Dynamics, 2013. Videohttp://vimeo.com/68763196
- Martín Gutiérrez, Almudena. *Flight simulator, trip to Saturn. (Simulador de vuelo, viaje a Saturno).* E.T.S.I. Aeronáuticos (U.P. Madrid). Degree project. May, 2015.
- Barceló, G.: On Motion, it's Relativity and the Equivalence Principle. Journal of Modern Physics. Vol.5 No.17, November 14, 2014. DOI: 10.4236/jmp.2014.517180http://www.scirp.org/Journal/PaperInformation.aspx?PaperID=51422#.VHB0jz SG To http://dx.doi.org/10.4236/jmp.2014.517180
- Barceló, G.: A new rotational dynamics of interactions for the planet Saturn. (Una nueva Dinámica Rotacional de Interacciones para el planeta Saturno), 2006.http://dinamicafundacion.com/wp-

In this way, we deduce that the ring in the planetary systems which are generated in the planetary systems can be the answer of the effect of a torque in the stage of this theory.

As we have explained, the theory gives us an answer to our initial question: check and understand the physical and mathematical relation between the orbiting and the intrinsic rotation, and therefore, the cause of the days and night in the Earth, because in this theory a correlation exists between the rotation and orbiting in the Earth.

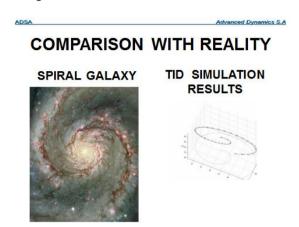


Figure 7.Representation of the arms of a spiral galaxy and the TID simulations results.

The theory defines a universe model in which the forces do not always create accelerations proportional to the mass. It would mean the existence of increasing speeds to infinity for a constant force. Instead of that, the force momentum generate a dynamic balance transforming lineal speeds into orbital speed, and straight trajectories into curve and orbiting paths, by associating dynamic effects to the speed. In change, Classical Mechanics according to Newton second law, the dynamic causes are identified with speeds changes.

All celestial mechanics considerations have allowed me to publish a book in two volumes about the human knowledge evolution: *Imago Universi: A human conception of the cosmos*. It is a book about cosmological history, where the last chapter incorporates applications of the Theory of Dynamic Interactions (TDI) to universe dynamic phenomena. We have completed an introduction video³⁴ about the book and a web.³⁵

The last chapter of the book *Imago Universi* shows our paradigm like a new conceptual structure in order to explore the non-inertial mechanics and, specifically, the celestial dynamic of rigid bodies under multiple non-coaxial rotations. Later, and as a summary of "Imago Universi", I have published an article³⁶, where an approximation to the Theory of Dynamic Interactions application can be analyzed in order to better understanding our cosmological environment and celestial mechanics.

To get more information about the Theory of Dynamics Interactions, some webs can be consulted:

http://advanceddynamics.net/ http://dinamicafundacion.com/

7. Short Biography

I finished the studies of Industrial Engineering in 1964, the Degree in Physical Science in 1968 and the Doctorate in Industrial Engineering in 1973. Through an exam for Public Service, I entered in

<u>content/uploads/2014/02/UNA-NUEVA-DINAMICA-ROTACIONAL-DE-INTERACCIONES-PARA-EL-PLANETA-SATURNO.pdf</u>

Sanchez Boyer J.: Imago Universi. Video, Madrid, 2013.https://vimeo.com/62247544

Barceló, G.: *Imago Universi: A Story of the Human Conception of the Cosmos*. Ed. Arpegio: Barcelona, 2013.http://www.editorialarpegio.com/ http://imagouniversi.com/

Barceló, G.: *Proposal of New Criteria for Celestial Mechanics*. International Journal of Astronomy and Astrophysics, 3, 385-391. 2013. http://dx.doi/org/10.4236/ijaa.2013.34044

the Administration as an Industrial Engineering serving the Public sector in 1971. In 1977 went to Financial and Tax Inspector and to State Finance Inspector in 1984.

Initially I worked as an engineer and consultor engineer in Facilities Engineering.

As a civil servant, I was Inspector Chief Inspector in various revenue offices. Also, I was Subdirector General of the Data Processing Center of the Ministry of Finance (1980 – 1982).

I was member of the international committee of the American Society for heating, refrigerating and air conditioning (ASHRAE), founder and president of the Technical Spanish Association of Air conditioning and Refrigerating (ATECYR). I was President of the Associations Federation of Industrial Engineers, vice-president of the Engineering of Spain Institute and member of their Energy Commission (1975 – 1980), founder and president of the Professional Association of Financial and Tax Administration (APIFE). I was Ph.D. Professor in the Universidad Politécnica de Madrid and other educational institutions.

I have published some books: "AIR CONDITIONING" which was prize for the best book of Aggrupation of Bilbao (ANII) Ed. Dossat (1969), "MODELS OF MANEGERAL BEHAVIOR" APD (1973), "THE ENERGY AND ITS SOCIAL IMPACT" Ed. INDEX (1976), "THE ENERGY IN EDIFICATION" ATECYR (1978), "THE ADMINISTRATION OF TAXES IN THE UNITED STATES", Institute of Fiscal Studies, Ministry of Economy and Finance (1982), "DICTIONARY OF MANAGEMENT PROCEDURE AND TAX INSPECTION". School of Financial and Tax Inspection. Ministry of Economy and Finance (1984), co-author of: "PLANNING AND STRATEGY TO THE ENERGY CHALLENGE", prize the best energy book, APD 1982, "DICTIONARY OF TAX ADMINISTRATION PROCEDURE", editorial Gaceta Fiscal, (1985), "LEGISLATIVE DICTIONARY I.V.A", editorial Gaceta Fiscal. (1986), "SOCIAL WELFARE IN THE COMPANY" (1991), Ed. Espasa Calpe, "MANUAL TAX ENGINEER" College of Civil Engineers (1992-2007), "TAX MANUAL ENTREPRENEUR AND PROFESSIONAL" Editorial Colex (1995), "SPECIAL SCHEMES IN CORPORATE TAX" (1996) Editorial Colex "TAX MANUAL. NEW IRPF" (1999). Editorial Colex. "THE FLIGHT OF THE BOOMERANG" Editorial Marcombo (2005), "A ROTATIONAL WORLD: Theory of Dynamics Interactions" Editorial Marcombo (2008), "Mr. CATALÁN" Ed. ADANAE (2009), "MIGUEL A. CATALÁN: LIFE MEMORY" Editorial Arpegio. (2012), "IMAGO UNIVSERSI: History of human conception of the Universe" Editorial Arpegio (2013).

I have published more than fifty technical and scientific articles in newspapers and journals of construction, engineering, installations, fiscal, sciences and technology, in English or Spanish language.

Founder and president of some companies. For more than 35 years ago, I have developed some activities in a private scientific research project in rotational dynamic.

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