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5 **Abstract**

6 The aim of this paper is to present given technological applications of the Theory of Dynamic
7 Interactions, a theory that has been the object of my investigation and embodies a new
8 scientific approach to Rotational Dynamics. The method utilized in the development of this
9 theory, and its applications, consists of a scientific analysis of the dynamic fields that are
10 generated in bodies subjected to simultaneous non-coaxial rotations. The results obtained in
11 the development of this dynamic theory allow an innovative approach to significant scientific
12 and technological applications, for example, in orbital dynamics, orbit determination, and
13 orbit control. As a conclusion, under the Theory of Dynamic Interactions various new
14 assumptions have been elaborated based on the analysis of inertial fields generated. A new
15 criteria has been found applicable in the understanding of the coupling of velocity fields. The
16 innovative dynamic theory that has been developed, based on new concepts such as rotational
17 inertia or field's coupling, has numerous technological applications in accelerated rotation
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22 Interactions, a theory that has been the object of my investigation and embodies a new scientific approach to
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25 the dynamic fields that are generated in bodies subjected to simultaneous non-coaxial rotations.

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31 such as rotational inertia or field's coupling, has numerous technological applications in accelerated rotation
32 systems.

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

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

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

42 Systems in the universe are in motion, in constant dynamic equilibrium. In the real universe, the general
43 dynamic behaviour of rigid solids is characterized by its dynamic equilibrium. Through time, orbitation coexists
44 with the intrinsic rotation. This aporia, and also the professor Miguel A. Catalán conjectures 2 were our We
45 conducted experimental tests that confirmed our hypothesis. These tests were video recorded and can be accessed
46 in different Internet portals 4 . Additional experimental tests have been carried out by other investigators. These

47 other tests and experiments have been published 5 and also video recorded. The video with this other evidence
 48 can be accessed online ?? .

49 As a result of all these tests, we arrived the following conclusion: These experimental references, and many
 50 others which can be suggested, infer the existence of a different non-Newtonian rotational dynamics, which is
 51 necessary for identifying the behaviour of rotating bodies, when they are exposed to new non-coaxial stimulations,
 52 and the behaviour of which is nowadays often interpreted as anomalous, paradoxical or chaotic, as the laws at our
 53 disposal do not allow to identify and predetermine it. 7 On the basis of the principle of conservation of motion 8
 54 , we have obtained the motion equation which is described in other texts 9 .This motion equation finally can be
 55 written: . Equation (1) is a general equation of motion for bodies with angular momentum that are subjected to
 56 successive non coaxial torques. For this equation, the rotational operator \hat{R} serves as a matrix that transforms
 57 the initial velocity, by means of rotation, into the velocity that corresponds to each successive dynamic state 10
 58 $\cdot \mathbf{v} = \hat{R} \mathbf{v}_0$. (1

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

62 By analyzing the dynamic fields created, we deduced that does not apply the discriminating Poincot hypothesis
 63 11 , admitted in classical mechanics, which supposes that the angular momentums were coupled between each
 64 other and separate from the linear dynamic momentums. For example, in case that the body has a translational
 65 velocity \mathbf{v} , we propose a new dynamic hypothesis which states that the field of translation speeds couples to
 66 the anisotropic field of inertial speeds generated by the second non-coaxial momentum acting, forcing that the
 67 center of masses of the mobile modifies its path, without an external force having being applied in this direction
 68 12 . As such, we obtain an orbiting movement, which is simultaneous with the constant intrinsic rotation of the
 69 moving body ? ? .

70 We can observe in nature many examples of bodies which behave according to the equation of motion. For
 71 example, in the case of a coin rolling on a flat surface, one can observe that a non-homogeneous field of speeds
 72 is generated as a result of the overturn momentum created by the weight and the fulcrum: when falling, the
 73 variations of the non-homogeneous field of speeds also generate an anisotropic field of accelerations, which we can
 74 be identified by the inertial forces that are generated (Figure 1). The figure shows the drop velocities distribution
 75 generated in the perimeter of the coin. But it has to be stressed that, according to the proposed theory, the
 76 non-homogeneous field of speeds couples to the field of translation speeds, generating a new trajectory of the
 77 mass centre. This example can be applied to many other cases, like the hoop or the wheel. Also occurs in the
 78 case of balls with spin effect. In sports where balls are used, this phenomenon can be observed when the ball
 79 acquires an intrinsic rotation: the ball takes a curved path and fails to maintain its linear path. In these cases,
 80 in our opinion, non-homogenous speed and acceleration distributions are generated, which can be represented
 81 in a section of the mobile body. In the assumption of a football with intrinsic rotation, when being kicked
 82 eccentrically, a new non-coaxial momentum with the existent rotation can be generated, the speeds' distribution
 83 of which couples, according to our

84 **1 Illustration of the distribution of the overturn speeds in the**
 85 **perimeter**

86 **2 Slope obtained as a result of the overturn momentum**

87 Year 2013 The figure 2 shows as it generates a homogeneous distribution of velocities and accelerations in a
 88 section of the ball, with rotation, transforming its linear path in another orbital.

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

93 Another example of the theory is the feared Roll Coupling of the planes. It happens when a plane, which
 94 is flying a screw or any other kind of air acrobatics which implies, for example, a turn around its main inertia
 95 axe, starts a new steering manoeuvre with curved trajectory. It is also another example of the theory the feared
 96 Roll Coupling of the planes. This occurs when an aircraft is flying a screw or any other type of aerial acrobatics
 97 involving, for example, a rotation about its principal axis of inertia, if its begins a new steering maneuver with
 98 curved path. In this case, the pilot can lose control of the plane.

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

102 The figure 3 This new rotational dynamics develops a mathematical model, from which we have performed
 103 simulations of dynamic behavior through computer.

104 This model incorporates inertial phenomena within a unified structure of a new rotational dynamics. Its
 105 backgrounds and fundamentals have already been work concentrates on the dynamics of rotations. It starts
 106 describing the main milestones in the evolution of scientific concepts which deal with, or are related to, the study

107 of rotations. It then presents the historical evolution of the theories of the rotational dynamics and continues
108 with a critical analysis of the different formulations of these problems during the consecutive development stages
109 of what we usually call rational mechanics. In these two parts the peculiar nature of the dynamics of rotations
110 is focused on, which certainly shows peculiar behaviours, not always coinciding with ordinary intuition, or even
111 not always well understood.

112 The final part of the book is an essay which presents an alternative proposal invoking the freedom of "inquisitive
113 thinking". This essay contains proposals of new dynamic hypotheses which would allow something like an
114 "imaginary nature", as a suggestion of a new path for interpreting nature from a new point of view, for what
115 could be interpreted as the keys for a new physics. This proposal of "imaginary nature", has led to a new
116 physical theory in the course of time, once the initial dynamic hypotheses were sufficiently checked by means
117 of experimental tests, and once the designed computer simulation model qualitatively coincided with numerous
118 examples in nature. This was the way how the Theory of Dynamic Interactions was designed, which helps us to
119 understand the cosmos in constant dynamic equilibrium; in a universe in which the celestial bodies simultaneously
120 rotate on its axis and orbit.

121 Simulation studies have been carried out, obtaining traces equivalent to the trajectories of real bodies in space,
122 open or closed. We can compare results and confirm this similarity, as for the case of the boomerang, or the
123 dynamics of the galaxies (Figure 4). Hence we can propose that, in the assumption of dynamic systems in which
124 simultaneous movements of intrinsic rotation and orbitation can be observed, one can infer the possibility of the
125 existence of dynamic interactions and a mathematical model composed of that new and simple motion equation
126 (1). 13 . This text is an essay on physics, which incorporates a portion of "inquisitive thinking . The "

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

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

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

142 Within the technological scope, the theory allows to propos a new steering system independent from a rudder
143 or any other external element. Also, many innovating hypotheses, as for example the analysis of internal strains
144 in moving bodies, due to internal efforts. The concept of dynamic coupling suggests the possibility of performing
145 a power conversion between the terms coupled and in both directions. We can assume that the rotational kinetic
146 energy can be converted into translational kinetic energy, or vice versa, which leads, for example, to conceive the
147 concept of dynamic lever. The theory also allows to give an answer to an initial aporia: allows us to be aware
148 and come to understand the physical and mathematical correlation between orbitation and intrinsic rotation,
149 and therefore, the rational casualty that we have day and night on earth, as our theory reflects a clear correlation
150 between the intrinsic turn of earth and the route within its orbit.

151 **4 COMPARISON WITH REALITY COMPARISON WITH REALITY**

153 **5 TRAJECTORY OF THE TRAJECTORY OF THE BOOMERANG BOOMERANG RESULT OF THE T I D RESULT OF THE T I D**

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

160 The pitcher would have as its primary mission to give to the aircraft or rocket the initial thrust to overcome
161 the attractive field, reducing the amount of fuel carried. The launching mechanism would consist of a fixed
162 structure and tractor train supported on earth. Using an electromagnetic system, the spacecraft levitates with
163 its longitudinal axis parallel to the ground. This initially is submitted to pairs of action and would generate a
164 rotational movement about its longitudinal axis. Finding the rocket in the catapult rotating and with magnetic

165 levitation will be subject to a strong initial impetus, imposed by the recoverable drive train. The aircraft, powered
166 with the initial velocity in the direction of its longitudinal axis, is subject to a new electromagnetic torque, in
167 this case a vertical axis perpendicular to the initial (Figure 5).

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

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

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

185 The technological development of this theory allows also, in our opinion, the determination of the devastating
186 effect of hurricanes. The theory will be applicable for predictions and control of dynamic systems which nowadays
187 might be understood as chaotic, but the trajectories and behaviour of which can be determined with the Theory
188 of Dynamic Interactions. We have developed a new dynamic theory applicable to accelerated rotation systems,
189 based on new concepts such as rotational inertia or field's coupling. Various assumptions have been elaborated
190 based on the analysis of the inertial field's generated and new criteria on the coupling of these velocity fields.

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

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

197 To end, we can remember Isaac Newton: We are to admit no more causes of natural things than such as Anyone
198 interested in cooperating with this independent investigation project is invited to ask for additional information
199 from Advanced Dynamics S.A. or to look up at www.advanceddynamics.net

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Figure 1:)?

201 1

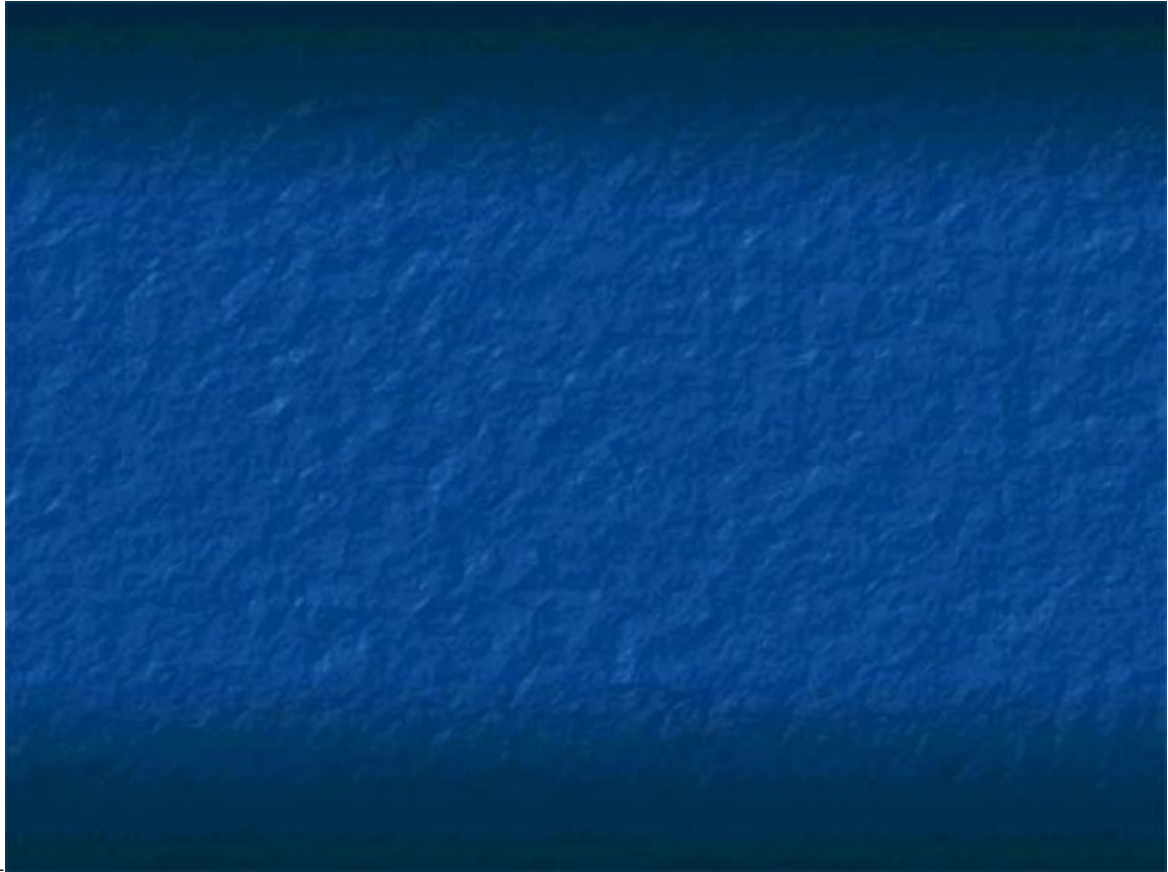


Figure 2: Figure 1 :

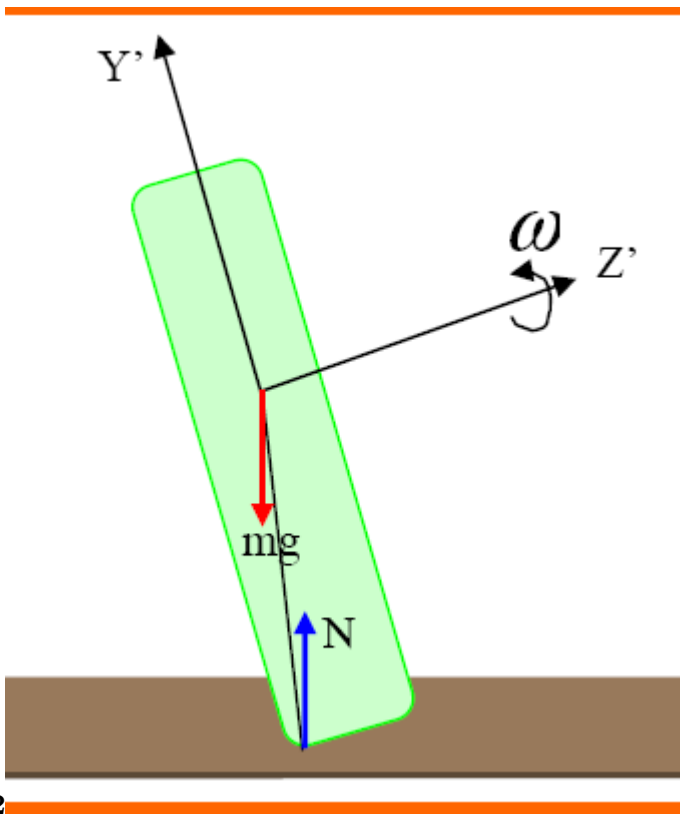
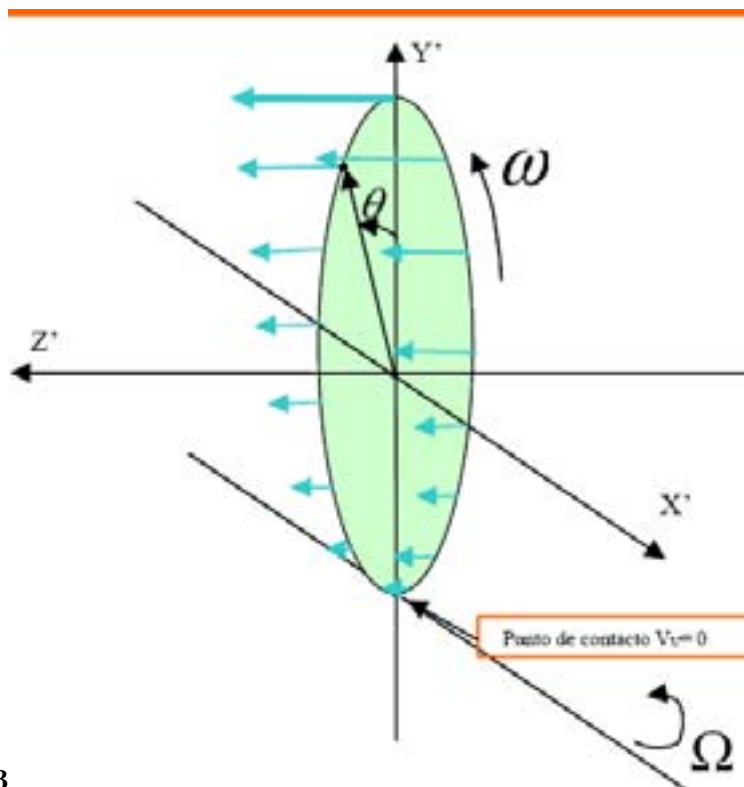


Figure 3: Figure 2 :



3

Figure 4: Figure 3 :



4

Figure 5: Figure 4 :

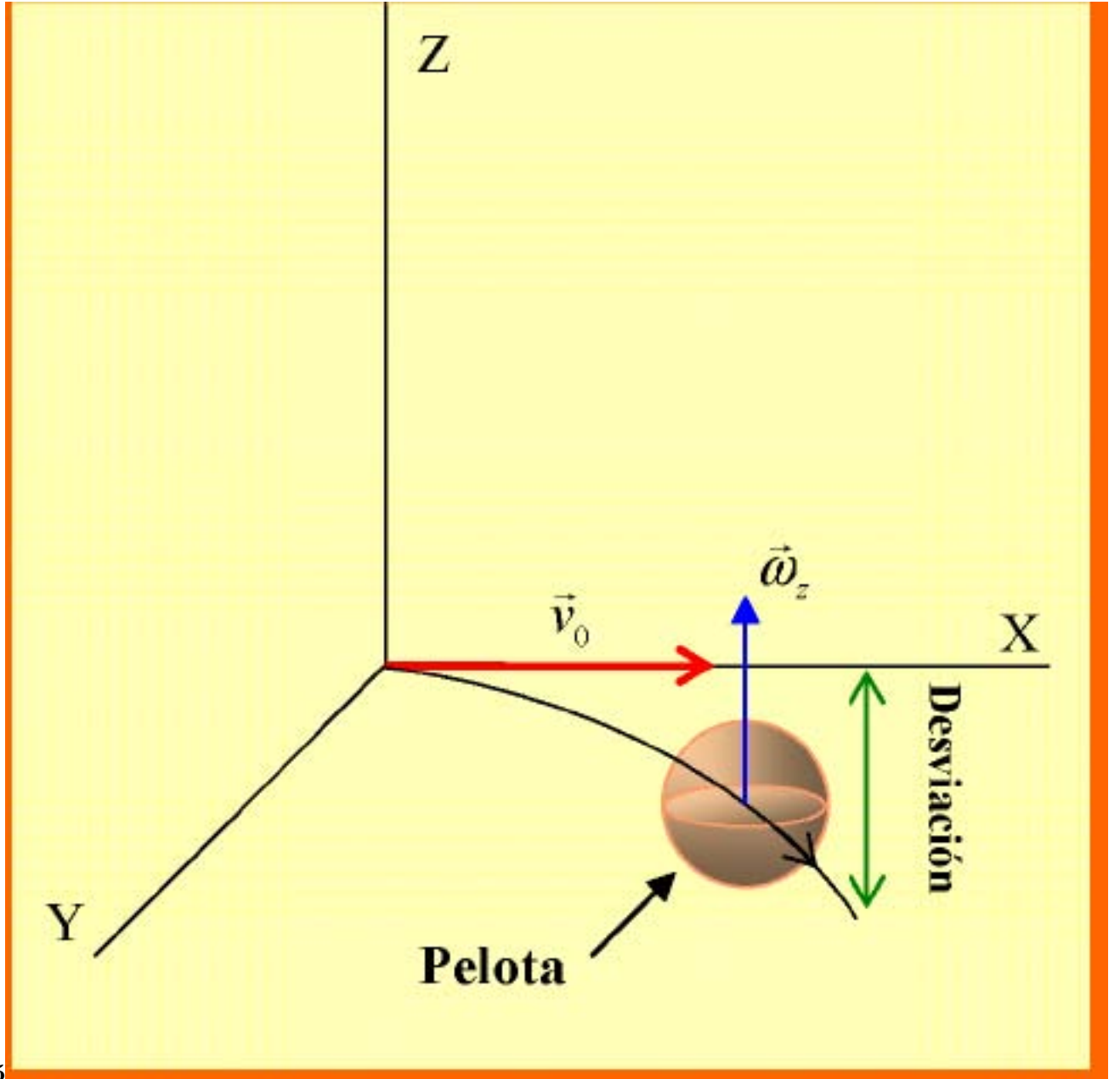


Figure 6: Figure 5 :

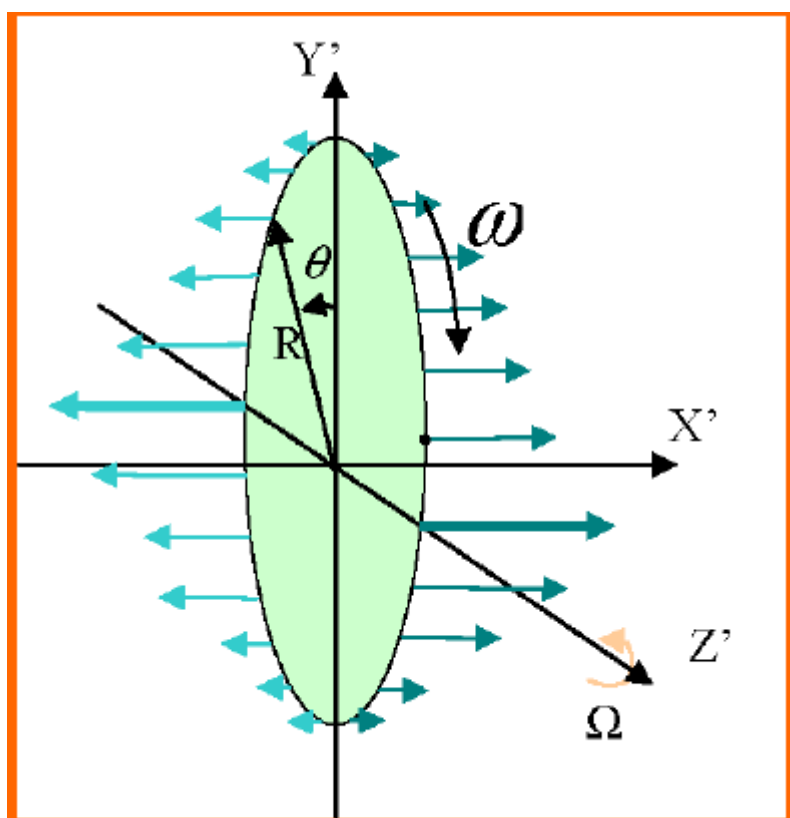


Figure 7:

202 .1 Global Journals Inc. (US) Guidelines Handbook 2013

203 www.GlobalJournals.org

204 [Landau et al. ()] , L D Landau , E M Lifshitz ; , L D Landau , E M Lifshitz . Course of Theoretical Physics
205 Mecánica,” Ed. S.A. Reverté (ed.) 1976. 1994. 1 p. 24. (3rd Edition)

206 [Barceló ()] ‘Analysis of Dynamics Fields in Noninertial Systems’. G Barceló . 10.4236/wjm.2012.23021. *World*
207 *Journal of Mechanics* 2012. 2 (3) p. .

208 [Barceló ()] ‘Analysis of Dynamics Fields in Noninertial Systems’. G Barceló . 10.4236/wjm.2012. [http:](http://www.coim.es/forocientifico/FORO%20CIENF)
209 [//www.coim.es/forocientifico/FORO%20CIENF](http://www.coim.es/forocientifico/FORO%20CIENF) *World Journal of Mechanics* 2012. 23021. 2 (3)
210 p. .

211 [Barceló] *Analysis of dynamics fields systems accelerated by rotation. Dynamics of non-inertial systems*, G Barceló
212 . Miami. USA: DeMSET-2011 Congress.

213 [Barceló] *Analysis of dynamics fields systems accelerated by rotation. Dynamics of non-inertial systems. DeMSET-*
214 *2011 Congress*, G Barceló . <http://www.coim.es/forocientifico/FORO%20CIENF> Miami. USA.

215 [Barceló et al.] G Barceló , Miguel A Catalán , Sañudo . *Sant Cugat. 2012, Cap. XIV*,

216 [Barceló ()] *Dynamic Anomalies in the Pioneer Space probes*, G Barceló . <http://www.dinamicafundacion>
217 2005. (Proposal of conclusions. Dinámica Fundación)

218 [Barceló ()] *El Vuelo del Bumerán (The flight of the boomerang)*, Editorial Marcombo, G Barceló . [http:](http://www.dinamicafundacion.com/)
219 [//www.dinamicafundacion.com/](http://www.dinamicafundacion.com/) 2005. Barcelona.

220 [Pérez ()] ‘New Evidence on Rotational Dynamics’. L Pérez . 10.4236/wjm.2013.33016. [http://www.scirp.](http://www.scirp.org/journal/wjm)
221 [org/journal/wjm](http://www.scirp.org/journal/wjm) *World Journal of Mechanics* 2013. 3 (3) p. .

222 [Barceló ()] ‘On the equivalence principle’. G Barceló . <http://www.coim.es/forocientifico/> *61st*
223 *International Astronautical Congress*, (Prague, CZ) 2010. American Institute of Aeronautics and Astronautics.

224 [Newton (1687)] *Rule I, of Book III of The Mathematical Principles of Natural Philosophy*, Isaac Newton . July
225 5 th 1687. London.

226 [Poinsot ()] ‘Théorie nouvelle de la rotation des corps, 1834, refer by Gilbert: Problème de la rotation d’un corps
227 solide autour d’un point fixe, Annales de la société scientifique de Bruxelles, 1878’. L Poinsot . *El vuelo del*
228 *Bumerán*, 2006. p. 121.

229 [Mach ()] ‘Un Mundo en Rotación (A rotating world), Edit. Marcombo Barcelona’. E Mach . *Die Mechanik in*
230 *Ihrer Entwicklung Historisch-Kritisch Dargestellt*, (Leipzig, Brockhaus) 1921. 2008.

231 [We propose: Our investigation has shown a clear correlation between the initial presumptions, the starting hypotheses, the math
232 *We propose: Our investigation has shown a clear correlation between the initial presumptions, the starting*
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235 *Laws,*