

ROTATIONAL MECHANICS

Generalization of Movement in space

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Abstract: *We suggest here the result of the new basic physical laws proposed by the author, backed by the observed behavior of rigid solids in rotation, and covered in several previous experiments and publications.*

We understand that there is a real disturbing discovery: the deviation of the trajectory of the center of mass of a body, without any external interaction, as an experimentally proven fact. Also expressed in this text are updated conclusions of the research project carried out.

Keywords: *Mechanics, Dynamic Interactions, Non-inertial systems, Dynamic coupling, Celestial mechanics.*

1. INTRODUCTION

We present in this text the research carried out, in recent years by our team, in relation to the behavior of rigid solid bodies subjected to rotations, proposing new laws to better understand the universe.

*We understand **motion** as any change in place of a body in time with respect to another reference. As far as its study is concerned, the human mind has conceived a conceptual structure to analyse inertial dynamic systems based initially on Newton's laws. The aforementioned structure, was further complemented and enlarged with other physic-mathematical investigations based on logical reasoning and experimental tests, thus giving rise to a well-established scientific discipline forming the basis for numerous technological applications of proven efficacy.*

Notwithstanding, in addition to this model or paradigm of human knowledge, acknowledged as classical mechanics, there are the non-inertial dynamic systems which have been subject to very little study and for which we are still lacking a defined conceptual structure. These refer to systems in motion that are subject to actions that generate variations in their speed, and which do not necessarily obey the laws and regularities of classical mechanics. Solid rigid bodies subject to acceleration belong to these systems, particularly bodies subject to actions that cause different simultaneous or successive rotations on different axes. In such cases, different spatially non-coincident, simultaneous acceleration fields are generated on the body under study.[1, Page. 33]

In our research project we have defined a new physical and mathematical model to predict the behavior of our natural environment in non-inertial circumstances and,

in particular, to determine the most general laws of movement in space.

The behavior of material systems exposed to external actions, the generation of spatial rotation and the quantities conserved associated with such circumstances have been widely debated, but we believe that this analysis can still be subject to new scientific and technological development based on the new hypothesis [2], that we propose.

At the time, we have already also proposed:

On the basis of certain dynamic assumptions and a new interpretation of the behavior of rotating bodies, i.e. bodies endowed with intrinsic angular momentum, when exposed to successive pairs of forces that are non-coaxial with their intrinsic rotation, we have developed new dynamic hypotheses that enable us to conclude that it is possible to configure a new mathematical model in the dynamic theory of rotating fields.

This new model enables us to explain certain behavior which has not hitherto been sufficiently understood. By means of this new conceptual model, different results are obtained for certain circumstances, exclusively based on a new interpretation of the composition or superposing of movements caused by the external actions, for example, of the momenta of forces.

We believe that the results obtained afford us a new perspective of dynamics, hitherto unknown, thus making it possible to convert the paths considered up until now as chaotic, into deterministic ones that can be modeled. We have come to the conclusion that there is a scientific space, as yet unstructured, in dynamics and, more specifically, in the field of rigid bodies subject to multiple, simultaneous, non-coaxial rotations.[1, Page 35]

2. THEORY OF DYNAMIC INTERACTION

At the time, we put forward the following definition of the concept of **Dynamic Interaction: The reciprocal action of bodies in motion and the resultant effect due to the dynamic and inertial reactions of the mass.**[3]

Advanced Dynamics team, for over 35 years, had developed a scientific investigation searching for nomological relations of non-inertial systems. As a result, we have found laws of dynamic behavior in environments where the laws of Classical Mechanics are not applicable.

The aim of these researches was to learn the laws of space, analyzing the behavior of those bodies with intrinsic rotation, to better understand why we live in a world with nights and days, with sunsets and sunrises....

One of our conclusions is that certain accepted mathematical formulations, do not faithfully show the true dynamic behavior of bodies subject to accelerations by simultaneous non-coaxial rotations.

Through repeated experimental tests, Advanced Dynamics has confirmed, with certainty its dynamic theory, and how to conceive the true development of scientific knowledge in this area of nature.

We can easily see simultaneous intrinsic rotation and orbiting movements in nature, when until now there was no physical or mathematical model that established a scientific correlation between both movements. We had proposed the aporia that there could be a physical-mathematical correlation between both actions.

3. NEW PARADIGM IN PHYSICS

The research project carried out has been disseminated in multiple articles and books. However, in the treatise in two volumes **New Paradigm in Physics** [1 and 7], the work done by the research team is summarized.

On **New Paradigm in Physics** it is suggested that our new dynamic model can be applied to the mechanics of Saturn's rings, to planetary systems and, in general, to celestial mechanics.

Having reviewed the scientific literature of the last two centuries, we do not find a similar analysis or study on rigid solid systems or bodies subject to external dynamic actions, that generate simultaneous acceleration, that do not coincide in space. Therefore, it may be proposed that this research work is totally original, and the conclusions had not been stated until now.

The starting hypothesis, as well as the inferred mathematical formulation deduced, was confirmed by a long series of experimental tests[4Appendix I: Experimental tests and videos]. Other researchers performed other tests, with equally positive results. Based on our equation of motion, a physical-mathematical simulation software was designed.

Advanced Dynamics believe that the results obtained allow having a new perspective on the dynamics of the cosmos, unknown to date.

It is the objective of the book, **New Paradigm in Physics**, to report on the surprising results obtained in this scientific research, and to attract the interest in the exploration of this new area of knowledge, on rotational dynamics, and of its multiple and remarkable scientific and technological applications [5].

After the edition of the aforementioned book, two new articles have been published in English[4] and [5].The complete bibliography of the proposed theory appears in the annex to the book.

In classical mechanics, in non-inertial assumptions, in addition to the real forces, fictitious forces are introduced to explain the actual behavior observed. We believe that this apparent discrepancy between reality and dynamics theory is difficult to accept.

4. PROPOSAL FOR CONCLUSIONS

What follows is an enumeration of a series of features of this research work and the theory of physics put forward therein. These may well be understood as a list of conclusions, without claiming to be comprehensive:

1. *It is hard to believe that to date the true behavior of bodies subject to multiple, non-coaxial rotations has not been identified and that these have been assigned a mathematically unsolvable equation, even in analytical mechanics, which makes it further hard to believe that nature can behave in such a manner: **without a resolvable, exact and predictive result.** After our analyses, we pointed to the inconsistency in the accepted Newton-Euler equations in their application to different bodies subject to diverse non-coaxial rotations [1].*
2. *But it is also astonishing to see that the accepted calculation procedure determines a trajectory for these bodies, which does not coincide at all with what can be observed in nature (see figure 1). This lack of coherence between the results of the formulas applied, and the true trajectory that is observed, makes us think that in all these years, no experimental tests or verifications have been carried out to confirm if those algorithms responded to reality, or if they were simple mathematical structures, alien to the authenticity of nature [4].*

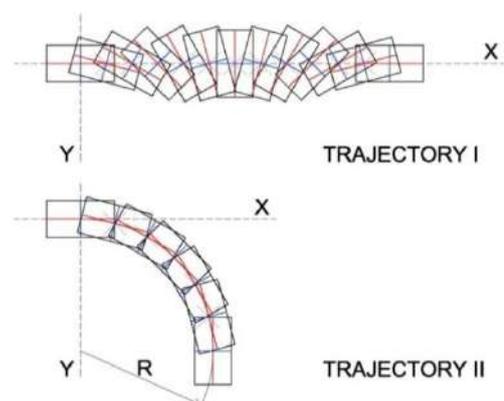


Figure 1: Trajectory I predicted by classical mechanics and trajectory II deduced by means of the Theory of Dynamic Interactions (TDI). We have observed and confirmed the second case repeatedly by experiments [6].

3. Consequently, the laws and equations of classical mechanics cannot be applied to non-inertial dynamic systems. The dynamic behavior of the bodies subjected to rotation is very different from that of inertial movements.
4. *As long as the constant initial angular momentum is maintained and a second torque or non-coaxial momentum is acting, the centre of mass of the moving body will follow a closed orbit without requiring any centripetal force.*
5. *It is not necessary to include unstructured effects, or fictitious forces, or supposedly inferred expressions, such as energy or dark matter, to conceive a model of the cosmos, and a dynamic behavior of nature, consistent with observational experience.*
3. *In previous works, we have suggested that by means of this analysis, the nature of any movement in space can be determined and predicted, defining its relativity [7 see Chapter 13].*

The Theory of Dynamic Interactions suggests that the Theory of Relativity should be reviewed and questions raised as to a yet to be assessed generalisation of Einstein's Equivalence Principle.[7. Page 433]

4. *The theory has been validated and confirmed by experimental tests[8]. This text does not purport to challenge the laws of Newton; what has been developed is a conceptual structure for systems accelerated by rotations that serves as a complement to classical mechanics. We put forward a theory based on a specific rotational algebra for non-inertial environments in which the starting hypotheses on which the laws of translational classical mechanics are based are not obeyed. We propose the exploration of a new niche of knowledge for certain very specific, albeit far from trivial, dynamic conditions, which can be repeatedly found in our universe.[9]*

By means of our model of dynamic interactions, it is possible to explain how a body in rotation can initiate an elliptical, circular or even helical trajectory, in the absence of a true central force. According to this dynamic model, the application of a torque on a body with intrinsic rotation, generates a stable system and one in constant dynamic equilibrium.

The existence of a rotational dynamics of interactions must be accepted; with real results that modify the behavior of bodies, in accordance with the proposed

universal dynamic laws, that have hitherto been unknown.

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