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1. INTRODUCTION TO A MORE GENERAL PRINCIPLE OF PHYSICS

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In spite of the beauty and simplicity observed in nature, and of the high development of science and technology of today, most of the basic phenomena in nature are still not well understood. There are too many theories, too many independent principles, too many postulates and hypotheses, and too many assumptions normally made up in each of large number of branches of science. The lack of unity in science is obvious.

It is often said that Einstein sometime compared physics with an old lady full of superstitions. Of course, Einstein contributed to eliminate many of them, *but not all of them*. Due to the great success of his theories, most people have stronger beliefs on the rest of these superstitions. Thus today most of them do not expect that something universally accepted in the literature may be wrong.

Another problem comes from the fact that most people trust too much on sophisticated mathematical formalisms that, in one way or another, are based on ad-hock hypotheses. Their results obviously depend on such hypotheses. In spite of this fact, most people put too much faith on the results of such mathematical machineries, without realizing that they may eventually not correspond to the reality. Something similar holds when we are watching a movie and we do not keep in mind that it does not correspond to a real happening.

This state of affairs is progressively getting worst because, during the last decades of this century, science has grown up outstandingly in volume and complexity. The competition for publishing almost anything, by any mean, is increasing rather exponentially. In parallel the number of its branches and the number of unsolved problems for fitting the relatively large number of theories or models with the observed facts are far from decreasing.

On the other hand there is an increasing volume of information on a wide range of subjects that are rather complied in the books according to the most *popular theories,* assuming that they are the right ones. In this way these theories are conserved throughout the time thus making most difficult that any new idea different from the conventional ones may come out or succeed.

What would happen with the books, and with the feelings of the people that have believed in those theories, if it is found that they are not the right ones? Would people accept easily a theory different from the conventional ones or would they react against of the new ones? It is well known that human beings normally react strongly against anything that is opposed to their beliefs.

In the universities, due to the large volume of subjects per unit of time that the students have to learn, they are induced to *believe, in a rush, in everything written in the books,* regardless on whether or not they are not well proved facts. Due to the lack of time, they are forced to trust in the old theories beyond the limits for which they have been tested. In this way, also, most of the probabilities for new original ideas that the student could have are virtually killed before they can be born. In this way, during the current learning process, students lose both the opportunities to get new original ideas and the capacity to disagree with the old ones.

On the other hand there is large number of specialized scientists, in a large number of fields of interest. They normally are doing highly specialized research. Most of the times they do not have time enough to make a fair and critical revision on general concepts. Most of them have trusted, when they were students, in that all of the basic concepts and theories in the literature are the right ones. Most of their meetings are rather made up to feed back their own beliefs throughout presentation of their works after approval by their own pairs. They are normally the referees for publications and they usually do not read carefully the manuscripts that disagree with their beliefs. They reject them either by any unimportant reason or just because it disagrees with the mainstream of conventional ideas.

Some editors, also, normally decline publications for similar reasons. In this way some branches of science rather look like religious sects or political parties defending some particular theories. They normally leave almost no space for other alternatives of thinking. This is most evident, for example, in gravity. All the classifications are normally based on “general relativity”. Only a tiny part of them is left for “other alternatives”

I have realized that science is like a high building in which most people are building the top floor. For many years its old basement has been patched with rather ad-hoc hypothesis, each time that some unexpected phenomenon has appeared. Then, it is reasonable that you would be not welcome to this building if you pretend to show that something in its basement is wrong. It would be difficult to convince everybody that it is better to start all over a new building, with a more homogeneous basement thus making sure that the new building can not collapse with the time. Something similar holds for every human activity, including religions.

Throughout the history, this seems to be the way according to which old conventional theories have persisted for long times, regardless of their inaccuracies. Most of the times such theories were patched, consecutively with ad-hock assumptions until serious contradictions with the observed facts did come out. In every time, it has often been claimed that *the last word has been said, and in every time this has not been so.* This is why sometimes it is better to try to find our own way to the truth.

However there are many ways to get the truth. I started the present one by trying to find it by myself, from the most elemental facts observed in nature.

1.1 A Brief Review on Relativity Concepts

In classical physics, at the end of the last century, it was thought that matter would be invariable after the changes of velocity of the bodies with respect to the observer. According to such beliefs, matter and light could travel with any arbitrary velocity with respect to the observer. Such period ended with the Michelson-Morely experiments carried out by first time ant the end of the last century. They proved that the local velocity of light is constant and independent of the system's velocity.

Indeed the MM experiments proved that apparently nothing happens within the instrument, after changes of its velocity. In particular, the local speed of light, within the instrument, is invariable. Thus Einstein postulated, as a matter of fact, that *the (local) speed of light and the local physical laws are the same in all reference frames in uniform motion with respect to each other.* These relativity principles were the base for his theory called *special Relativity*

After using plain algebra, it was simple to find that, in order that the local light speed can be constant, *the bodies should have fundamental changes after changes of velocity with respect to an observer that has not changed of velocity*. The basic changes, derived by first time by Lorenz, are called *Lorenz's Transformations*. According to them, for example, the mass of a body moving with respect to a fixed observer is larger that the mass of the same body after a stop.

Special relativity has been fairly verified by reliable experiments. Consequently, it should be accepted, definitively, that the current parameters of bodies moving relative to some fixed observer are not the classical constant values. They are functions of the velocity of the bodies with respect to the observer.

In spite of the fact that Special Relativity solved, mathematically, many problems, it did not provide a fair phenomenological "explanation" for the well proved fact, that the local speed of light is invariable after changes of velocity of the measuring system.

Later on Einstein conceived his "*General Theory of Relativity*" (General Relativity) after generalizing his relativity postulates for the case of the changes of both velocity and G potential. Thus he postulated the equivalence *principle* (EP), according to which "*the local (non gravitational) physical laws are the same, anywhere in the universe*". This principle has been fairly tested by exact and reliable measurements.

On the other hand "the form" of the equation that relates the field properties with the field sources, called "*the field equation*", was derived after "trial and error methods".

Einstein proposed it on the base of properties of electric fields, according to which *the space in a G field* *would also have some energy that would be given up to the bodies doing G work*. Since such space energy would be an *additional source of G field*, then the field equations of General Relativity turn out to be *nonlinear*.

Of course, this makes a contrast with the high linearity of implicit in the Equivalence Principle. Such non-linearity is the main source of difficulties in General relativity. Because *an odd singularity*, called *the Schwarzchild singularity*, comes out at the radius *r = 2GM*. In such radius, and below it, everything is odd and uncertain.

The results of General Relativity have been fairly tested but only in very weak fields. Indeed *General Relativity has never been fairly tested in strong fields*.

In spite of this fundamental doubtfulness of the field equation of General Relativity, such theory is rather a synonymous of gravity just because it appears to be the most exact and popular theory at hand.

From General relativity and from the experiments, it becomes evident that *the relativistic properties of the bodies do not depend only on the velocity and on the field potential of the object but also on the velocity and potential of the observer*.

For this reason let us classify *the observers* into in three main cases:

The most general *nonlocal (NL) case*, when the observer is in a fixed potential and the bodies are moving in field potentials different to the observer one.

1. A less general *local (L) case,* when the observers and the objects are in the same field potentials and eventually moving relative to each other.

2. The more particular case is when the observers and the bodies are moving close together, i.e., they are bounded to have the same velocity and field changes. This is called here the *superlocal (SL) case*.

Throughout the time the physical theories have evolved from the most particular superlocal (classical) cases, up to the more general nonlocal cases in G fields.

1.2 What is Certain and Uncertain in General Relativity

Physics must conciliate two main facts that may look contradictory to each other.

1. -General Relativity is more exact than the Newtonian theory because it is based in a more exact *Equivalence Principle* (EP). According to it and to the most exact experiments, “the local physical laws do not change after changes of velocity and field potentials of the measuring system”.

2. -On the other hand, from the results of such theory, and from the “nonlocal” experiments done for testing it, it is concluded that

The atoms and the clocks of observers located in different G potentials are not physically the same with respect to each other, respectively[1].

This fact stands out most clearly in the *G time dilation experiments* that prove that *a) Two atomic clocks located in different G potentials have frequencies different compared to each other. (G time dilation or G redshift)*

b) *Such time differences have nothing to do with any eventual change that the radiation may have during their trips between such potentials*.

c) *Some fundamental changes occur to the atoms and clocks, when they change of G potentials: they run at different speeds with respect to each other*.

d) *The unit systems of observers located in different G potentials are different with respect to each other. This is a fundamental difference with E fields.*

The points **1** and **2** can be consistent to each other only if:

In any measuring system, everything in it changes in identical proportion after identical change of G field potential thus making believe that nothing has changed.

Only in this way every local ratio and every local law can remain unchanged. Notice that this is a somewhat more explicit form for the Equivalence Principle. On the other hand, from the same Experiments and Principle it is inferred that

Most of the current relations between quantities measured by observers in different field potentials are inhomogeneous because their standard atoms and clocks are not physically the same relative to each other.

*C*onsequently, strictly,

"Most of the relations between quantities measured in different G potentials have no well defined physical meanings[2].

This is obvious when time-intervals measured by observers located in different heights are compared to each other. Since their clocks run with different speeds, such comparisons don't have well defined meanings. The same would hold for quantities that are directly or indirectly related to the time intervals.

Then it is concluded that

In G fields, the current local language becomes ambiguous and misleading. It cannot be directly used for nonlocal cases, i.e., for comparing quantities measured in different G potentials unless that previous gravity corrections (or transformations) are made. Such transformations are as fundamental as *the Lorenz transformations* of special relativity*, are done.*

When Einstein conceived his gravity theory, he justified his field equation by using the ordinary physical language. Most probably he did not realized this one is not well defined for nonlocal cases of G fields. This seems to be reasonable because he could have not anticipated the results of his theory.

Einstein *assumed, without fair proofs* that *the G field has some energy that is given up[3] to the bodies during the G work*. He justified it on the base of the better known properties of the electric fields. Thus he tacitly assumed that "*the G field would have some properties similar to those of electric fields*[4]*", no matter the fact that such fields are fundamentally different with respect to each other*. For example:

1.The electrons are charged fermions whose physical properties are radically different from the uncharged bosons (typical G field sources).

2.The E fields are "closed" ones. Thus the electrons are not isolated particles but parts of closed (uncharged) systems. On the other hand the G fields are "open" ones.

3.*The E fields do not show phenomena such as G time dilation, G redshift and G refraction. The existence of these phenomena (paradoxically discovered after General Relativity) puts into relief the most important differences between G fields and E fields, as shown below.*

In G fields, on the other hand, it is not obvious which part of the system puts on the energy for the gravitational work. Because if we see just an object that is moving in the road, it is not obvious if the car is moving with its own fuel or if it is pushed by some other car tied with some non visible rope. That is the difference between a self-propelled car and a car pushed by some external force.

Thus Einstein was forced to make a choice between the two alternatives. Thus he justified his field equation with rather ambiguous statements. He argued that the G field gives up energy to the body because it gives up the momentum for the acceleration. Of course, this is not necessarily true, either, because *the same argument is not true for the cases of self-powered systems that use their own internal energy to accelerate*. Such systems do not exchange energy with external systems. The last ones give up "just" the momentum needed for the acceleration but not the energy. The kinetic energy increases at the cost of a fraction of the internal energy confined in the self-powered system. This one doesn't come from an external system. Ordinary examples of this case are: cars, humans and animals accelerating by themselves, after using their own energies and the momentum supplied by the road *static forces*[5].

In the case of a body falling freely in a "static" G field, it is not evident whether or not the forces are truly static or not. Just to the contrary, it looks more obvious that they should be static forces, the same as the road forces in the case of a man accelerating with the energy of his muscles.

The nonlinear term of the field equation of the theory of General Relativity is just the result from the assumed energy that the G fields would have to exchange with other bodies. Such term turns out to be the main cause of the high complexity of General relativity and, also, the main source of the problems in cosmology and astrophysics.

Then it may be recognized that General Relativity depends "strongly" (+) on the most reliable principle of physics, called the equivalence principle (EP) but it also depends, to a less extent, of a very "weak" (-) hypothesis on the G field energy, Because:

- *It is based on one of the best-tested principles of physics, which is "The Einstein's Equivalence Principle".*
- *Its field equation, is the weakest part of such theory because it was derived after trial and error methods, on the base of hypotheses made up on a language that is not well defined in a G field.*

Then it is most important to find whether or not such hypotheses is simultaneously consistent with the gravity tests and Equivalence Principle.

The weak point is normally supported by the common (but improper) use of local quantities for nonlocal cases in gravity fields. This common practice seems to come from the fact that all of them: the ordinary (superlocal) experiments, altogether with the Equivalence Principle, induce to believe, erroneously, in that the bodies and the space are really invariable, with respect to *any* observer, after changes G potentials. *These beliefs are in conflict with the relative changes of objects, detected by observers that have not moved altogether with the bodies. This holds, for example, in G time dilation, G redshift, and in G refraction.*

1.3 The First Steps of this Theory

Long ago, when I studied Special Relativity I realized that you can understand it better by using a very simple "particle model" consistent with the Michelson-Morely experiments and with the Equivalence Principle (EP). This model was made up of photons in stationary state within a box with perfect mirrors. I assumed, as a gedanken experiment, that the photons were produced by the annihilation of matter-antimatter. Them the theoretical properties of the model should not depend on were matter-antimatter or radiation exists in the box. Thus, externally, this model is like "*a black box*" in which *it does not matter if inside of it there is an electron pair or a well-defined number of quantums of radiation in stationary states.*

On the other hand I also found that special relativity is more clear when the velocity and the position of the observer are clearly stated by suitable symbols, like a "subscript". In this way it is simple to test that every relation is strictly homogeneous, *i.e.*, referred to the same standard.

Later on in 1973, when I was studying some luminous plasma observed in the high atmosphere, I tried to find the possibility for the existence of antimatter in the universe. Then I realized that the current theories and models on the evolution of the universe and of its celestial bodies had too many fundamental problems without fair solutions. Since it is of no use to work with uncertain hypotheses, I tried to find by myself a simpler model of universe based in some more general and unquestionable principle[6].

Then I remembered that my earlier particle model clearly suggested me that matter be made up of waves. Since waves are cyclical phenomena then the sum of several waves is also a cyclical phenomenon of a larger period. Then, after consecutive generalizations I found that it is reasonable that matter in the universe should be evolving rather *cyclically, with larger periods, between gas and super dense states, and vice versa.*

But in order that a closed cycle of matter can exist, it is necessary that the so-called "black holes", after capturing radiation for long times, can explode regenerating new gas. Only in this way the new gas can regenerate stars like the ones that we see in the sky. In this way these closed cycles, occurring rather statistically, could keep constant the average entropy in the universe.

Effectively, the first trial for the new model for universe evolution, by assuming that the black holes can explode, was apparently more consistent with the observed facts. For this reason I published this first trial in Atenea[1], in 1974.

However the final explosion of black holes, after capturing enough radiation, was in clear disagreement with the Einstein's theory of General Relativity[2]. According to it, matter could never get away from a black hole. Then I thought on the possibility that something in *General Relativity* may be wrong[7]

Then I tried to find, by myself, what is really is happening during the most elemental free fall in a gravitational (G) field, after using the light-box particle model that I used before for the case of special relativity.

Then I realized that for this purpose *it is most important to use a fixed observer that* does not changes of G potential. Because the standards of observers in different G potentials are physically different, each one with respect to the other ones. Only by using a standard in a fixed state of velocity and field potential, it is possible to be completely sure that the physical relations between objects located in different potentials are "strictly homogeneous".

This is equivalent to use a more strictly homogeneous language that corresponds to a simple extension of the one that I used before for my studies on special relativity. This was done by adding it just a new variable more: *the G field potential*, or by default, *the object's positions*.

The results obtained in such first trial, according to the *linear properties of light*, were obviously *linear*. Then I found, rather surprised, that "*the G field itself has no energy*". In spite of such fundamental difference with General Relativity, the new nonlocal relations were in strict agreement with the standard tests for G theories.

Then I found that new kind of black holes (that I called "semi-black holes", or "linear black holes"), after capturing enough radiation, can explode thus completing a matter cycle. In this way the new kind of universe, ultimately fixed by unquestionable properties of light, turned out be more consistent with the astronomical facts.

Then I tried to look for the fundamental differences between my work and General Relativity, after reading the original book written by Einstein[2], titled "Introduction to Relativity". Only then I realized that Einstein postulated his field equation after trial and errors methods, by using the current physical language, from analogy with the electric field, regardless of the fundamental differences between those of G fields. Then realized that the main difference between my work and General Relativity, aside of its more simple mathematical formalism, is the form of the G field equation.

In my new approach, to the contrary, it is not necessary to postulate the form of such equation because this one is fixed by the linear properties of the radiation confined in the particle model.

Indeed I was surprised to find that the literature is plagued with direct relationships between quantities measured by different observers whose reference standards are not strictly the same with respect to each other. It seems that most people tends to ignore, just in G field cases, that such relations are inhomogeneous and, therefore, they have not a true physical meaning. Such errors normally produce feedback between themselves.

The first results of the present theory altogether with a gross brochure on the new cosmological context were published in Atenea[3], in 1976.

A discussion on the main point of disagreement with General Relativity, on which part of the system is the one that puts on the energy during a free fall, was presented in *The Einstein Centennial Symposium on Fundamental Physics*, in Bogota[4], in 1979.

A more complete work was published in the *International Journal of Physics*[5], in 1981. In such article I proposed the foundations for "a new gravity theory" based on a particle model consistent with the Equivalence Principle. However I thought that it was too early to talk about a new theory.

Later on I realized that the original particle model turns out to be the most elemental hypothesis on the nature of particles that one can think of. This one can also be used for deriving *basic principles and laws of physics.* This turns out to be a radical way of starting all over from the most elemental facts. This is also a direct and reliable way to find the unified nature of many physical phenomena.

The first steps of this theory were published in a booklet entitled "*Introducción a una Teoría No Local de la Física, Aplicada a Campos Gravitacionales*". (Introduction to a nonlocal theory for physics applied to gravity fields, January of 1983).

I have dedicated most of my spare time, for over 25 years, to this work. During this time I have been trying to communicate these ideas to the scientific community, by different means. However I found that most of the referees and editors declined the publications just because it disagrees with General Relativity. Thus small parts of this work have been presented in other meetings. The main ones are:

1. *A dilemma in the physics of G fields*. The Einstein Centennial Symposium on Fundamental Physics, in Bogota[4], in 1979

2. *Theoretical properties of G fields derived from properties of light*[5]. Fourth Marcel Grossmann meeting. Rome, 1985.

3. *Evolution of celestial bodies resulting from electromagnetic wave theories for matter and light.* Spring Meeting of the American. Physical Society. Crystal City, USA. April 1987.

4. *A new model for the structure and evolution of main sequence stars*[7]. IAU. Colloquium 137. *Inside of the Stars*. Astronomical Society of the Pacific. Vienna, (1992).

5. *The new astrophysical context derived from a quantum-wave matter model*. 16th Texas Symposium on Relativistic. Astrophysics and 3rd Symposium on Particles. Berkeley. California. 1992.

6. *Advances on a unified theory based on a standing wave particle model*[39]. Seventh Marcel Grossmann meeting. July 1994.

7. *Unified relativistic physics from a standing wave particle model*[8]. Sixth Canadian Meeting on General Relativity and Relativistic Physics. May 1995

8. *The new kind of universe fixed by a standing wave particle model*[9]. Sixth Canadian Meeting on General Relativity and Relativistic Physics (poster).

9. *Linear gravity fixed by he experiments.* Joint Meeting of the American Physical Society and the AAPT, Indiana. USA. May 1996.

10. *The cosmology fixed by the experiments.* Joint Meeting of the American Physical Society and the AAPT. May 1996.

11. *Nonlocal conservation laws derived from an explicit equivalence principle. The 8th Marcel Grossman Meeting on General Relativity*, Jerusalem, 1997

12. Cosmic tests for a more explicit Equivalence Principle. *The 8th Marcel Grossman Meeting on General Relativity*, Jerusalem, 1997

13. The Equivalence Principle used for a sure way for interpreting the universe". The VLT Opening

Symposium, March 1999 in Antofagasta. Chile.

Footnote: [Later on I will update this list and link each item with a copy of the works sent for publication in the corresponding proceedings, or a scanned copy, so as to make them available for the readers.]

I decided to write the present book because the time and the space normally given in the meetings and journals are not enough for a fair introduction of this theory.

My task in these meetings has been not easy because most people do not expect that any serious error may exist in conventional gravity. Some of them do not expect that the current physical language may become ambiguous in just the G field case. Nobody would believe that the simultaneous use of a simple particle model and a more strictly homogeneous language can give more exact results and account for such wide range of phenomena in nature.

The old dilemma on "*what comes first, the egg or the chicken*", also applies here. Because no serious demonstrations in gravity can be made without introducing a strictly homogeneous physical language for G fields. But nobody likes to learn a new language unless that it is clear that the actual language becomes inhomogeneous in the G field case. To prove it, a more strictly homogeneous language must be used, anyway.

I must recognize that I have had very nice surprises by finding many new concepts and interpretations of natural phenomena. I would like that you can feel the same after reading this book.

Nevertheless it has been discouraging to find that practically all of the meetings and the spaces in the literature on gravitation, gravity *is not gravity but General Relativity*. This is a clear message in that, for the scientific community, there is no real interest for new theories.

The same holds for the referees and editors. I have realized that most of the editors of scientific literature do not like to publish works that are against the mainstream of current theories. According to some of the current verdicts of referees and editors, I can conclude that most of the times the referees for the subject of gravity are normally specialists in General Relativity that cannot believe in that something is wrong in such theory. Thus I have found that some of them have not read the articles but just a few lines.

However, this was something that I expected because we are humans with the natural tendency to close the doors, or to crucify, to anyone that pretends to demonstrate that we are in the wrong way.

I must also recognize that in this task I have not been alone. I have had the support of my wife, my family, my university colleagues and my friends. Even more, I have always had the feeling in that God has always been present in the development of my ideas. It has been like traveling throughout the universe on the shoulders of the most wonderful of the fathers.

1.4 The more Explicit Equivalence Principle from the Michelson-Morley Experiments

The present work was conceived from a careful analysis of the negative results of the local experiments of Michelson-Morley (MM), carried out at the end of the nineteenth century. This one must be consistent with the fact, observed in ”nonlocal” gravity experiments, that matter *does* change with respect to the observer after a change of G potential with respect to such observer.

In the first kind of experiments the instruments are essentially made of “*matter*” and “*radiation*”. The last one is traveling back and forth between mirrors, in conditions similar to those of *a standing wave* with a well-defined number of wavelengths between them. What was really proved in those experiments is that *the number of wavelengths between the mirrors does not changes after any change of velocity of the instrument*. This is a universal fact, i.e., for local and nonlocal observers.

The straightforward conclusions that come out of local and nonlocal experiments and are:

1.*Matter and stationary radiation's change in the same way and in the same proportion, along the same orientations, after the same changes of velocity*. Only in this way every local ratio can remain constant.

2.*Matter and stationary radiation obey the same general local physical laws.* Only in this way they can change in the same way and in the same proportion.

3.*The local physical laws do not change after changes of velocity and field potentials of the measuring system* <u>*because*</u> *matter is made up of radiations in stationary states*. Only in such way all of the ratios within the measuring system can remain unchanged after the common changes of velocity and of G potentials.

These three points make up a different form for *a more Explicit Equivalence Principle (EEP)* compared to the one of General Relativity[1].

According to this EEP, the physical properties of ordinary matter can be found, theoretically, from properties of the stationary radiation. This can be done after using the simplest kind of particle model made up of stationary radiation.

This means a <u>new kind of general physics based on just radiation properties</u>

. This work proves that this can be effectively done in a very simple way, and that the results are in strict agreement both with fundamental physics and with the observed facts ranging from single photons up to the universe.

1.5 The Global work

The original idea in this work was to start all over from the more explicit equivalence principle, after substituting real particles by the simplest kinds of particle models made up of stationary radiation. This method is bounded to give positive results because *this kind of particle model is the only one that can be simultaneously consistent with the local experiments, such as the MM experiments, and with the Equivalence Principle*.

This work proves that particle mode model can be effectively used to find:

1.*More reliable and general physical properties of particles and of their fields.*

2.*Genera (non-conventional) Properties for the black holes and of the universe*.

3.*A unified understanding of the basic phenomena occurring in nature*.

In principle this can be done in a very simple way, **step by step**, because *from general properties of light we can get general properties of particles and their fields. From the last ones we can get properties of the black holes and of the universe.*

Below it is found that this theory reduces the number of independent principles, postulates and assumptions in physics, astrophysics and cosmology, up to a minimum. This is due to the fact that most of the general physical properties of the bodies and of the space turn out to be fixed by general properties of radiation. Thus *there are no chances to depend on arbitrary assumptions*.

Most probably ideas similar to the present one have failed because they have used the current physical language normally used for electromagnetic fields, without realizing in that such language becomes inhomogeneous and ambiguous for the nonlocal cases in G fields. A better-defined physical language, with a higher degree of *physical homogeneity*, is essential for a fair description of the gravity phenomena.

For the present purposes it is most important to use *well-defined reference frames that have not changed in the same way as the objects*. Only in this way the theoretical description of the gravitational phenomena can be complete. Notice that this is the only way for the complete description of all kinds of relativistic changes occurring in nature. According to the Equivalence Principle, such changes cannot possibly be detected by the superlocal observers whose reference standard change in the same way and in the same proportion as the objects.

Here, the term "superlocal" is used for the cases in which the observer is moving altogether with the body, i.e., having always identical velocities and identical G potentials, in any circumstance.

Here I have started from the simple fact that *everything happens in nature independently on whether or not some observer exists*. Thus the changes occurring in the space of in the bodies have been derived theoretically, *i.e.*, rather independent of the experimental problems that some kind of observers may have for detecting such changes. In this way "the experimental methods can be used, *subsequently*, for testing the theoretical findings with the observed facts".

Below, I have used a rather particular viewpoint for the concepts of *special relativity*, that I called "*local relativity*". This was done to be able *to generalize the relativistic concepts and language used in local relativity for the more general nonlocal cases in gravity*. The last case is called here *nonlocal (NL) relativity*. This is done in the simplest way, *i.e*., without using the more sophisticated languages used in current gravity theories. In this way *this book can be understood by non specialized readers*. Of course, more general and sophisticated descriptions can be made, later on, but only when we are certain to understand the real nature of the most elemental physical phenomena.

Some applications of NL relativity have been done here in order to put into relief the most important sources of errors in physics. Most of them seem to come from the inappropriate use of special relativity to NL cases in G fields. This has been done after theoretical and experimental methods. Thus the last ones can be regarded as fair tests for the present theory.

In the Sections **1** to **6**, the basic properties of the radiation and of the model have been analyzed on the base of the most elemental conservative principles for radiation, derived from "*wave continuity*". Then the basic theoretical properties of the particle model and of its G field have been derived according to these principles and compared with those of fundamental physics. They have also been tested with the most exact experiments, including the so-called "Gravity Tests".

In Sections **7** and **8**, the new properties of the black holes and of the universe have been derived from the new G field equation fixed by the Explicit Equivalence Principle. In this way it is possible to find the gross structure and evolution of the universe and its celestial bodies. Thence the new cosmological context turns out to be ultimately fixed by the linear properties of radiation. The Explicit Equivalence Principle doesn't leaves room for arbitrary assumptions!

In Sections **8, 9,** and **10**, the new cosmological context is used as guide for interpreting the phenomena observed in astronomy. In this way the self-consistency of the new astrophysical context and its consistency with the astronomical observations seem to be fair tests for the present theory.

The new global context, including the role of the man in the universe, is summarized and analyzed, globally, in the Sections **11, 12** and **13**.

In spite of the disagreement of the present work with the field equation of general relativity, *the present work has been conceived by using fundamental concepts introduced mainly by Einstein and a large list of pioneers in physics.*

My intention was to make this book as self-consistent as possible. In this way a normal reader may not need a previous knowledge on highly specialized physics or mathematics. Thus the new quantities and definitions used here are the simplest ones. They correspond with the natural way of thinking of human beings.

The symbols used for the quantities may look bulky because they include positions and velocities of both the object and of the observer. This must be done here, in this introductory stage, just to prevent ambiguities and misinterpretations. In this way every quantity is much better defined compared with ordinary quantities. Indeed they are just ordinary functions for observed at rest in some fixed positions of some static G field. More general cases, of course, can be easily be derived, later on, from such functions.

For reason of space and continuity, I have used equations with several members in line. They show several intermediate steps of the deductions. In this way we can also choose any pair of them, according to more general needs.

This book should be easy to read by non specialized readers because it is self-consistent and starts from very elemental properties of light. It is addressed to open-minded readers that are not tied up to old concepts or current theories.

I apologize if I have not cited many previous works of other authors that may eventually have had ideas similar to the present one. Indeed I have not been able to read much of the voluminous literature existing in the wide range of subjects involved in this theory. Only in this way I could grant a theory non-contaminated with pseudo copies of other theories. Otherwise I would have not been able to do the present work. It is reasonable that there are other works similar to the present one. I would be glad to know about them and to compare the results obtained from different viewpoints.

I hope that you can enjoy with the high unity that comes out from this new viewpoint, after starting all over from the most elemental facts. May be that you can also be able to contribute with new ideas for a better understanding of the wonderful universe in which we are immersed.

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[1] The case is similar to the one of two observers located in different countries, using different kind of money. Such moneys are well defined for exchanges within each country, respectively. They cannot be used to buy goods in other countries that have different moneys. These moneys are physically different relative to each other, regardless of the identical unity number. Of course, the one observer can buy in the other country but only after converting the money of his country into money of the other one, after some well defined rate

[2] The above cited assumptions are similar to the ones made in *classical physics*. In old times, it was assumed that the bodies were invariable after changes of velocity. Later on it was proved that the quantities measured by observers moving with *different velocities* cannot be directly compared to each other unless that the so called *Lorenz transformations* are used. For similar reason, in gravity, the quantities measured *in different G potentials* cannot be directly compared to each other unless that some *gravity transformations* are used. Such transformations are missing in the reasoning used by Einstein to formulate his field equation. It is obvious that he did not expect that G fields could be much different from the electric ones, in this respect

[3] To give up energy during G work means a differences of quantities measured in different G potentials, with unit systems different relative to each other. Such (inhomogeneous) differences have no real physical meaning.

[4] Such ideas are consistent with "*quantum gravity*". So far such theory has not succeeded in demonstrating in that the G field is quantized. So far, the experiments trying to find *gravitational waves* have failed.

[5] Curiously, I have found many people have never thought in that, *for the case of a self-powered body, its relativistic mass, relative to a fixed observer, remains constant during its acceleration*. Most people remember just the old "recipe" in that, "the mass of the bodies increases with the velocity" but they do not take into account in that such mass increase is due to just the energy given up by some external system. For the case of self-powered bodies, *no external energy is given up to the body* and, according to *mass-energy conservation, its relativistic masses must remain unchanged during the acceleration*. The external momentum given up to it is the one that makes possible that such internal energy can be transformed into its own kinetic energy. In self powered systems, for example, the relativistic increase of kinetic energy of the system *is balanced by the mass-energy lost by its power sources* (normally chemical

energy in batteries or human cells). In the case of a compressed spring, its initial rest mass is larger than the one in uncompressed state. When it is released from one of its ends, according to mass-energy conservation, its initial rest mass is equal to the final relativistic mass moving with respect to the observer.

[6] This was done independently on general relativity because, honestly, I did not trust in the arguments that Einstein made to justify his field equation. Anyway, such theory has never been tested in strong fields.

[7] This is reasonable because most people has put too much faith on Einstein's works, even when he made many mistakes and he honestly recognized them.