# DARK MATTER AND DARK ENERGY... a solution???

Francisco Gutiérrez de la Cruz

ACCI
Asociación Cultural y Científica Iberoamericana

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To my family, from here and from there, especially
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# INTRODUCTION

Mankind has always been curious about everything that surrounds us and that has given risen to many disciplines, among them physics. If we look at the development of this science, we would conclude that everything began with the knowledge of the three fundamental magnitudes (length, mass and time) and that no doubt the need to use them arose with the awakening of human intelligence in the early days of our species.

Obviously when mankind came into the world, it was already there and those three magnitudes, the existence of which we noticed due to their use in everyday life, have also served to build an explanation of all the physical phenomena we know. But even so, we want to know more and wonder if what is established as fundamental really is so; for example, who has not heard the classic question, What is time? Obviously, there is still no convincing answer, and perhaps if there was we would begin in other, more fundamental ways, and we would always have the same dilemma. As a reflection, if intelligence had appeared when the universe was being born, other, even more fundamental parameters than the three mentioned would perhaps have been seen.

Those magnitudes are nothing more than simple data that our senses observe and that our mind interprets. We take it for granted that our brain observes the world objectively but perhaps this interpretation is not correct because we can fool our senses. As an example, land seemed flat because that's how the ancients saw it when they looked out at it, but they realised with other, more indirect observations that it was round and finite. Perhaps the same thing will one day happen with the universe, that is, after uncovering the mysteries, on looking up to the sky we will not imagine an enormous space but will use other magnitudes referring to space-time and it will seem to us somewhat isolated and small, the only thing is that the laws of nature prevent us from moving freely, on a path that is short but full of obstacles.

Coming to metaphysics, as Plato said, perhaps there is a world beyond the reach of our senses that we will never perceive.

If there is a “undetectable” world, we may never find out, but if there is an effect that interferes with the normal world, there is no doubt that sooner or later humans will detect it, perhaps opening the way for a new branch of science. An illustrative example would be the discovery of industrial electricity, we lived ignorant of its existence until a century ago, but on inquiring about phenomena where it (electricity) is involved, we have revealed a whole branch of physics, allowing the invention of many practical applications. Another more recent example that may be similar and that is in its infancy is the Higgs field, where perhaps devices based on its effects may be used before terribly long.

Continuing with electricity, it was in the nineteenth century when magnetic and electrical effects that concluded with the

famous Maxwell's laws were observed and defined. For this, the concept of a field was introduced, which is used to quantify something “not seen” but which causes phenomena that we do observe. Obviously, the properties that were attributed to the idea of a field were valid since all electromagnetism experiments confirm it.

But physics advances by making assumptions that experiments later confirm to be correct, and also the opposite, that is, phenomena appear that must be explained. If we take as an example the wave-particle duality for photons, Einstein explained the photoelectric effect by assuming that these are particles; in other experiments to be able to understand them, it was established that they are waves, therefore, oddly enough, a photon is considered a wave and a particle at the same time because experiments so confirm it.

As an aside, human beings seek to explain with their intelligence phenomena they observe in the world around them, but their brain will itself surely someday be a source of strange new phenomena; moreover, their role as observers generates more complicating elements for the overall understanding of everything, as quantum mechanics perfectly illustrates. The mysteries it contains are amazing from the physical point of view, how consciousness is generated from inert matter! Therefore, even if at some point we understand how the universe works, we cannot close the door to new phenomena until we know what's in the brain. We might be surprised when we discover we're very simple and the product of the functioning of a “machine” “designed” to survive as another living being, or on the contrary, it is confirmed we're unique, intelligent and free, as we now think of ourselves.

To continue, perhaps at some point we'll discover something that we cannot understand; might it then be necessary to modify some property of the concepts that have been established? Obviously, if these are endorsed by a multitude of experiments, the logical thing is to be reluctant to change and look for some the solution in some other way.

We find this situation now with the subject of dark energy and dark matter. In this regard, the proposal we make in this book is not to change some basic concept, but to modify its interpretation, generating a development to reach some conclusions. Perhaps it is just one more among so many that have been published, but a long time thinking about the subject and the feeling that it may be useful for those interested in these two mysteries of the universe, produce the urge to make this work known.

# SUMMARY OF THE BOOK

**The aim of this work is to show an "amusing" idea based on effects of electric charge and mass, and which can be applied to understand the origin of dark matter and dark energy. *We must warn that in this book the term "dark matter" will be replaced most of the time by "dark mass" since we believe that the phenomenon is an effect of mass and not the appearance of new particles or new matter.***

The ideas that are developed are based on the similarity of the electrical and gravitational fields, a subject that has been studied in depth. The formulas that define it, Coulomb's law and Newton's universal gravitation, are identical, which makes one think that similar phenomena must occur in both fields; therefore, facts deduced in the charges about mass and *vice versa* are applied, however they have a common basis, which is that both are energy. For example, it will be explained that the magnetic effect between two charges can be considered an increase in the value of their electric charge due to their speed, just as mass is increased as shown by the theory of relativity.

**In development, in addition to classical electromagnetism, the theory of special relativity has been used, especially the formulas of energy (E=mc2) and relativistic mass. The**

**equivalence between inertial and gravitational mass, basic for general theory of relativity, has also been considered.**

Although there is great similarity between electrical and gravitational forces, there are also differences such as that gravitational force is always attractive and its origin lies in a single type of mass and electrical force is generated by two types of charges, positive and negative.

**It will be assumed that the total energy of the universe is zero by establishing that gravitational energy, considered negative (since it brings the masses together), is cancelled out by the rest of the energy that the expansion produces, which we shall call positive.**

There are two important conclusions in the development of the book:

1- Dark mass is induced (or produced) when normal mass is compacted, therefore at the beginning of the universe there was a great amount of it, spread throughout the universe but being concentrated as galaxies were forming.

2- The kinetic energy of the dark mass that has been undergoing expansion (like normal mass) since the beginning of the universe, is being transformed into so-called dark energy in the expansion process. This is because as the "volume" of the universe increases, the dark mass disappears and, in order for the principle of the conservation of energy and momentum to be fulfilled, there must be an acceleration of the normal mass.

Based on this, **there will be a clear link between dark mass and dark energy**. In short, the dark mass is transformed into energy of expansion. Something like this has been observed and was

published in *Physical Review Letters* by researchers from the University of Rome, La Sappienza, on 1 October 2014.

As an observation, if the universe is homogeneous and isotropic some influence will have had the dark matter and dark energy to make it so, which along gravitational force and the mechanism of transformation of one in the other have shaped this two characteristics.

An observation:

It is known that the universe in large scales is homogeneous and isotropic, this means that the density of matter is constant throughout the volume, and it is also known that the universe is flat (without curvature), that is, that the density of matter besides being constant it has a certain value. But these characteristics are supposed to have always been, since the inflationary period, means that the big-bang was not a chaotic "explosion" but rather an uniform expansion throughout the volume.

Question:

Acting only the force of gravity, would it be possible to maintain these three characteristic though time (homogeneous, isotropic and flat universe) or would dark matter, dark energy and the transformation mechanism of one into other be necessary?

The answer is clear, everything is necessary because everything exists.

# CHAPTER GUIDE

In chapter 1:

-Comparisons are made between the effects of mass and charge.

-Just like Newton deduced the unit of force (the newton) with gravity and the moment of inertia of mass, we propose to find another unit of force (which we shall name newton-charge) with the effects of charge, drawing conclusions about what the energy of the electrical field is.

-We reach the conclusion that charge has inertia, which is camouflaged with the inertia of the mass of bodies. And in short, the charge generates an electric field, which is energy, which in turn is equivalent to a mass (due to relativity), which has inertia and a gravitational field, which amounts to saying that the charge also generates gravitational force.

-It is observed that upon compressing a charge sphere generates an electric charge that we call “induced charge”, which suggests it can be interpreted as the existence of a “dark charge”, in parallel to “dark mass”. Obviously, this “induced charge” is not new particles but effects as if electric charge increased although very weakly.

In chapter 2:

-Classical magnetism is studied and reinterpreted, demonstrating the existence of “charge induced” by magnetic methods, introduced in chapter 1.

-The force is analysed between two charges that travel in parallel at a certain speed, and it is concluded that their increase in force or mutual magnetic force generated by the motion can be interpreted as an increase in charge, as happens with mass according to the theory of relativity.

-It is shown that if those two charges travelling in parallel suddenly separate, an acceleration appears in the direction of motion similar to a “dark energy” of the charge.

In chapter 3:

**-Gravity is considered negative energy since it is an attractive force, and the rest is considered positive, since it generates the expansion. It is justified by the idea that the total energy of the universe is zero. The law of conservation of energy is also fulfilled if the same value of positive energy and negative energy (gravitational energy) appear or disappear at the same time, so that they are cancelled out.**

-Also, as in charges, upon compressing the masses or bringing them together, an “induced mass” appears, which in reality we consider to be the direct origin of dark mass.

- Just as in chapter 2 with the charges, the force between two masses travelling in parallel is analysed, and it is concluded that to the force of gravity (considered at rest) must be added