Deep Study of the Universe through Torsion

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By

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PREFACE

A torsion is the observable result of a field interacting in space-time resulting in the creation of gravity from a vacuum-energy interaction. This leads to agitation in space-time resulting in leptogenesis and the creation of dark matter and dark energy, relevant to the process of baryogenesis and the evolution of the actual universe. Factors concerning inflation and matter-energy are analyzed, as are hadrons, which are fundamental to dark matter production. Some results of torsion with baryogenesis are given to analyze the evidence relating to baryon acoustic oscillations, the role of sterile neutrinos, and hadron proliferation in this step of the universe's development, as well as the different effects of cosmic expansion, redshifts, and space distortions etc., which are effects of gravity caused by torsion and matter production in the universe. Two results are obtained, one in the context of Majorana neutrinos and another that goes beyond neutrinos and deals with dark energy. The present monograph on torsion as a field observable has the fundamental goal of creating a specialized study of torsion and describes a new theory based on the energy of the curvature of the universe. Its applications are corollaries of this theory.

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CHAPTER 1

INTRODUCTION

In the study of the origin of our universe, the currently accepted model is based on the CMB[1]. In this model, we consider nucleosynthesis to be the fundamental process forming energy-matter. This is a long process taking several thousands of million years to pass through the various stages of leptogenesis and baryogenesis in the early universe and up to the proliferation of hadrons and tachyons, among other particles. Through the field mechanisms and interactions between these particles, certain oscillations are achieved at the fundamental level.

Over a period of time, the universe was formed with a large quantity of leptons of various classes of fermion, which developed the charges of the universe. Their interactions with gluons and other gauge bosons formed energy-matter through the torsion field[2] (with one of the products being gravitational waves), later passing this energy on to matter. A torsion, as an invariant of energy-space, is defined as $T^{\gamma}_{\alpha\beta}=2S^{\gamma}_{\alpha\beta}$ and involves energy through waves called spinors; it operates on points in space-time defined by the spinor correspondence [1] (see fig. 1). This process gives the appearance of waves agitating space-time as the field acts, at the microscopic scale, leading to the existence of energy in space. This energy can be an indication of gravity, measured by scientists as gravitational waves and involving other aspects of the field equations [2, 3].

[1] Cosmic microwave background.
[2] In this process of matter, the gravitational field is produced due to the actuation of the torsion field [1-3].

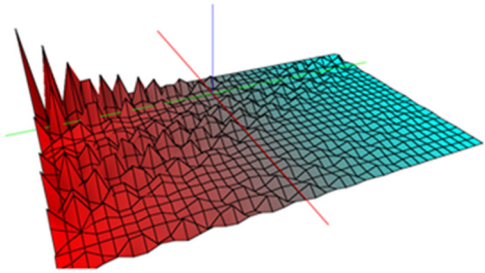

Fig. 1. Spinor image of spin-waves in torsion: 2-D model of spin-waves generated for a magnetic dilaton with a cylindrical-spiral movement trajectory [3-5].

The torsion field mechanism is fundamental to all the evolutionary processes of sidereal objects in the universe, such as galaxies, black holes, supernovas, pulsars, and nebulae, which are formed by the intersidereal field. For example, in galaxies the spiral arms are oriented and the galaxy's rotation is driven by the intersidereal magnetic field. However, the torsion field also results in the production of large amounts of positive energy originating at the microscopic level in early matter (atoms and primal particles, i.e. the so-called ***H***-particles[3]), which produce the mechanism of movement from the space-time vacuum and the energy interaction [6] (fig. 2).

[3] Higgs Bosons.

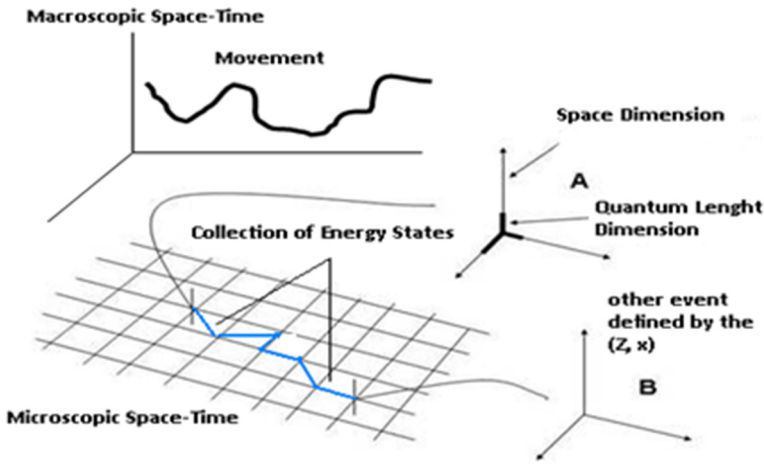

Fig. 2. Description of the ***H***-particle states.

In astrophysics, we study the accretion and rotation lines in galaxies, the movement of black holes, and their action in the universe. Likewise, the universe in its early years appears very similar to the actual universe with a high proliferation of atoms with extra energy, as evidenced for neutrinos (which constitute the major part of the universe) and free photons observed, for example, in the luminous disk of a galactic horizon up to 10 kpc (see fig. 3). However, this indicator is not precise according to the inhomogeneity detected by WMAP (redshift-space distortions and microwaves in background) observations of the background of the actual universe [4]. Here we may precisely consider an extension of the Standard Model; however, what happens with the gravitational failure in these effects of cosmic inhomogeneity [5]? In this respect, it is necessary to consider additional studies on the evidence for torsion and extrapolate this to the evolution of baryogenesis so as to prove that the effects of cosmic inhomogeneity are due to the action of the torsion field at the microscopic level of observation [6], for example, in terms of baryon oscillations within cosmic expansion (see fig. 3).

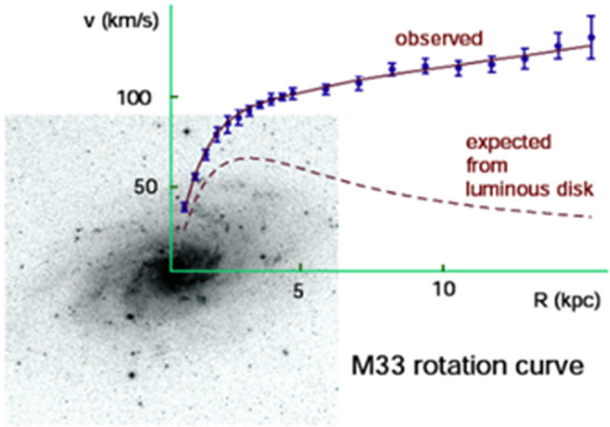

Fig. 3. Cosmic expansion in dark matter.

Some aspects of general relativity and quantum field theory will possibly be very useful and can be modified to fit with the CMB-model and the super-symmetrical extensions that must be considered in the Standard Model for field actions [7, 8]. Some of this model goes beyond the theory of neutrinos, for example, in the energy-matter context.

Cosmic expansion is equivalent to baryon oscillations, which produce dark energy. This fact can be gauged by considering an appropriate w-parameter inside the field equations in the framework of scalar field theory and accounting for certain values of w in relation to different physical characteristics or different key values[4]. For example, the values of $w = 0$ for matter; $w = 1/3$ for radiation; $w = -1$ for the cosmological constant; and $w <– 1/3$ for the acceleration of fluids in the universe.

[4] Using baryon acoustic oscillations, it is possible to investigate the effect of dark energy in the history of the universe and constrain the parameters of the equation of state of dark energy.

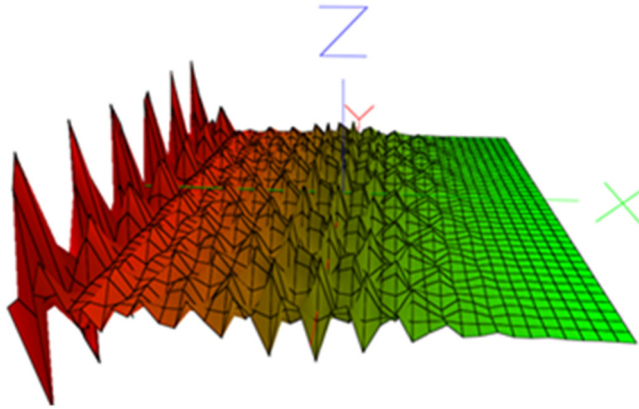

Fig. 4. Geometrical model created to explain the persistent nature of the torsion field in the production of gravitational waves [9]. Dark energy may have been produced from the remains of axions in the expansion process and is possibly a key value arising in the field equations. We can observe here the horizon of the 2-D space model and compare it to the 6-degree field galaxy redshift survey given in figure 3. An inconsistency may arise from the second process, or baryogenesis, through which dark energy joined with gravity at the beginning of the universe. This explains the appearance of matter and the start of the process of nucleogenesis [1].

The precursor values are considered characteristic of the corresponding work that is required for each physical entity (matter, radiation,…..), considering the latent force of certain “pressures” (tug) of the physical entity contrary to the displacement of certain heavy particles. These values are theoretical and are obtained through dynamic models in which the virial energy model of the universe is applied. It thus could be the case that dark energy has negative pressure, in contrast to dark matter, which has positive pressure.

Table I: Physics of Dark Energy with *w*-parameter and Scalar Factor *a*

#	Physics	Equation
1	State (radiation, temperature, scattering)	$P = w\rho$
2	Conservation of Energy	$dE = d(\rho a^3) = -pd(a^3)$
3	Rearrangement	$\rho \propto a^{-3(1+w)}$
4	Friedmann equation (thermal inflation, expansion, matter variation)	$da/dt \propto a^{-(1+3w)/2}$

Finally, the variations in pressure in both physical aspects—dark matter and energy—can be detected throughout the universe's expansion process as baryon oscillations, which has been shown by experiments with heavy particles. As such, *dark energy is gravitational + photon energy*, filling space and interacting with matter-producing field effects from these bodies, which are observed as maser and laser radiation. In fact, in this step of the universe there is a proliferation of **H**-particles[5], which can explain the large quantity of hydrogen in the universe, it being a fundamental chemical element composing interstellar and sidereal bodies (stars, globular clusters, nebulae, galaxies…).

[5] Hydrogenic atoms.

CHAPTER 2

OBSERVATIONS, EXPERIMENTS, AND MEASUREMENTS OF TORSION AS A FIELD OBSERVABLE

2.1. Geometrical Models and Signal Analysis

A torsion is a double curvature of a space or body resulting from the interaction of two fields—one field is the electromagnetic field and the other is a field that is relative to matter, i.e. the gravitational field in its broad sense (even considering quantum gravity).

Likewise, as mentioned in the introduction, a torsion born from the spins of matter and under the action of the electromagnetic field, produces spin-waves whose geometrical invariants are spinors in the invariant theory [1, 4] (see fig. 5).

This has been formulated in an initial conjecture.

Conjecture 2.1.1. The curvature in the spinor-twistor framework can be perceived with the appearance of a torsion and anti-self-dual fields [1].

As stated in an electronics study [3] using a magnetic Hall effect sensor[6], evidence of the existence of torsion as a field observable was obtained using a magnetic particle as a dilaton [4, 11] moving through a trajectory whose torsion is constant in all space [12]. Likewise, the signal below was

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[6] **Lemma [10].** We consider a Hall effect sensor device $\mathcal{L}_{\text{Hall}}^{\boldsymbol{H}}$. The current deflection detected for the change in the magnetic field by the sensor produces torsion energy per unit of volume

$$\tau = \frac{V}{2\pi}\frac{b}{(a^2+b^2)}\frac{1}{1}\left(= \frac{\text{Volts}}{(\text{meter})^3}\right).$$