A SIMPLE EXPLANATION OF THE VELOCITY CURVE OF THE WHIRLPOOL GALAXY FROM THE NEW ECE RELATIVITY.

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ABSTRACT

The velocity curve of a whirlpool galaxy is described by the new ECE relativity developed in recent papers of this series, papers which have refuted the Einsteinian general relativity. The orbital linear velocity is defined by the cylindrical polar coordinates in a plane, and the constant total angular momentum of the system defined in terms of the spin connection and a characteristic time. It is shown that all orbits can be described by the relevant spin connection magnitude, so this is a new theory of general relativity that can be applied to astronomical observations without the use of dark matter and without the Einstein theory. Therefore this is a new relativistic explanation without the use of dark matter.

Keywords: New ECE relativity, velocity curve of a whirlpool galaxy, rotational Hooke law.

UFT 198

1. INTRODUCTION

In recent papers of this series of one hundred and ninety seven papers to date { 1 - 10} Einsteinian general relativity has been thoroughly refuted in several ways. This means that a century of standard model relativity is meaningless, both theoretical and experimental, and is an example of Langmuir's pathological science, or carelessly repeated dogma coming from an unwillingness or inability to test the original concepts with sufficient mathematical rigour. Astonishingly, the first refutation of Einstein's general relativity occurred barely a month after he had published a paper on the perihelion advance of Mercury. The paper was published in November 1915 in the Proceedings of the Royal Prussian Academy, and has been translated recently and heavily criticised on the web for basic mathematical errors that nullify its physics {11}. Reference (11) translates a letter sent to Einstein by Karl Schwarzschild in December 1915. The letter refutes Einstein's paper comprehensively, and introduces the genuine, or real and original Schwarzschild metric. Einstein published only one minor note on this subject after that. In a later fabrication a different metric was attributed to Schwarzschild after his death in 1916 of disease in the trenches. This fabrication became known as "the Schwarzschild metric". In recent papers UFT190 ff. of this series (www.aias.us) this fabrication has been tested directly using computer algebra and has been shown to be total nonsense. For example it does not produce a precessing elliptical orbit as claimed so often by the dogmatists. In effect, this is exactly what was pointed out by Schwarzschild to Einstein by letter in December 1915, nearly a hundred years ago.

So Einstein's general relativity should have been abandoned in December 1915. If Schwarzschild had lived he would probably have out argued Einstein before the latter's dogma started to balloon out of control. Schroedinger also started to criticize Einstein in

1918, along with Bauer. Unfortunately Eddington started to claim that his experiments supported the light bending theory of Einstein, and the latter's dogma was blown out of all proportions by a media that did not understand it, the twentieth century disease. In UFT 150B and 155 of this series (www.aias.us) and in a series of essays, the general public has been reeducated and now know that the light bending theory is also riddled with errors which nullify its physics. In one of the supreme ironies of physics, the magnitude of the light bending is known with precision at tremendous cost, and attributed to complete mathematical nonsense. Much worse even than this for standard physics is the incorrectness of the Einstein field equation due to neglect of torsion, and again this nullifies all the physics of the twentieth century based on that field equation, fantasises such as big bang, black holes, dark matter and all that. Down the years others have suspected Einstein of promoting errors, or keeping quiet about them, and included Dirac, Eddington (despite his initial enthusiasm), the mathematician Levi-Civita who inferred curvature, Vigier (who came to reject general relativity in his last papers), and many others. Hoyle dismissed big bang out of hand and left Cambridge.

In the aftermath of this fiasco UFT 196 began the search for a new ECE relativity based on simplicity and Ockham's Razor, rejecting the meaningless and mathematically incorrect complexity of twentieth century relativity. This search was initiated using the concept of the velocity tetrad {1 - 10}. As a first step into unknown territory, the methods of special relativity were adopted to calculate the relativistic kinetic energy and the correctly relativistic total angular momentum. In future work these initial steps ought to be looked at critically and developed but we intend to try to keep it simple - Ockham's Razor and as in this paper try to test it simply against experimental data - Baconian principles of science.

In Section 2 the orbital linear velocity is calculated in cylindrical polar coordinates in a plane and expressed in terms of the angular velocity. The latter is developed in terms of the constant total angular momentum, which is expressed in the simplest possible way in terms of the Cartan spin connection and a characteristic time of the system. This time interval is a constant akin to the idea of relaxation time and originates in the need for a fully relativistic kinetic energy. Line element general relativity has been refuted trivially for all spherical spacetimes in UFT 194, and can no longer be used, so a new method of calculating relativistic quantities has had to be introduced. Using this definition of the constant total angular momentum, a constant of motion, the orbital linear velocity can be expressed in terms of the orbital function, found by observation in astronomy. It is shown in Section 2 that the observed velocity curve of a whirlpool galaxy can be explained straightforwardly in terms of the spin connection magnitude for any type of spiral arrangement of stars. The orbital linear velocity reaches a plateau with increasing r, the distance between the star and the centre of the galaxy. Finally the fundamental relativistic explanation of the whirlpool galaxy is expressed as a driving torque. The torque originates in spacetime torsion, which is governed by Cartan's geometry and which gives rise to the ECE field equations of gravitation and electrodynamics in a generally covariant unified field theory {1 - 10} - ECE theory. For a hyperbolic spiral for example the torque is proportional the square of angular displacement.

In Section 3 the various spiral orbits considered in this paper are illustrated by computer together with the spin connections for each type of orbit. This method can be extended to any type of orbit observed in astronomy and gives a self consistent cosmology.

2. EXPLANATION OF THE VELOCITY CURVE

In cylindrical polar coordinates the orbital linear velocity of a star in a whirlpool galaxy is defined as {12}:

$$\underline{v} = \frac{dr}{dt}\,\underline{e}_r + r\frac{d\theta}{dt}\,\underline{e}_\theta = \frac{d\theta}{dt}\left(\frac{dr}{d\theta}\,\underline{e}_r + r\,\underline{e}_\theta\right) \quad -(1)$$

In UFT 196 (www.aias.us) the constant total angular momentum of the system was shown to be:

$$L = mr^2 (1 + \omega c t_g) \frac{d\theta}{dt} \quad -(2)$$

where m is the mass of the star, r the distance between the star and the centre of the galaxy, ω the magnitude of the spin connection and t_g a characteristic and constant interval of time of the system. This is a fully relativistic description based on Cartan's geometry. Therefore the angular velocity of the star is:

$$\frac{d\theta}{dt} = \frac{L}{mr^2 (1 + \omega c t_g)} \quad -(3)$$

about the centre of the galaxy. The velocity can therefore be expressed as:

$$\underline{v} = \frac{L}{mr^2 (1 + \omega c t_g)} \left(\frac{dr}{d\theta} \underline{e}_r + r \underline{e}_\theta \right) \quad -(4)$$

and the square of the velocity is:

$$v^2 = \left(\frac{L}{mr^2 (1 + \omega c t_g)} \right)^2 \left(\left(\frac{dr}{d\theta} \right)^2 + r^2 \right). \quad -(5)$$

In a whirlpool galaxy it is observed that v becomes constant with increasing r, and this velocity curve cannot be described by Einsteinian general relativity. The velocity curve is therefore described by:

$$v \xrightarrow[r \to \infty]{} \text{constant}. \quad -(6)$$

From Eq. (5)

$$\left(\frac{dr}{d\theta}\right)^2 + r^2 = A r^4 \left(1 + \omega c t_g\right)^2 \quad -(7)$$

where:

$$A = \left(\frac{vm}{L}\right)^2. \quad -(8)$$

So the magnitude of the spin connection is defined by:

$$\omega = \frac{1}{c t_g A^{1/2} r^2}\left(\left(\frac{dr}{d\theta}\right)^2 + r^2\right)^{1/2} - \frac{1}{c t_g} \quad (9)$$

for any orbital function $dr/d\theta$. Here t_g is a characteristic and constant time interval. The arrangement of the stars in a whirlpool galaxy is observed to be a spiral. It is shown as follows that the velocity curve can be explained in the new relativity irrespective of the type of spiral observed astronomically.

The hyperbolic spiral is given by:

$$\left(\frac{dr}{d\theta}\right)^2 = \frac{r^4}{r_0^2} \quad -(10)$$

so the magnitude of the spin connection is:

$$\omega = \frac{1}{c t_g A^{1/2} r}\left(1 + \left(\frac{r}{r_0}\right)^2\right)^{1/2} - \frac{1}{c t_g} \quad (11)$$

with the limiting property:

$$\omega \xrightarrow[r \to \infty]{} \frac{1}{c t_g A^{1/2} r_0} - \frac{1}{c t_g} \quad -(12)$$

So as r becomes infinite the spin connection for the hyperbolic spiral becomes constant because:

$$A \xrightarrow[r \to \infty]{} \text{constant} \quad -(13)$$

i. e . v becomes constant as r approaches infinity.

The logarithmic spiral is defined by:

$$r = r_0 e^{\beta\theta} \quad -(14)$$

where β is the pitch. So:

$$\frac{dr}{d\theta} = \beta r \quad -(15)$$

and the magnitude of the spin connection is:

$$\omega = \frac{L}{c t_g v m r}\left(1+\beta^2\right)^{1/2} - \frac{1}{c t_g} \quad -(16)$$

Its limiting behaviour is:

$$\omega \xrightarrow[r \to \infty]{} \text{constant} \quad -(17)$$

and as r becomes infinite both v and ω become constant.

The Archimedes spiral is given by:

$$r = a + b\theta \quad -(18)$$

so its spin connection is:

$$\omega = \frac{1}{c t_g A^{1/2} r^2} \left(b^2 + r^2 \right)^{1/2} - \frac{1}{c t_g} \quad (19)$$

with limiting behaviour:

$$\omega \xrightarrow[r \to \infty]{} -\frac{1}{c t_g} \quad - (20)$$

So for the Archimedes spiral the spin connection ~~vanishes~~ becomes constant as r becomes infinite.

Fermat's spiral is given by:

$$r = r_0 \, \theta^{1/2} \quad - (21)$$

so:

$$\theta = \left(\frac{r}{r_0} \right)^2 \quad - (22)$$

and

$$\left(\frac{dr}{d\theta} \right)^2 = \frac{r_0^4}{4 r^2} \quad - (23)$$

Its spin connection is therefore:

$$\omega = \frac{1}{c t_g A^{1/2} r^2} \left(\frac{r_0^4}{4 r^2} + r^2 \right)^{1/2} - \frac{1}{c t_g} \quad (24)$$

with limiting behaviour

$$\omega \xrightarrow[r \to \infty]{} -\frac{1}{c t_g} \quad - (25)$$

the same result as for the Archimedes spiral.

The lituus is defined by:

$$\theta = \left(\frac{r_0}{r}\right)^2 \quad -(26)$$

so

$$\left(\frac{dr}{d\theta}\right)^2 = \frac{r^6}{4r_0^4} \quad -(27)$$

and its spin connection is:

$$\omega = \frac{1}{ct_g A^{1/2} r}\left(1 + \left(\frac{r}{r_0}\right)^4\right)^{1/2} - \frac{1}{ct_g} \quad (28)$$

Its spin connection becomes infinite with infinite r.

There are many other types of spiral, usually the stars are fitted experimentally with a hyperbolic spiral. There is a spin connection for any type of spiral, or indeed any orbit.

In the solar system the astronomically observed orbital function is the precessing ellipse:

$$r = \frac{\alpha}{1 + \epsilon \cos(x\theta)} \quad -(29)$$

where 2α is the right latitude, ϵ the eccentricity, and x the precession constant. Its spin connection is:

$$\omega = \frac{L}{ct_g vmr}\left[1 + \left(\frac{\epsilon x r}{\alpha}\right)^2\left(1 - \frac{1}{\epsilon^2}\left(\frac{\alpha}{r} - 1\right)^2\right)\right]^{1/2} - \frac{1}{ct_g} \quad -(30)$$

The precessing ellipse reduces to a circle if

$$x = 1, \quad \epsilon = 0, \quad \alpha = r \qquad -(31)$$

in which case the spin connection becomes:

$$\omega = \frac{L}{c t_\gamma v m r} - \frac{1}{c t_\gamma} \qquad -(32)$$

and is a constant because for a circle:

$$L = m v r. \qquad -(33)$$

The earth's orbit is very nearly a circle, so its spin connection magnitude (units of inverse metres) is determined by the interval of time t_γ. In the new general relativity the earth's orbit is due to the underlying spacetime torsion.

The torsion manifests itself as a torque magnitude:

$$Tq = L \frac{d\theta}{dt} = m r^2 (1 + \omega c t_\gamma) \left(\frac{d\theta}{dt} \right)^2. \qquad -(34)$$

For each type of orbit there is a characteristic Tq. The hyperbolic spiral for example is given by:

$$Tq = \frac{L^2}{m r^2 (1 + \omega c t_\gamma)} = k \theta^2 \qquad -(35)$$

where k is a constant. This is a driving torque, not a restoring torque, so the sign of k is positive. The torque is generated by the underlying spacetime torsion. The equation of the hyperbolic spiral is given from Eq. (35) as:

$$\theta = \left(\frac{L^2}{m k (1 + \omega c t_\gamma)} \right)^{1/2} \frac{1}{r} \qquad -(36)$$

each type of orbit is driven by a torque generated by spacetime torsion. The latter is governed by Cartan geometry and the ECE field equations of dynamics and electrodynamics. One of the equations for dynamics reduces to the inverse square force law of attraction as the spin connection becomes zero. Usually this is attributed to Newton, but it was inferred originally by Hooke. In the received opinion the inverse square force law of attraction is negative valued and results in a static elliptical orbit. The received opinion takes the rotational kinetic energy energy and redefines it incorrectly as a centrifugal potential energy. A balance of the centrifugal force and attractive force is asserted to keep an object of mass m in an elliptical orbit.

In the new general relativity developed in this paper the orbit is the result of a fundamental spacetime geometry. For a static ellipse:

$$x = 1 \qquad -(37)$$

so the spin connection for a static elliptical orbit is defined by Eqs. (30) and (37). When there is no angular momentum:

$$L = 0 \qquad -(38)$$

there is no longer any rotational motion, and the spin connection vanishes. In this case the inverse square law of attraction is recovered through one of the ECE field equations. The latter are given by Cartan geometry. When there is no angular momentum there is a central force law of attraction between an object of mass m and one of mass M.

Section 3

Graphics by H. Eckardt and R. Cheshire

A simple explanation of the velocity curve of the Whirlpool Galaxy from the new ECE relativity

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3 Graphics

3.1 Spin connections

The radial development of the spin connections for the spiral orbits described in the preceding chapter has been plotted in Fig. 1. As can be seen, all spin connections converge to a constant value with exception of the Lituus which diverges for $r \to \infty$. All parameters in the spin connections have been set to unity with exception of $\epsilon = 0.1$ which occurs in the orbit of the solar system. The curve for the solar system ends at $r = 2$ where ω becomes complex valued. This is not astonishing since the limit $v = const$ for which the spin connections were derived is not true in the solar system. Furthermore, curve parts for small radius values are not reliable since there is a r dependence of the velocity curves in this regime.

3.2 Fine art graphics

Only so much can be deduced from a still, galactic photograph. That is, rotating the photograph does not simulate a rotating galaxy. Rather, the photograph is a snapshot of objects in spacetime that are frozen in their development. The snapshot is a replica of how the galaxy looks in some mid-development. So the image we have may or may not be a repeating cycle of symmetry as would appear in M51, the Whirlpool Galaxy (Fig.2) with its symmetrical, spiral evolutions for example.

Current observations indicate that the spiral arms are sectioned by varying degrees of arc and have a generally short length to their "plume". Once joined in sequence and torsion however, they form the classic spiral development, appearing to be one long, spiralling body.

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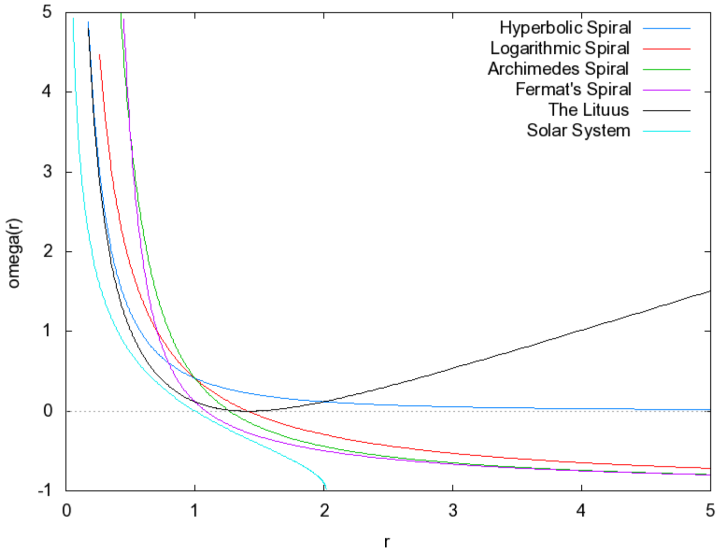

Figure 1: Spin connection for various types of spiral orbits and the solar system.

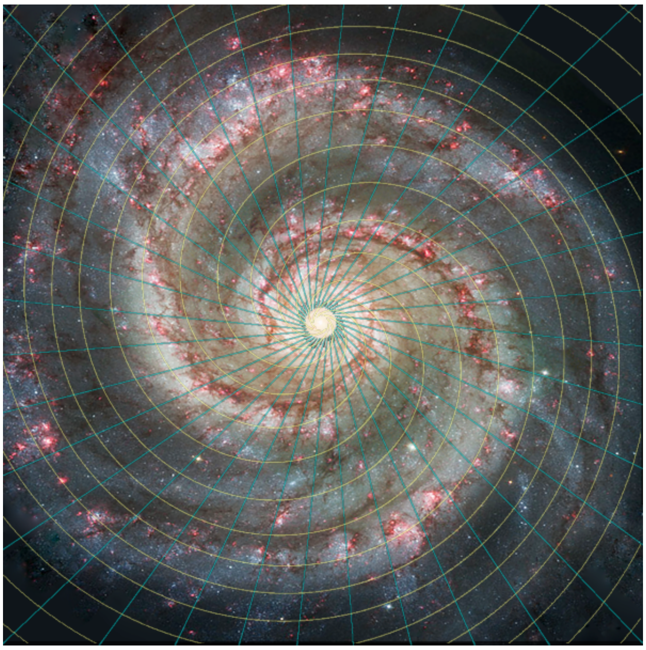

Figure 2: M51, the whirlpool galaxy - clockwise rotation.

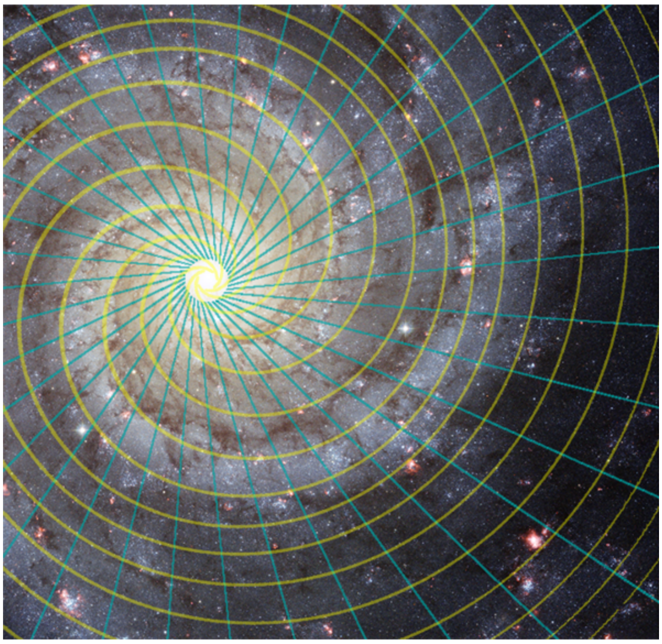

Figure 3: M74 - counter clockwise rotation.

Nevertheless, observations also show a tendency in all spiral arms towards an overall, polygonal symmetry that manifests as skewed, semi hexagonal or semi-octagonal in presentation.

Closer scrutiny has also revealed a profusion of straight-line, trajectory traces that "cut" through the spiral developments and appear to have created interaction or collision with the more sedately orbiting and spiralling masses.

Further scrutiny implies that all matter begins orbit by degrees of vigorous radial trajectory and that there is visible evidence of further vigorous interaction, collision or inherent mass "explosion" traces peppering particularly, the whole of M51's galactic plane. In higher velocity, radial trajectory, it is inconceivable that masses or matter would not collide on a regular basis.

Energetic or explosive, bright white and red "bubbles" of activity, the bluish white type being reminiscent of a still-shot of a divers air bubble as it is caught shimmying to the surface, will also appear to be the instigators of more traces and tracks of ejected nebulae. It is worthy of note that in almost all cases, resultant nebulae and "blast debris" and its traces will invariably be on the outside only of the "bubbles" and outward bound, rarely if ever, on the core side or in that direction.

The apparent vigour of the outward blast should, in an inherent explosion, show 360 degrees of blast arc that may distort but would encroach inward at least to some degree. No such debris has been observed (Figs. 2 - 7).

The sum of observations thus far, imply vigorous ejection at the core of a radially inclined trajectory. The fastest of this matter achieves a straight-line trace after slight curvature near the core area and briefly on emanation only.

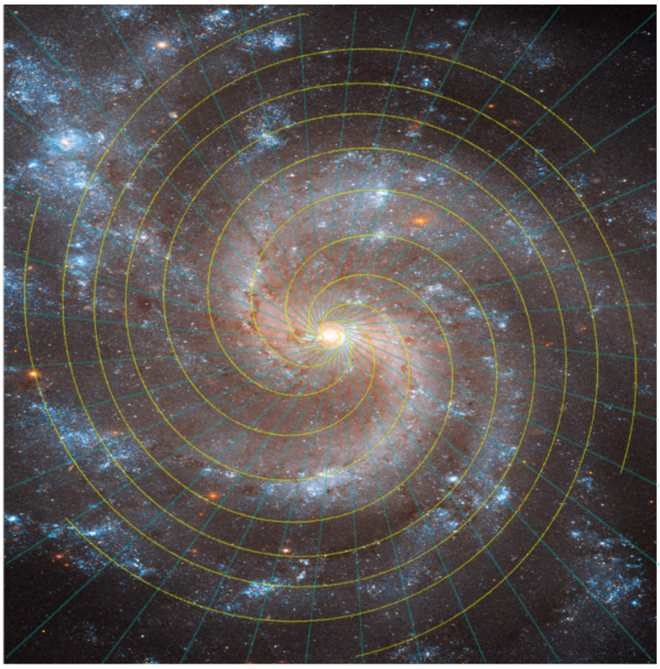

Figure 4: NGC 5584 - clockwise rotation.

The slowest of such matter will be in spiral trace orbit and develops a positive angular momentum of a minimal value which is proportional to the overall rotation speed.

Energetic activity or explosive collision in the middle reaches of the plane may form new plumes that mimic neighbouring, fully developed spiral arm orbits. This gives a false impression of more core generated arms than there actually are (Figs. 5 & 7).

The true paths of these masses and matter are not accurately reflected in the photographic image. The Spiral Arm development is real and obvious enough. The radial traces, the "Cheshire Lines" are real enough if not so obvious. The missing, or more accurately, invisible half of the evolutionary picture is Torsion dominated. Doctors Evans and Eckardt have voiced a number of analogies that graphically describe the effects of torsion. Here I will refer to one of Dr. Evans' as it best describes the effects relevant to my present visual analysis:

A cylindrical glass rod is caused to rotate around its longer axis in a beaker of water (in practical terms and for ease of visualisation, by a pillar drill say, or similar) and without direct contact with the inside of the containing beaker.

Firstly, the water would begin to rotate en masse with and around the rod like a whirlpool. But for the friction between the base of the beaker and the table it sits on, the beaker would begin to spin in union. The same applies to the table and the floor, the floor and the building, the building and the ground it sits on and so on and so on. The "frictional drag" between the rod and the water, and that which draws in all things into the spin is caused by the Torsion

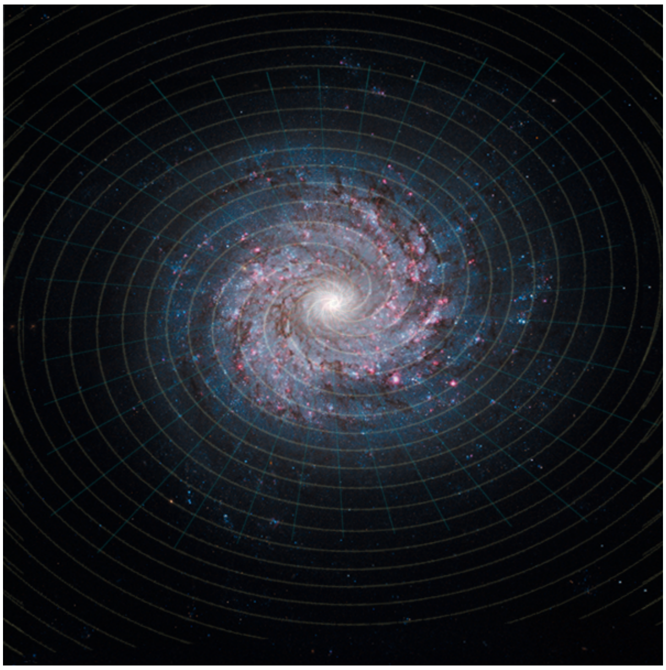

Figure 5: M101- counter clockwise rotation.

in spacetime. So a small, spinning mass will cause far reaching rotational effects in a much larger spacetime that surrounds it.

So it is in galaxies, moons, planets, suns , atoms, electrons and all spinning things, which is, to all intents and purposes, everything. Everything is spinning in spacetime.

With that picture firmly in mind, it can now be understood more easily that the galactic photograph is showing us relative motions only. The radial traces are very straight in the picture but the true orbital track of matter on this course in absolute space, will have a significant and more obvious curvature. I have deduced through animated simulation that in relation to one galactic revolution, the spiral arms will have a true, absolute spiral orbit path of twice the pitch of the visible arms.

For each revolution denoted by the relative spiral orbits in the galactic photograph, there has been an "invisible" orbit visually obscured by the revolution of the spacetime around the whole galaxy. Therefore, what appears in the photograph to be a spiral of specific angle is, without trickery and in reality a spiral of twice the angle which is identical to its visual product by scale of 100% . Only a factorial angle can do this. Variation of angle here will change the visible spiral shape to angles which would be factors of that variation when related to one revolution.

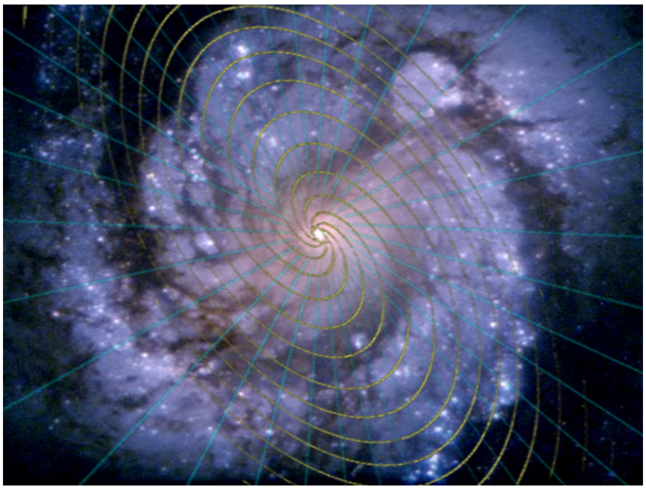

Figure 6: M100 - clockwise rotation.

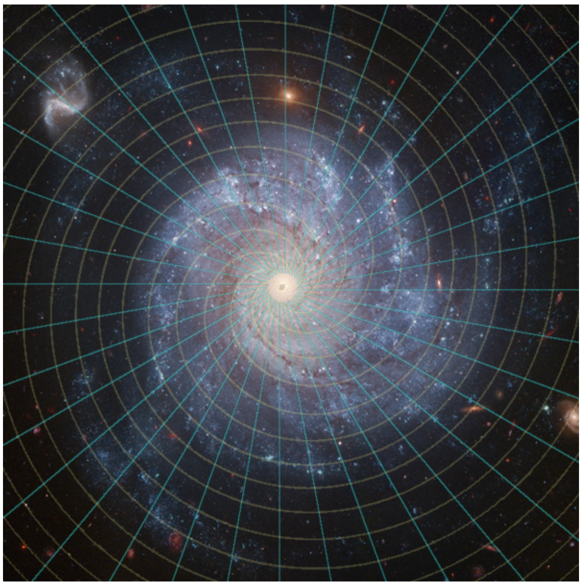

Figure 7: NGC 1309 - counter clockwise rotation.

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