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Gravitomagnetic Evolutionary Classification of Galaxies

Bar-Galaxies explored

explained by Gravitomagnetism

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Abstract

The Milky Way might be a bar galaxy. In this paper, we show that bar galaxies are spiral galaxies with an orientation change of the bulge's gravitomagnetic field. The tilting of the gravitomagnetic field evolves from the bulge to the galaxy's extremities at wave speed and the physical acceleration of the stars away from the disc follow soon. Finally, this will result in a new, slightly elliptical galaxy that will again turn into a disc galaxy and then a spiral galaxy. If the Milky Way really is a bar galaxy, the solar system will some day get a novel acceleration (an apocalyptic sway?) towards a new, widely oscillating position in the galaxy. Finally, we come to a Gravitomagnetic Evolutionary Classification of Galaxies that is different from the usual classifications.

Key words : *gravitation, gravitomagnetism, Milky Way, bar galaxy, evolutionary classification*
Method : *analytical.*

1. The galaxy evolution from a spherical to a spirally disc galaxy.

Spherical galaxies mostly don't remain spherical forever. They turn to spherical and even disc galaxies, that on their turn become spiral galaxies (fig. 1.1).

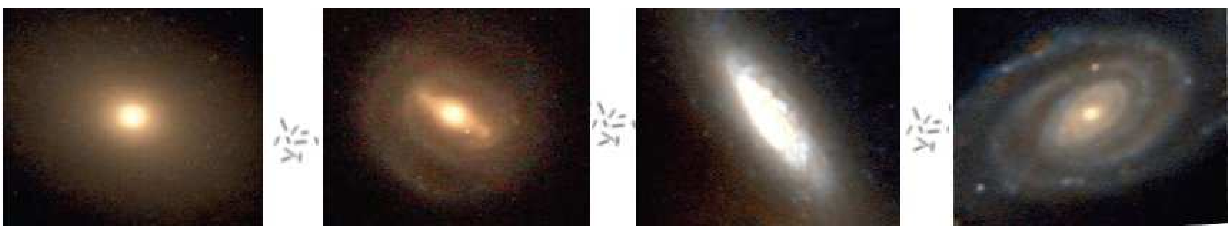

Fig.1.1 : *The evolution of a spherical galaxy towards a spiral galaxy.*

Below, we will explain how this happens, due to a number of spinning stars in the center of the original galaxy. We use gravitomagnetism, which already explained countless cosmic phenomena in the past [1] [2] [3].

1.1. From a spherical galaxy to a disc galaxy

Consider a spherical galaxy. Nearby the center of a spherical galaxy, there are many stars that are attracting due to gravitation. The galaxy doesn't collapse by its gravitation because we expect that the stars are orbiting about the center. The very close orbits of the huge amount of stars in the center will constantly influence each-other.
Most probably, the sum of all the orbits and spins of the stars of the center will result in a global angular momentum different from zero, which will guide the rest of the galaxy's future. This global spin is responsible for the creation of a gyrotation field as explained in "*A coherent dual vector field theory for gravitation*". A magnetic-like gyrotation field around the bulge will influence every moving object in its neighborhood, such like the orbits of the stars in the galaxy.

The stars outside the center will undergo a force which is analogical to the Lorentz force. In my paper "*Lectures on 'A coherent dual vector field theory for gravitation*", I explain in Lecture C how the orbits move, depending from their original motion. The Lorentz-like force for gravity pulls all the prograde orbits towards the center's equator, as explained in chapter 5 of "*A coherent dual vector field theory for gravitation*". Since the gyrotation force is of a much smaller order than the gravitation force, the entire orbit will swivel very slowly about the axis that is formed between the intersection of the orbit's plane and the bulge's equatorial plane. This is due to the tangential component of the gyrotation force that makes the orbit swivel under influence of the gyrotation field. The orbit will slowly progress towards the equator of the galaxy's center. The orbit's radius will not change much because the radial component of the gyrotation force is small.

If a star was originally orbiting in retrograde direction, the gyrotation force will push the star away from the bulge's equator. Since the orbit's radius will only change very slightly during this orbital swiveling, the swiveling will continue until the entire orbit becomes prograde, and further converge to the bulge's equator.

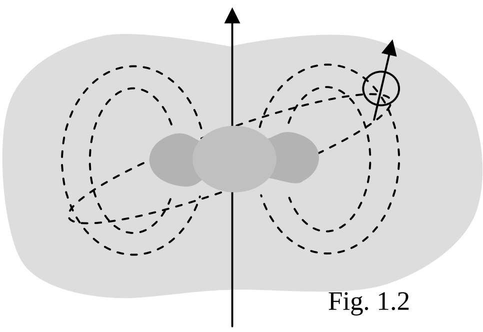

Fig. 1.2

The spherical galaxy turns into an ellipsoid galaxy and finally to a disc. Greatly exaggerated, it could look like fig. 1.2. (a star in its orbit, dotted line, with its angular momentum vector is represented; other dotted lines are gyrotation fields).
Taking into account the above explained effect, all stars will end up having the orbit in the same sense that the sense of the rotation of the center (prograde), depending on the amplitude of the gyrotation. Every star will have an absorbed oscillation, but it can become a group of stars in phase, or even a part of the disc. It can become a disc with a sinuous aspect.
And in this way, the gyrotation widens its field in agreement with the conservation law of angular momentum.
The center is obviously not a point but an amalgam of stars that has own rotations in various directions. Farther on the disc, only a gravitomagnetic force of the center and of the first part of the disc exists. Closer to the center, the stars have chaotic movements.

1.2. From a disc to a spiral disc.

The pressure on the stars exerted by the gyrotation continuously flattens the disc and increases its density so much that several stars will get in fusion. Several high density zones will create empty zones elsewhere. Finally, some structured shapes, such as spirals or matrices, will begin to be shaped.

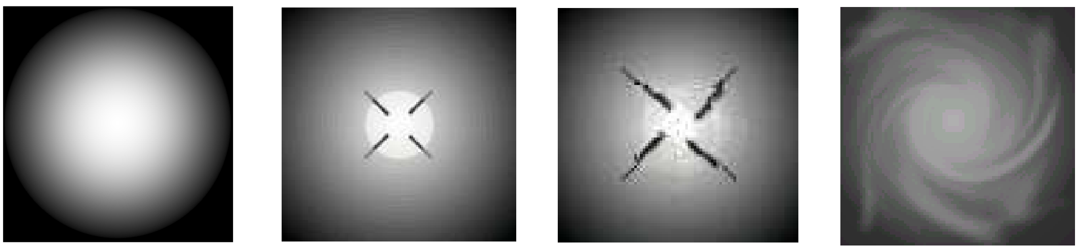

Fig. 1.3 : *From a disc galaxy, compressed by gyrotation, towards a spiral galaxy.*

Since the creation of the galaxy, a long time has passed. The mystery of the (apparently too) low number of windings of spirals in spiral galaxies is explained by the time needed for the angular collapse.

1.3. The galaxy's bulge area.

Gyrotation acceleration of stars inside the bulge.

Let us consider a spherical galaxy, whereof the center is rotating, say, one or more massive black holes. These black holes are fast spinning, and many stars near the center of the spherical galaxy are spinning as well.

When we look at a disc galaxy, we observe that the central bulge is not a sphere like the sun, full of matter, but that the bulge is a system by itself.
The summation of the gyrotation field of all the fast spinning stars of the bulge creates a global, fuzzily spread gyrotation field, which is difficult to analyze as long as the distribution of the spinning stars is unknown.

Since it is even more difficult to know the local gyrotation acceleration *inside* the bulge without knowing the locations of the individual black holes, it seems that the spread of gyrotation would be rather -*a priori*- random-based.
But even if there are several spinning black holes rotating in different directions through the bulge, the global gyrotation field of the bulge apparently allowed the formation of the disc galaxy. The disc of the galaxy finds its origin in a global gyrotation field vector, which is perpendicular to the disc.

The fuzzy gyrotation field of the bulge.

Let us consider the fuzzy gyrotation field of the bulge again.

The locations and the parameters of the fast spinning stars and black holes are not known. But we know that the black holes are attracting more and more stars and that the orbits of these many black holes are making chaotic motions. We also imagine several stars spinning about each other, losing some energy, and becoming black holes.

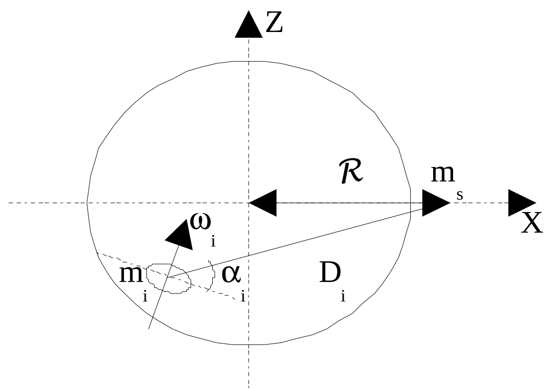

fig. 1.4

The bulge of the disc galaxy. An orbiting mass m_s at a horizontal distance $\mathcal{R}$ from the centre is influenced by the gyrotation of black hole i. The bulge and its surrounding are fuzzy, caused by a quasi-random distribution of n black holes which result in unwell defined vectors of the gyrotation fields.

In the next chapter, we will look at the stability of the angular momentum of the bulge and we will find that major changes are possible.

2. When the global spin of the bulge flips : from a spirally to a turbulent bar galaxy.

Before being able to explain the possible reasons of such a tilt change in the bulge, we first lookup the equations that govern the bulge and the disc.

2.1. The acceleration and the swiveling time of the bar galaxy to a newly formed disc galaxy.

The value of the acceleration and of the swiveling time of the bar galaxy towards a newly formed disc galaxy is found in "*Swiveling Time of Spherical Galaxies Towards disc Galaxies*" .

In that former paper, I assumed also that the average path length of an arbitrary chosen orbit of the spherical galaxy was $\pi\mathcal{R}/2$ until the equator. The time had then to be found out of a double integration of $a\,\Omega$ to the time.
In the present case, if the bulge of the bar galaxy tilted with an angle θ, the swivelling path length will now be reduced to only $\theta\,\mathcal{R}$. The correct time for the swivelling of the bar galaxy into a newly formed disc galaxy will last (for a place $\mathcal{R}$) :

$$\theta\,\mathcal{R} = \int_0^t \left(\int_0^t a_{t,\Omega}\,\mathrm{d}t \right) \mathrm{d}t \qquad (2.1)$$

In (2.1) , $\mathcal{R}$ is the distance of a certain place on the bar galaxy from the bulge's center, a_Ω is the acceleration due to the gyrotational field of the bulge.
After integration (is not time-dependent, only place-dependent in the disc) and rearranging, the result is given by :

$$t_{\mathcal{R}} = \sqrt{\frac{2\,\theta\,\mathcal{R}}{a_\Omega}} \qquad (2.2)$$

Also here, I have neglected the small time retardation due to the wave transmission. A real value for that time can be deduced when we find a way to find the gyrotational acceleration a_Ω of the bulge. I will do that in one of the coming papers. From my former paper, mentioned above, the gyrotational acceleration a_Ω is given by (2.3) :

$$a_\Omega = \frac{\pi}{2}\,\frac{\omega_s\,G}{c^2}\,\frac{\sum_{i=1}^{n} I_i\,\omega_i}{\mathcal{R}^2} \qquad (2.3)$$

wherein we have simplified several parts and where I_i and ω_i are the rotation parameters (inertial momentum, the angular velocity) of the n spinning black holes and stars, which can be moving anywhere in the bulge. The orbital rotation of the star *s* is ω_s .

2.2. Catastrophes in the bulge of galaxies : when a new giant black hole is formed.

The sum of all the angular moments $\boldsymbol{L}$ of the k stars and the $(n\text{-}k)$ black holes in the bulge is given by :

$$L = \sum_{i=1}^{n} I_i\,\omega_i \qquad (2.4)$$

wherein I is the inertial momentum and ω_i the spin for any of them. We consider here the stars to be spheres and the black holes to be rings, as explained in "*On the Geometry of Rotary Stars and Black Holes*".

One would think that equation (2.4) regulates the bulge's gyrotation and the disc's orientation, but that's not totally true. Indeed, the conservation of angular momentum is important and has to be respected, but the real influence upon an orbiting star outside the bulge is given by (2.3), and another influence is explained below.

In the bulge, an amalgam of stars can clot into a set of mutually orbiting stars. Their global angular momentum will cause a global contraction (collapse) due to the gyrotation field that has a compression that is proportional to the global spin velocity.
This collapse of stars will dramatically increase the speed of the mass of the star and so, its gyrotation field, as described by Oliver Heaviside [6] and Oleg Jefimenko [7], because of the retarded fields by the speed of light, which is at the origin of the relativistic effect due to velocity, and which increases the gravity fields anisotropically. Hence, the resulting transmitted gyrotation will be *larger* than the bulge's original angular momentum before an important collapse.

Thus, an important evolution inside the bulge is that an amalgam of stars can collapse and become a huge black hole with a different spin rate and spin orientation. A single huge black hole can dramatically influence the global gyrotation axis of the bulge.

Another effect could be that the quasi-chaotic motion of the black holes and large stars in the bulge can bring them closer by stars at the bulge's edge, and eventually attract them. The new upcoming stars and black holes can have totally different spin orientations than the global bulge's angular momentum.

2.3. Description of the process.

The consequence of this process is that the size and the orientation of the total angular momentum of the bulge can evolve dramatically. In cases when a large quantity of stars reduced into a huge black hole, it can get a totally different angular momentum. If the bulge would merge with a group of stars or a galaxy, even small, a strongly different orientation of the bulge's angular momentum is possible.

And when such a change happens, the disc zones at the bulge's boundaries will become to get a modified orientation as well: that part will swivel and bit by bit, from the bulge's border to the outer side of the disc, the whole disc will swivel as well. But will this happen unscathed?

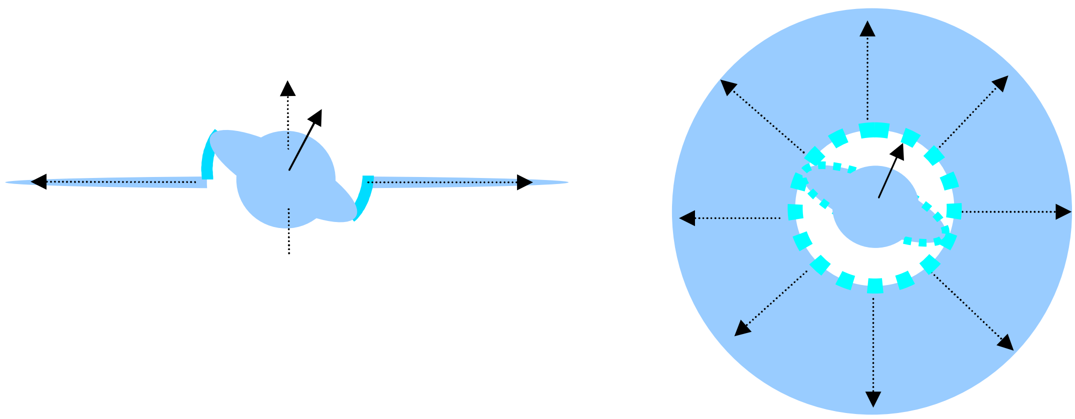

Fig.2.1: *Side view and top view: a bulge tilt occurred by the evolution of the number of newly arisen black holes' tilts, making the disc swivel from the center to the outer parts of the disc and tare loose the stars by a gyrotation shock wave. We get a bar galaxy.*

Imagine a bulge that gets tilted compared to the disc. The transmitted gyrotation wave at the speed of light will make swivel the disc by a circular shock wave and the newly tilted part of the disc will gravitationally disturb the rest of the disc. It will attract the boundary and cause fatal issues for planets nearby stars.

The disc galaxy becomes a bar galaxy with a circular turbulent area at the border of the new forming part and the old disc.

4. Introduction of a new evolutionary classification scheme for galaxies.

This leads us to a clear view on the evolutionary classification of galaxies. First we have the spherical galaxy. When the galaxy's center contracts and the orientation of the center becomes well defined, gyrotation flattens the galaxy in to an elliptic galaxy and then a disc galaxy, by making the orbits swivel slowly into prograde orbits. The gyrotation compression augments the disc density and allows stars to get grouped, forming new star activity, and cluttering. This makes it possible to get zones with an increased number of stars and more empty zones. By the constancy of the speed of the stars in the disc galaxy, the arms become spirals.

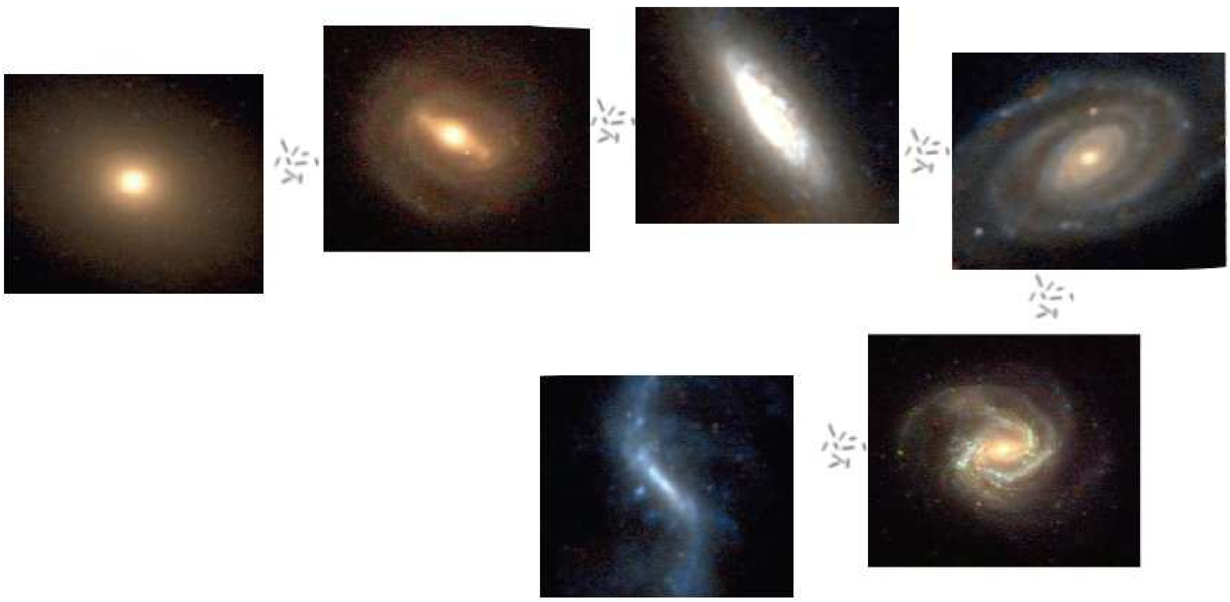

Fig.4.1: *Evolutionary classification of galaxies. From spherical galaxy to an elliptic galaxy, then a disc galaxy and a spiral galaxy. After a reorientation of the bulge's angular momentum, a bar galaxy with a circularly outside-spreading turbulent zone is created, which a apocalyptic disturbance of the stars and planetary systems of the whole galaxy.*

It is possible that, sooner or later, the bulge gets another tilt due to one of the processes I mentioned before. Then the galaxy becomes a bar galaxy, from the bulge towards the rest of the disc. The galaxy swishes into a turbulent object with gravitationally interacting stars by apocalyptic sways. Later on, that slightly elliptical galaxy will again become a disc galaxy.

5. Conclusions.

Gravitomagnetism allows a novel evolutionary classification wherein the bar galaxy has a more correct position. The formation of bar galaxies occurs when the bulge's angular momentum changes dramatically, either due to the relativistic gyrotation increase after a collapse of star, or to the absorption of a small galaxy, or to a cluster of stars that reduced to a fast spinning huge black hole, or by the natural attraction of stars from the disc with totally different spin orientations. Out-phasing black holes and the ejection of matter from companion stars in dual star systems also change the bulge's angular momentum.

Most likely, bar galaxies will only form after the stage of disc galaxies and spiral galaxies, and generate a shock wave with a turbulent reorientation of the whole disc galaxy into a newly oriented flat elliptical galaxy and then again to a disc galaxy.

6. References.

1. De Mees, T., 2003, A coherent double vector field theory for Gravitation.

2. De Mees, T., 2004, Lectures on 'A coherent dual vector field theory for gravitation'

3. De Mees, T., 2005, On the Geometry of Rotary Stars and Black Holes.

4. De Mees, T., 2007, Deduction of orbital velocities in disc galaxies, or "Dark Matter" a myth?

5. Feynman, Leighton, Sands, 1963, Feynman Lectures on Physics Vol 2.

6. Heaviside, O., A gravitational and electromagnetic Analogy, Part I, The Electrician, 31, 281-282 (1893)

7. Jefimenko, O., 1991, Causality, Electromagnetic Induction, and Gravitation, (Electret Scientific, 2000).

8. De Mees, T., 2003-2016: http://gsjournal.net/Science-Journals-Papers/Author/58/Thierry,%20De%20Mees