

GALACTIC REPULSION

(According to 'Hypothesis on MATTER')

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Abstract: Matter bodies seem to exist everywhere in space, more or less evenly distributed. Discovery of gravitation necessitated a search for the cause for distribution of matter bodies throughout universe. Mutual gravitational attraction between matter bodies defies possibility of their even distribution in space unless it is counteracted by a repulsive action between them, at least in case of large-scale groups of matter bodies. So far, none of various concepts proposed to overcome gravitational attraction between matter bodies on a large scale, has not supplied a rational theory. 'Hypothesis on MATTER' proposes a logical explanation that describes how neighbouring galaxies overcome gravitational attraction, to settle at a stable distance from each other, during major part of their life. Same mechanism describes how formation and disbursal of galaxies are determined by their spin motion. Outer periphery (halo) of a spinning galaxy is formed by independent primary matter-particles. Their primary electric fields are mechanically oriented to create sufficient electromagnetic repulsion between neighbouring galaxies, to neutralize gravitational attraction between them. This is a natural process originating from the universal medium, which encompasses entire universe. Other macro bodies, smaller or different in structure from stable spinning galaxies, do not have this protection from gravitational attraction. Since galaxies are able to maintain their relative positions in space, universe (as a whole) is able to have a perpetual steady state of existence, except for local recycling of matter.

Keywords: Gravitational attraction, galaxy, halo, primary electric field, biton, galactic spin, galactic repulsion, cosmology, cosmological constant, big-bang, Hypothesis on MATTER

Introduction:

Whether it is due to mutual attraction or due to changes/deformations in undefined fields about matter bodies (changes in space-time continuum), it is a fact of observation that all matter bodies in nature have a tendency to approach each other. Cause of this phenomenon has so far eluded logical explanations. Advent of Newtonian gravitational theories traced various properties and actions of this mysterious attraction between matter bodies. Although these theories did not offer a logical cause, mathematically they are quite successful in mechanics. Most other (widely accepted) modern theories also describe properties of this mysterious attraction in different ways. However, none of these theories attempts to describe its cause or origin. Currently, gravitational attraction is simply accepted as a ‘fundamental natural force’ on empirical evidence. A logical explanation to the cause and actions of gravitation is provided in reference [2].

It is observed that matter bodies are present everywhere in space, as far as we can survey. From this observation it may be deduced that matter is more or less evenly spread throughout universe, however large or endless the universe may be. Discovery of gravitational attraction raised further logical questions. If matter bodies have a tendency to approach each other, at some stage of universe, all matter bodies in nature should coagulate to form a single matter body and presence of whole matter in the universe will be concentrated at or about a point. This is not logical and contrary to empirical evidence. Thus, it has become necessary to discover a logical mechanism that keeps total matter content of the universe widely and more or less evenly spread throughout its infinite extent. In the past, many theories (like; cosmological constant, big-bang creation of universe, expansion of space, etc.) were devised to justify wide-spread presence of matter bodies in the universe, irrespective of gravitational attraction between them. Unfortunately, none of them gained acceptance as a logical theory. As long as cause of gravitation remains elusive, a logical mechanism that can overcome gravitational attraction will evade discovery.

In the concept, put forward in ‘Hypothesis on MATTER’, it is shown that certain distortions in universal medium (structured by quanta of matter) about 3D matter bodies produce the phenomenon of gravitation. Gravitation and gravitational attraction are different phenomena. Gravitational action on different 3D matter bodies causes simultaneous displacements of these 3D matter bodies towards each other to produce an apparent (gravitational) attraction between these 3D matter bodies. Gravitational attraction between 3D matter bodies is a minor by-product of separate gravitational actions on each of the 3D matter bodies. If distortions in the universal medium, causing gravitational attraction can be modified by natural phenomena, gravitational attraction between very large 3D macro bodies (of certain characteristic properties) can be counteracted to keep them away from each other. At the same time, such neutralization of gravitational attraction is not available between 3D macro bodies, which do not exhibit these peculiar physical properties. It is the nature and magnitude distortions in the universal medium (2D energy fields) about the 3D matter bodies, which dictates the nature of apparent interactions between them. This article gives only brief description of causes and mechanism of gravitational attraction. All conclusions expressed in this article are taken from the book, ‘*Hypothesis on MATTER*’ [1]. For details, kindly refer to the same.

Universal medium:

Whole matter in our universe is in the form of quanta of matter. Matter content of a body and the energy about it are distinctly separate. Magnitude of matter content is the total sum of three-dimensional matter in a body. Energy is the stress developed in universal medium, due to ‘distortions’ in natural arrangements of its constituent quanta of matter, in and about a 3D matter body. Matter content and energy content of a macro body cause and support each other for their existence and stability. They are not convertible into each other.

Entire space (outside basic 3D matter particles) is filled with ‘2D energy fields’, two-dimensional latticework formations by quanta of matter. 2D energy fields, in various directions and planes, provide an all-encompassing universal medium [3]. 2D energy fields, passing through a point, co-exist. Although, 2D energy fields are made of (apparently) rigid quanta of matter, it has all properties of an ideal fluid. Parts of 2D energy fields, within spatial dimensions of a macro body, contain sufficient distortions (and corresponding energy) to sustain macro body’s integrity and stability in its current state. This part of 2D energy fields is the ‘matter field’ of the macro body. Distortions in a macro body’s matter field are ‘work’, existing about the macro body. It may be considered as a combination of intrinsic and additional work

associated with the macro body. Intrinsic work develops during formation of macro body and its constituent matter particles and it maintains integrity and stability of the macro body and its constituent matter particles. This part of work remains with the macro body throughout its existence. Additional work, transferred (from external sources) into matter field associated with a macro body, determines macro body's state (of motion). Actions of external efforts vary magnitude of additional work about a macro body to change its state of motion. Force is the rate of work, being stored in/removed from a macro body's matter field with respect to rate of change of macro body's state of motion. Action of an effort is simple structural reshaping of matter field and resulting motion of any 3D matter particles present in the region. State of (motion of) a macro body depends on magnitude of additional work (additional energy stored) in its matter field rather than on magnitude of effort applied on it.

All apparent interactions between 3D matter bodies take place through the medium of 2D energy fields. 2D energy fields are in direct contact with every 3D matter particle in nature. Direct actions by 2D energy fields on two different matter bodies appear as an interaction between these matter bodies. This avoids the assumption of 'actions at a distance through empty space'. There are no 'pull forces' or 'rigid bodies' in this concept. All efforts, classified into various types of 'natural forces', are different manifestations of only one type of effort and it is of 'push nature'. A free body is that macro body, which is free from all external influences other than efforts/actions considered.

Tendency of a 2D energy field to attain serenity does not allow static distortions in it. Transfer of distortions in the matter field of a macro body carries constituent 3D matter particles of the body and thus produces macro body's motion. This inertial action, about a macro body, maintains macro body's state (of motion). [Adjective 'inertial', in this concept, is used to mean an 'action that causes inertia, rather than to indicate fictitious nature]. Inertia is a property of 2D energy fields. A change in inertial actions about a macro body produces its acceleration. If certain magnitude of additional work is invested into or removed from a macro body's matter field, the macro body will stabilise its state of motion only after inertial delay, during which additional work within macro body's matter field stabilizes. This is true even after the action of external effort is terminated. Matter is inert; it has no ability to move or act on its own. Associated matter field-distortions of a macro body produce all apparent actions, presently assigned to 3D matter (bodies).

Presence of 3D matter particles, in a 2D energy field, breaks its continuity. Discontinuity causes imbalance in the structure of 2D energy fields. Pressures applied by 2D energy field-latticework from sides, in an attempt to restore its own continuity, compress the 3D matter particle present in the gap. [Basic 3D matter particles (photons) are of uniform radial size and they constitute all other superior matter bodies]. If extents of 2D energy fields on opposite sides of a 3D matter particle are unequal, the matter particle experiences a resultant effort, which tends to move it towards the side of lower effort (pressure or force). Extent of 2D energy fields between two 3D matter particles is always less than extents of 2D energy fields on their outer sides. As a result, 3D matter particles are always pushed towards each other. This phenomenon gives rise to gravitational (apparent) attraction between 3D matter bodies. Motions of constituent 3D matter particles move whole macro body. This action is the gravitational (apparent) attraction between macro bodies. Gravitational attraction between two matter bodies is, relatively, a minor by-product of gravitational actions on them. Gravitational attraction takes place between basic 3D matter particles (spinning and disc-shaped photons) of both macro bodies, which are in same plane at the given instant. Gravitational attraction, at any instant, is produced between extremely small numbers of constituent basic 3D matter particles in two macro bodies. An average apparent attraction is derived from sporadic actions between various 3D matter particles, which happen to be in the same plane at any instant. Contrary to present belief, gravitational action is enormously stronger compared to other manifestations of efforts (natural forces). Its dynamic action, observed as gravitational attraction between 3D macro bodies is only a very minute fraction of gravitational actions on each of the 3D matter bodies constituting the macro bodies.

2D energy fields store work, in the form of distortions in their latticework structure. Such distorted regions about any 3D macro particles are 'distortion fields'. Distortion fields of all 3D macro particles of a macro body, together make the macro body's matter field. When distortion fields of two macro particles overlap, distortion-density in the region is no more homogeneous. Inherent property of 2D energy fields to maintain their homogeneity, cause translational transfer of distortions in 2D energy field-latticework squares in the region. This tendency produces 'field forces'. Transfer of distortions carries any 3D matter

particle, which happens to be in the region, along with distortions. Movement of 3D matter particles converts ‘field force’, into inertial actions of 3D matter bodies. Depending on the nature of distortions, distortion fields are classified into linear (magnetic field), angular (electric field) and radial (nuclear field) distortion fields. Electric field, which has low curvature of its lines of force, acts as a magnetic field [1].

3D matter particles:

A very brief outline of creation and development of 3D matter particles and primary particles are given in this paragraph. For details, kindly see reference [1]. All movements are considered with respect to absolute reference (a point in universal medium).

Photons:

During their local breakdowns, 2D energy fields by their gravitational actions on a group of free quanta of matter within a gap in them, create matter-core bodies of basic 3D matter particles. Gravitational actions by distorted 2D energy fields mould these core bodies into segmented spherical discs, move them at highest possible linear speed (without causing own breakdown) and spin them about one of their diameters at spin speeds proportional to their matter contents. These linearly moving spinning core bodies, together with associated distortion fields (equivalent electromagnetic waves) are corpuscles of light (photons) or other radiations. Matter-core body and associated distortion field cause and support each other to maintain stability of a photon.

Biton:

Under suitable conditions, gravitational actions help two complimentary photons (of high matter contents) form a binary unit of ‘biton’. Bitons are self-sustaining primary matter particles. Under suitable conditions bitons group themselves, under gravitational actions, in a variety of structural formations to develop various fundamental particles, found in nature.

Biton is a self-sustaining primary particle, made up of a binary union of two identical photons. Constituent photons of a biton maintain their linear motion at critical linear speed in a common circular path. Simultaneously, constituent photons of biton spin in phase about a common axis passing through biton’s centre. Under gravitational actions, two bitons may form tetrons, number of which arrange as spherical shells to form neutrons or as spherical shells in conjunction with a positron to form protons. If there are three bitons in a combined unit, it becomes a hexton, which (depending upon its distortion field) may be classified into positron or electron.

Repeated passages of distortion fields associated with photons of a biton along same circular path create a common distortion field around the biton in its plane of rotation. By virtue of its structure and movements of its constituent photons, a biton has an angular distortion field around common path of its constituent photons. This is a ‘primary electric field’. An electric field is an angular distortion field, where direction of distortion field may be indicated by imaginary ‘lines of forces’ with arrows in the direction related to inertial action, it may cause. The face, where lines of force appear in clockwise direction is ‘positive electric charge’ and the face, where these lines of force appear in anti-clockwise direction is ‘negative electric charge’. Electric charges are nothing but relative angular directions of distortion fields. Every electric field has both positive and negative electric charges.

Bitons are unable to move at any appreciable linear speed in planes of their existence. While moving in linear path at considerable speed, bitons orient themselves so that resistance to their motion from the 2D energy fields is least. To achieve this, plane of a biton orients itself so that constituent photons move in identical ‘cork-screw’ shaped paths. Planes of bitons’ primary electric fields become perpendicular to their line of linear motion. In all cases, where bitons have to move at very high linear speeds, they orient themselves in this fashion. This is a mechanical action and their electric charges may face forward or rearward direction at random.

Direction of inertial motion (apparent attraction or repulsion) produced by interaction between electric fields not only depends on directions of electric fields, but also on the distance between them. At ‘zilch force distance’ [1] between two electric fields, there will be no apparent interaction between them. Direction of inertial actions on either side of zilch force distance between them, reverse. If two electrical fields of certain relative orientation at less than zilch force distance apparently attract each other, the same electric fields will have no inertial action between them, when they are placed at ‘zilch force distance’ and

the same electric fields will apparently repel each other, when distance between them is increased beyond 'zilch force distance'.

Magnetic fields are distortion fields in 2D energy fields, where lines of force of distortions are of linear nature (or of angular nature with low curvature). Electric field has angular distortions. As there are no means to produce linear distortion fields, combination of electric fields in proper array is the only way to create magnetic fields. As curvature of lines of forces increases, a distortion field will increase its electric nature and reduce its magnetic nature. As curvature of lines of force decreases, a distortion field will reduce its electric nature and increase its magnetic nature. An electric field with low curvature of its lines of forces behave as magnetic field.

An electric field (whose lines of force have high curvature), while moving within a region of external magnetic field (whose lines of force have very small or no curvature) with gradual change in magnetic field strength, will orient itself so that its interactions with the magnetic field become apparently attractive towards the region with higher magnetic field-density. If this electric field is free to move, it will be (apparently) attracted towards the direction of higher magnetic field-density. A free electric field-producing element, like a free biton, moving in a magnetic field with a gradient (gradually varying in strength), tends to reorient itself such that it is in attractive (interactive) phase towards higher-density region of magnetic field. Details of these actions are given in 'Hypothesis on MATTER' [1].

Inter-galactic cloud:

Major part of 3D matter is created, formed, developed and differentiated into various elements and compounds under conditions of great natural upheavals. Under such chaotic conditions, a lot of high matter content photons are produced simultaneously, which can form bitons in place, before they are radiated away. Once the bitons are formed, further development into tetrons, hextons, neutrons, protons, deuterons, nuclear sections, nuclei, atoms and molecules takes place by natural selection and by chance. Gravitational actions sustain stability and integrity of 3D matter particles and gravitational attractions help development of macro particles by the basic 3D matter particles.

Environment, suitable for the conversion of quanta of matter into photons, also provide equal opportunity for the development of all (chemical) elements. However, certain arrangements of the deuterons to form nuclei of atoms are easier and faster to develop. Elements with such arrangements in their nuclei are more abundant in nature. Only hydrogen atoms are formed under steady conditions in free space as the result of pair productions. Unlike other elements, hydrogen atoms and molecules are produced in the space all the time. This is the reason for the abundance of hydrogen in the nature. Due to lack of formations of protons during chaotic conditions, very few hydrogen atoms are produced, along with other types of atoms. Hence, hydrogen contents of large bodies in nature are much lower than the present estimates. Large macro bodies do not require hydrogen to produce matter/energy radiations. Massive macro bodies radiate matter/energy due to their gravitational collapse alone.

Many of the atoms or groups of atoms, formed during chaotic conditions (super novae or accidental collision between large macro bodies), are blown away into space from the place of their formation by external efforts. Such dust particles and other debris are common in inter-galactic space. In inter-galactic space, gravitational attraction between dust particles and other bodies is very less due to the enormous distances between them. However, if these dust particles are attracted strongly enough by a large macro body, they will move and fall in to that body. Otherwise, they remain as floating bodies in space, moving as dictated by gravitational attractions towards any other 3D matter bodies.

When there is very large quantity of dust particles and other debris in a region in space, gravitational attraction between these particles bring them nearer to form a 'galactic cloud'. Further development of a galactic cloud depends on total 3D matter content in it and nature of its gravitational collapse. Depending on physical size and parameters of spin motion of a galactic cloud, it may develop in to a single body or in to a number of separate bodies of various sizes, forming a group or it may disburse whole of its 3D matter in few parallel planes in space.

In due time, a galactic cloud collapses and condenses under the action of the external gravitational pressure on the cloud body and apparent attraction due to gravitation between matter particles, it contains. 3D matter in a galactic is mainly gaseous state with few solid matter bodies in them. Generally, they can be

considered as of fluid nature. A fluid macro body has low viscosity. Adhesion due to inter-particle ‘field forces’ and mutual gravitational attractions between its constituents provide bond between its body-particles. Actions of these efforts, which continue to reduce size of the fluid macro body is its gravitational collapse. A free fluid macro body situated in free space and under external gravitational pressure tends to assume spherical shape. If efforts, due to gravitational collapse, moulding a macro body (into a sphere) are uniform throughout the fluid macro body’s surface, the fluid macro body will not gain spin motion. Smaller groups of separate bodies may form larger collection of bodies with other similar groups within a collapsing galactic cloud.

It is very improbable that radial motions (due to gravitational collapse) of parts of such a large macro body of diverse contents are uniform in all directions. Movements of matter particles, from its periphery towards the center, and uneven shape of galactic cloud during developmental stage invariably give the macro body, a spin motion about one of the axes through the macro body. Outer regions of the macro body attain greater spin speed about its spin axis, compared to its inner regions. Uneven radial motions of different parts of a fluid macro body induce its accelerating spin motion. Due to low viscosity, in fluid macro bodies, ‘centripetal force’ (provided by mutual gravitational attraction between body-particles) is very low. Hence, during spin motion, fluid macro bodies in free space (not restricted by a container) spread outwards from their spin axes.

If no additional torque is supplied to a rotating fluid macro body, magnitude of total additional work associated with it, remains constant. The fluid macro body should continue to rotate at a constant angular speed with respect to absolute reference. However, changes in its body-parameters are bound to affect fluid macro body’s state of rotary motion. As the spinning-fluid macro body expands in diameter, a body-matter particle at its periphery continues to move away from centre of rotation. If the fluid macro body has to maintain its original angular speed, its outward-moving body-matter particles have to move faster in their circular paths. If no additional work is supplied to the fluid macro body, this cannot be accomplished. Without additional work in association with each body-particle, linear speeds of body-particles will reduce as they move away from centre of rotation, with corresponding reduction in angular speed of the fluid macro body.

Outward displacement of body-matter particles will continue until sufficient ‘centripetal force’ can be provided to arrest their outward displacement. As the total matter content of the fluid body remain same and expansion of its radial size increase, ‘centripetal force’ on its matter particles can only reduce, rather than increase. Tendency of expansion of spinning fluid macro body acts in direct opposition to actions of its gravitational collapse. In such a spinning macro body, every body-matter particle tends move away from the centre of rotation of the macro body due to its angular motion, while ‘centripetal force’, provided by gravitational collapse tends to move them towards the centre of rotation. Balance between these actions determines future formation of the fluid macro body.

Magnitude of ‘centripetal force’, F_c , required for a body-matter particle (situated on the outer periphery) of the spinning fluid macro body, to maintain its motion in a circular path;

$$F_c = 4mv \tan \omega \quad (\text{by equation (3) in reference [4], article ‘Motion in curved path’}) \quad (1)$$

Where ‘m’ is mass of the body-matter particle, ‘v’ is its tangential linear speed and ‘ ω ’ is angular speed of the body-matter particle about spin axis of the fluid macro body.

This effort is provided mainly by adhesion due to gravitational attraction between the body-matter particle and rest of the macro body. By using inverse square law for approximate magnitude of gravitational attraction in 3D spatial system, F_g ;

$$F_g = \frac{MmG}{R^2}$$

Where ‘m’ is mass of the body-matter particle, ‘M’ is mass of rest of the fluid macro body, ‘G’ is the gravitational constant in 3D spatial system and ‘R’ is the radius of the fluid macro body, taken as the average distance between the body-matter particle and rest of all body-matter particles of the spinning fluid macro body.

For stable state of radial size of the spinning fluid macro body, body-matter particles (on an average) should move in steady circular paths. This can be achieved only when magnitudes of ‘centripetal force’ on them should be as given by equation (1). Hence, a spinning fluid macro body can maintain constant radial

size, only when magnitude of gravitational attraction, F_g , is equal to the required 'centripetal force', F_c , on every body-matter particle.

$$\frac{MmG}{R^2} = 4mv \tan \omega, \quad \frac{MG}{R^2} = 4R\omega \tan \omega, \quad \frac{MG}{4R^3} = \omega \tan \omega$$

$$\left(\frac{MG}{4} \right) \frac{1}{R^3} = \omega \tan \omega \quad (2)$$

For critical equilibrium, radial size of the spinning fluid macro body in (every) plane of its spin, equation (2) has to be satisfied. In the equation, ' ω ' is fluid macro body's spin speed and ' R ' is its radius. For a fluid macro body, the term $(MG/4)$ is a constant. Hence, $(\omega \tan \omega)$ is inversely proportional to cube of its radius.

$$\text{Putting; } \omega = \frac{v}{R}, \quad \left(\frac{MG}{4} \right) \frac{1}{R^3} = \frac{v}{R} \tan \omega, \quad \left(\frac{MG}{4} \right) \frac{1}{R^2 v} = \tan \omega$$

Linear speed of peripheral matter particles in halo of a stable galaxy may be approximated to speed of light, c .

$$\text{Therefore; } \frac{MG}{4R^2 c} = \tan \omega$$

$$\text{Approximate spin speed of a stable galaxy (at its periphery), } \omega = \tan^{-1} \frac{MG}{4R^2 c} \quad (3)$$

Gravitational collapse and accelerating spin motion of the fluid macro body cannot be stopped. Hence, these actions will continue to change parameters of the fluid macro body, even if it is in the form of a stable galaxy. A spinning fluid macro body, in free space, will gradually expand until its angular speed is sufficiently lowered, when 'centripetal force' is sufficient to maintain curvature of its periphery. However, such a body can sustain its stability of radial size only as long as equation (2) is satisfied.

Stable galaxy:

Should the magnitude of angular speed ' ω ' or radius ' R ' of a galactic cloud become comparatively more, inward radial motion of body-matter particles due to gravitational collapse will become too less to compensate for their outward displacement due to their motion in circular path. Matter contents of the galactic cloud will continue to spread outwards in the plane of its spin. As linear speeds of body-matter particles in their circular path approach the speed of light, body-matter particles will breakdown to primary 3D matter particles (bitons) to form a 'halo' around the equatorial plane of the galactic cloud. Halo, formed around a galactic cloud, tends to arrest whole-body linear motion of galactic cloud towards any other macro body and keep it steady in space to form a stable galaxy, for further inner development.

A very large galactic cloud, during its condensation period, may be fragmented into many smaller clouds by uneven distribution of its matter content and by spinning motion of the cloud, as is envisaged in 'Nebular hypothesis'. These smaller clouds further condense into separate bodies but simultaneously being constituents of the same group. In this case, total matter content of the combined macro body is distributed over a wider region and hence there is no concentration of its mass in a place. Photons, escaping from the region of the galactic cloud are not slowed down very much and hence these types of groups of bodies, called 'galaxies', are visible to outside observers within the universe.

Galactic stability, which is related to translational motion of one galaxy towards another, is a short lived phenomenon. Excepting for its translational motion, a moving galaxy may never reach stable state. A galaxy is a combined macro body, whose constituent bodies are continuously moving and evolving, within the galaxy. Galaxy, itself, changes its parameters continuously, until whole of its matter content is disbursed or reverted back into universal medium. This is the death and ultimate fate of all galaxies. Smaller galaxies or galactic clouds (before their development into stable galaxies) may approach each other under gravitational attraction at oblique angles to collide and integrate into a single rotating macro body. Depending on magnitude and direction of their spin motions, this type of collisions may help to form super-galaxies or cause total disintegration of both galaxies.

Galactic repulsion:

Speed of light is the ultimate linear speed of 3D matter bodies in nature. It is limited by the ability of universal medium to move matter particles, without causing its own breakdown. As linear speed of a macro body approaches that of light, it breaks down into its constituent fundamental particles and primary particles. At linear speed of light, only 3D matter particles that can survive are photons. Beyond this speed, no 3D matter body can be moved because that is the ultimate speed, 2D energy fields can provide to move 3D matter particles through them.

Due to the very large size of a galaxy and its spin motion, linear speed of 3D matter particles situated towards its edge are extremely high and is comparable to the linear speed of light (photons). No 3D matter particles larger than photons and bitons (with their planes perpendicular to direction of their motion) can survive at this speed. Therefore, all 3D matter particles in the region along the periphery of a galaxy find themselves disintegrated in to their constituent bitons. Dismembered photons shall escape into free space. Bitons, in this region, orient themselves to minimize resistance to their motion, from 2D energy fields, by having their planes perpendicular to their line of motion. This is purely a mechanical action so that the moving bitons experience minimum resistance from the 2D energy fields. Outer edge of a galaxy is filled with independent bitons, moving in this fashion. Peripheral region of a galaxy, occupied by free bitons, is its 'halo'. Effect of gravitational attraction between bitons in halo and matter content of rest of the galaxy is balanced by outward motion (centrifugal action) of the bitons due to their linear motion in circular paths around the galaxy.

Each biton has a primary electric field. Primary electric fields, being very small in size, act within 'zilch force distance' with other distortion fields, in their immediate neighbourhood. Orientation of a biton along the periphery of the galaxy is a mechanical activity. Therefore, these bitons are randomly oriented in the beginning. They could be oriented in either of the two ways. Their electric charges could be in phase or out of phase with a reference. Primary electric fields of equal numbers of bitons (in any region), which are out of phase with each other, neutralize. There will be some surviving primary electric fields, which produce a resultant electric field in any one direction.

Primary electric fields (in any region), together, make a resultant electric field in the shape of a toroid along the outer edge of the spinning galaxy, as shown in figure 1. Resultant electric field being large (lines of force of low curvatures), acts outside its 'zilch force distance' and hence behave like magnetic field. Therefore, there is a strong magnetic field around the edge of a (spinning) galaxy, perpendicular to its plane of spin. Lines of force of magnetic fields at two places on the periphery of a galaxy are shown by grey arrows in figure 1. They are in opposite directions. Directions of these magnetic fields, appearing on the periphery of the galactic disc, are with respect to an external reference. Each biton, contributing to this magnetic field, is also capable to interact on its own with any other external distortion fields.

Galaxies, in space, are also under gravitational influence. They apparently attract each other due to gravitation. Galaxies tend to move towards each other under gravitational attraction. If they are near enough, magnetic fields about their periphery interact with each other. There are two possibilities. Their magnetic fields can be in repulsive phase or in attractive phase with each other. Two galaxies, moving towards each other under gravitational attraction, have strong magnetic fields about their periphery, perpendicular to their plane of spin.

As their magnetic fields starts to interact, each of the primary electric fields of free bitons, present about the rim of galactic periphery, is also interacting with the magnetic field of the other galaxy in its own

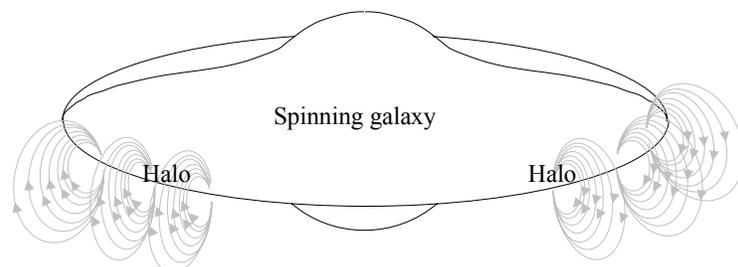


Figure 1

capacity. They are able to act on their own because each biton is an independent body and is not bound to any other 3D matter particle of the galaxy, mechanically or otherwise. Because of the great distance between the galaxies, there is a gradient in their magnetic field strength along the line joining their centers. Magnetic field gradient of one galaxy affects the primary electric fields of bitons of the other galaxy. Each of the primary electric field (if required) tends to re-orient itself so that it is in attractive phase towards the higher-density region of the magnetic field of the other galaxy. Many of the bitons succeed to re-orient themselves in this way.

Ability of a biton, to re-orient itself, depends on the relative strength of re-orienting effort with respect to the aligning effort due to its linear speed. Re-orientation of a biton does not always mean that the biton is turned through 180 degrees, but it is turned by angle enough to make a change in the sense of its primary electric field with respect to external distortion fields. Figure 1 shows magnetic fields produced at two different places in the halo of a spinning galaxy, facing two other external galaxies. They are of different polarities.

Two parallel and unidirectional distortion (like-magnetic) fields repel each other. Let the magnetic lines of forces of the two approaching galaxies are of the same polarity. Lines of forces are parallel and unidirectional. Hence, the approaching galaxies apparently repel each other. If their repulsion is strong enough, the galaxies come to stay away from each other, at appropriate distance between them, where gravitational attraction and the apparent repulsion due to their magnetic fields balance each other. Since the galaxies are spinning bodies, this balancing is a dynamic action. As the galaxies turn, nearest points on their peripheries facing each other, change. Magnetic field strength at these points may be different. Therefore, variation in the strength of galaxies' magnetic fields has to be continuously updated to maintain the required balance.

If apparent repulsion due to interaction between their magnetic fields is not strong enough, approaching galaxies may continue to move towards each other. Now, free bitons in a halo, moving along the periphery of one galaxy are carried into the magnetic field of the other galaxy. Magnetic fields of the galaxies have higher density in a direction towards galactic centers. Therefore, these bitons (disregarding their movements along the periphery of the galaxy) are also moving towards a region of higher-density magnetic field. Bitons, moving towards higher-density magnetic region, tend to re-orient themselves, such that their primary electric field is in attractive phase with the higher-density magnetic region. Bitons in both galaxies tend to re-orient and many of them will succeed. If the approaching speed of the galaxies are faster, more bitons are re-oriented and at a higher rate. Re-orientations of these bitons strengthen magnetic fields of both the galaxies to increase their magnetic field strength and resulting mutual apparent repulsion.

Two parallel distortion fields (magnetic fields) in opposite directions attract each other. Let the magnetic lines of forces of the two approaching galaxies are of opposite polarity. In this case, lines of forces are parallel but in opposite directions. Hence, the galaxies apparently attract each other due to interactions of their magnetic fields. This apparent attraction assists the gravitational attraction, already existing between them. These galaxies are bound to move in a collision course at an accelerating pace.

Since the magnetic fields of approaching galaxies (let them be galaxy 'A' and galaxy 'B') are in opposite directions, they tend to neutralize each other. Only the resultant of the two is left over. Therefore, for the time being, we will consider that galaxy 'A' has stronger magnetic field compared to galaxy 'B'. Resultant magnetic field of their combination belongs to the galaxy 'A', whose magnetic field is of greater strength. As the galaxies move towards each other, free bitons on the rim of galaxy 'B' are carried into the magnetic field of galaxy 'A', in a direction towards high-density region of the magnetic field. These bitons tend to re-orient so that they are in attractive phase with the region of higher-density magnetic region. Many bitons succeed to re-orient themselves. This reduces magnetic field of galaxy 'B', which was in opposite direction to the magnetic field of galaxy 'A'. Process of re-orientation of the bitons will continue and gradually the galaxy 'B' will develop a magnetic field, which is in the same direction as that of galaxy 'A'. Now, magnetic fields of both galaxies are in repulsive phase. Strength of the apparent repulsion between the galaxies will be adjusted in due course of time as described earlier.

By re-orientation of bitons, in this way, resultant electric field / magnetic field of parts of both galactic peripheries, facing each other, have now become in repulsive phase with each other. Thus, the galaxies are prevented from coming into colliding distance, irrespective of their relative direction of spin. Factors controlling this phenomenon are the direction of the magnetic field of one galaxy and the direction of

orientation of the free bitons in the other galaxy. Because of this action, it is possible for a galaxy to have different directions of its magnetic fields at different places around its periphery, facing other galaxies.

A multi-body system in space may be an independent group of bodies like a stable galaxy or part of a larger system of bodies, like a planetary system. In either case, members of the system spin around the central part of the system or appear to do so. However, each of the member-bodies has independent existence in space and any changes in parameters of their movements depend on external efforts on them. Gravitational attractions between these bodies are the only external effort on them. Attractive nature of gravitational attraction can only effect movements of constituent bodies towards each other. However, for stable existence of galaxies, it is necessary for gravitational attraction between galaxies (between its member-bodies, which have no mechanical connection) to create repulsion between them. This, being the case, it may appear repulsion between stable galaxies (or other multi-body systems), performed by gravitational attraction, is a riddle.

Integrity of a spinning multi-body system is sustained by balance between centrifugal action and gravitational attraction on each of its member-bodies. In case, a member-body on outer perimeter of a spinning multi-body system is moved towards centre of its rotation, by an external effort, centrifugal action on that member-body diminishes and magnitudes of gravitational attraction between the displaced member-body and all other member-bodies in the multi-body system increase. Overall effect on the multi-body system will be to reduce its radial size by increased gravitational attraction between member-bodies in the system. If the multi-body system is static in space, movement of the displaced member-body will subscribe to increase magnitude of gravitational attraction on all other bodies in the direction of displaced member-body. Every other member-body in the multi-body system tends to move in the direction of displaced member-body. As a result, the multi-body system as a whole displaces itself in the direction of displaced member-body.

Conversely, if a member-body on outer perimeter of a spinning multi-body system is moved away from the centre of rotation, by an external effort, centrifugal action on that member-body increases and magnitudes of gravitational attraction between the displaced member-body and all other member-bodies in the multi-body system decrease. Overall effect on the multi-body system will be to increase its radial size, by reduced gravitational attraction between its member-bodies. If the multi-body system is static in space, movement of the displaced member-body will subscribe to reduce magnitude of gravitational attraction on all other member-bodies in the multi-body system in the direction of displaced member-body. Encouraged by centrifugal action, every other member-body in the multi-body system tends to move away from displaced member-body and the multi-body system (as a whole) moves itself in a direction, away from the displaced member-body.

Repulsion between two stable galaxies works similar to the second case, mentioned above. Repulsive effort between two stable galaxies is initiated by electromagnetic repulsion between their halos. As halo of a galaxy is repelled in certain direction (by halo of an approaching galaxy), it will be displaced towards its own galactic centre and encompass one or more constituent matter-bodies at the periphery of the galaxy. Linear speed of halo's inward motion is very slow and inward moving 2D energy field-distortions in the halo will have little effect of an enclosed matter-body. However, primary matter particles – the bitons, constituting the halo are moving (almost) at the speed of light in circular path around the galaxy. 2D energy field-distortions in the halo are being transferred at this linear speed to move constituent bitons of halo. 2D energy field-distortions, which are being transferred at this linear speed, try to carry any matter-body (trapped within this part of halo) also at the same linear speed. As linear speed of the trapped matter-body increases, it may disintegrate into its constituent bitons (to strengthen halo) or centrifugal action on the matter-body may overcome gravitational attraction towards other bodies of galaxy to move the matter-body away from galactic center. In the case of disintegration of the body, its constituent bitons will re-orient and gravitational attraction due to the matter-body may be lost to the galaxy, in its original form. Displacement of the matter-body, away from galactic center will reduce magnitudes of gravitational attraction between the matter-body and all other constituent matter-bodies of the galaxy. All other matter-bodies in the galaxy, under centrifugal action on them, will overcome balancing gravitational attractions and move away from the matter-body encompassed by galactic halo. Overall effect will be to move the galaxy, as a whole, away from halo of the approaching galaxy.

Only factor, producing apparent repulsion between galaxies, is the ability of free bitons to re-orient

themselves, irrespective of their direction of motion. Hence, any two bodies with similar high-spin-speed and with free bitons at their periphery can develop magnetic fields to produce apparent repulsion between them. Therefore, directions of planes of the galaxies or their shapes do not affect this phenomenon. Any two galaxies (even if their direction of approach is along their spin axes) are prevented from approaching each other within collision distances. They may collide only in accidental situations, which are most improbable. If sufficient time is not available to create enough apparent repulsion between stable galaxies, they will collide into each other.

Magnetic interactions, between spinning galaxies, keep them at definite distance from each other. Distance between two galaxies, in stable state, depends only on their matter contents. That is, distance between two galaxies is proportional to gravitational attraction between them. Their magnetic field strengths are automatically corrected to keep this distance. A galaxy may have more than one neighbouring galaxies. Distance between a stable galaxy and its neighbours may be different. Similarly, magnetic strength or polarity at different points in the halo of a stable galaxy towards any of its neighbours may be different to suit parameters of interacting galaxies. An external effort on a very large fluid matter body, like a galaxy, has its immediate effect at the region of action of the effort. Rest on the fluid body accepts the effects gradually. Due to dissimilar repulsion at different points on the periphery of a galaxy, these points move inward by different magnitudes. Matter particles in the region that moves towards galactic centre achieve greater linear (and angular) speeds. This phenomenon, along with uneven distribution of matter bodies in galactic clouds, causes their uneven equatorial periphery. Therefore, most galaxies acquire spiral shape (with dissimilar length of arms) during their formation.

Macro bodies, smaller than a galaxy (or galaxies with no or low spin speed), do not have this protection. Here, it is the size of the macro body and its spin speed, what counts and not its matter content. Many of the smaller macro bodies are spinning and have magnetic fields of their own but they do not apparently interact in this way for two reasons. First, their peripheral speed is too slow to have free bitons around their periphery. Secondly, magnetic field-producing elements are not free, as to reorient themselves under the influence of an external magnetic field. As a result, these macro bodies approach each other under gravitational attraction between them to collide into each other or to be captured-in, to form union of multi-body system.

This phenomenon gives stable galaxies their ability to exist independently and static in space (relative to absolute reference). Hence, wherever in space we look, we may find galaxies there. Stable galaxies constitute 3D matter-world to us. This 3D matter-world, on a large scale, is in steady state and perpetual. However, macro bodies are not perpetual. Locally in any part of a galaxy or the galaxies themselves are destroyed and rebuilt in cyclic manner. 3D matter is created from 2D energy fields at cyclically varying rate. At the same time, 3D matter is reverted into 2D energy field at similar cyclically varying rate. Development of 3D matter and formations of 3D composite matter bodies in nature increases entropy. Reversion of 3D matter into 2D energy fields, which is a highly ordered stable system, reduces entropy of nature. Cyclic conversion / reversion of matter into its 3D state and its 1D status in the universal medium keeps entropy of universe within limits. Here, 'entropy' means the measure of disorganization or degradation of the universe.

Stable size and nature of a galactic cloud (formed in free space by accumulation of inter-galactic clouds and debris) is determined by its spin speed during formation. With low or no spin speed, such a body will condense to become a 'black hole'. As long as the spin speed of such a body corresponds to equation (2), it will maintain its stability as a galaxy. Should its spin speed exceeds the magnitude given by equation (2), it will gradually disintegrate and lose most of its matter content into free space.

Since a stable galaxy is a spinning fluid macro body, its gravitational collapse and spin acceleration will continue, even after it has attained brief period of stability. Increase in internal pressure of a galaxy, due to gravitational collapse, causes radiation of matter content from it in the form of light, heat and other forms of radiations. Lose of matter content reduces rate of gravitational collapse. At the same time, spin speed of a galaxy gradually increases. These two effects together compel contents of a galaxy to have a constant tendency to spread outward. As diameter of the galaxy increases further and linear speeds of peripheral primary particles reach the speed of light, they will breakdown into independent basic 3D matter particles (photons), to be radiated in various directions, away from the galaxy. Gradually, most part of the galaxy will disintegrate into basic 3D matter particles and radiate away. Reduced matter content and

increased radius will make it impossible for the expanding galaxy to satisfy equation (2). Therefore, matter content of such galaxies will disburse into space, to re-form into new free inter-galactic clouds.

Black hole:

Should the magnitude of angular speed, ω , or radius, R , of a galactic cloud or its central region become comparatively lesser (or a galactic cloud has no spin motion) during its formation, outward motion of body-particles will become too slow to compensate for their inward radial motion due to gravitational collapse. Galactic cloud (or its central region) will shrink at an accelerating pace to form a single, very dense macro body (black hole), with low spin speed or without spin motion at all. This body has no protection from gravitational attraction towards other macro bodies in space, as is in the case of a stable galaxy.

Main difference between a black hole and a galaxy is in the distribution of their matter content. In a black hole, whole of its matter content is concentrated in a single body but the total matter content of a galaxy is distributed over a wide region in space in the form of small bodies and dust clouds. Galaxies spin as a single body, over and above the spinning motion of local bodies within the group. Each part of a galaxy and the galaxy as a whole-body develop their spin motion independently. A galaxy develops its spin motion due to its gravitational collapse and uneven distribution of its matter content. Spin motions of other bodies are developed by their gravitational collapse as well as by apparent interactions between them. A galaxy may contain millions of stars, planet-sized bodies and smaller bodies. It also has assorted small sized bodies along with dust clouds.

Conclusion:

Spinning galaxies, in their stable state, have a natural protection to prevent them from approaching each other and colliding under gravitational attraction. Similar protection is not available to black holes, even if they have comparable matter content. This mechanism automatically regulates the apparent repulsion to overcome gravitational attraction between stable galaxies, irrespective of their spin speeds or total matter contents. A stable galaxy may have many neighbouring stable galaxies. Sustaining relative positions of galaxies in space (at somewhat constant distance from each other) helps to maintain steady state of a perpetual universe. This is irrespective of occasional local disintegration of matter bodies, necessary to maintain universe's entropy within limits. Gradually, even the stable galaxies disburse their matter content into universal medium and disintegrate.

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