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# Dark Matter is Just Gravity, Only Normal Matter is the truth Dark Matter is Just Gravity

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***Abstract:** All the major observational evidences available so far for the existence of dark matter can be explained by simple physical equations and derived astronomical data proving that dark matter theory is wrong. Furthermore, the normal matter is the only matter this is causing all the phenomena's to happen that was previously believed to be due to unexplained dark matter. New general laws of physics for galactical rotation that cannot be explained by Kepler's law alone is also derived.*

***Keywords:** Dark matter; Normal baryonic matter; Gravity*

## I. INTRODUCTION

Dark matter is a hypothetical form of matter that is thought to account for the majority of matter in the universe. It is believed to be invisible, meaning that it does not emit, absorb, or reflect light. Despite its invisibility, scientists have been able to indirectly detect dark matter through its gravitational effects on visible matter and radiation. Dark matter is a crucial component of the universe, as it shapes the structure and evolution of galaxies, and scientists are still trying to understand its properties and origin. This paper solves the greatest mystery even encountered by humankind by revealing the real truth about the various phenomena's seen by scientists that make them believe that dark matter exists. All the major indirect methods available to detect dark matter have been refuted and so will be more as it has been proved that all such effects seen are only due to simple gravitational effects of normal matter seen everyday on mother earth. Any future research should thus be directed in studying such effects rather than fancying on the matter that does not exist and is a waste of all effort, time and money that could be put to better use somewhere else in this limited resource available.

## II. METHODOLOGY

Below are some of the key observational evidences that point to the existence of dark matter, being quoted heavily by all major astronomists and physicists to explain the unexplained [1] & [2][26][27][28]. Also shown are the scientific facts that prove that these observational evidences can be explained by normal baryonic matter [3] & [4].

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### 1. Gravitational lensing

*1.1 Definition*

Gravitational lensing occurs when a massive celestial body, such as a galaxy cluster causes a sufficient curvature of spacetime for the path of light around it to be visibly bent, as if by a lens [5]. Gravitational lensing, and the amount of bending is one of the predictions of Albert Einstein's general theory of relativity. The body causing the light to curve is accordingly called a gravitational lens. When light from a more distant light source passes by a gravitational lens, the path of the light is curved, and a distorted image of the distant object, a ring or halo of light around the gravitational lens might be observed [23] & [24].

*1.2 Gravitational lensing and dark matter detection*

Gravitational lensing is a powerful technique for providing indirect evidence for the presence, distribution and detection of dark matter in the universe [6]. As described earlier the dark matter cannot be seen directly since it does not interact with radiation such as light or other types of electromagnetic waves. As it is believed to have mass, which causes it to exert a gravitational force on objects around it. This gravitational force can distort the path of light passing through it, creating a lensing effect.

Gravitational lensing is believed to reveal the presence of dark matter since it can cause the gravitational field of a massive object, such as a galaxy cluster, to act as a lens, bending the paths of any light that passes through it. The dark matter within the cluster can significantly amplify the lensing effect, which provides astronomers with an indirect yet reliable method of detecting its presence. One of the primary ways that gravitational lensing is used in detecting dark matter is through the measurement of the mass of galaxy clusters. This method involves measuring the degree of distortion that galaxies near the cluster undergo due to the gravitational lensing effect of the dark matter in the cluster.

As light from a far-off galaxy passes through the gravitational field of the cluster, it bends due to the presence of dark matter. This bending causes the apparent position of the background galaxy to shift or warp. The magnitude of this bending is directly proportional to the mass of the dark matter halo in the cluster. By carefully measuring the positions and distortions of background galaxies around a cluster, scientists can infer the distribution of dark matter within the cluster. This is done by comparing the degree of the cluster's lensing with computer models that predict how the dark matter mass could create such distortions. The resulting models can then be used to determine how much of the cluster's mass is made up of dark matter.

Gravitational lensing can help scientists infer the mass of an object, thereby revealing the presence of dark matter in massive structures such as clusters of galaxies. The precise measurements made using gravitational lensing also provide researchers with valuable information in our growing understanding of the nature and properties of dark matter [21] & [22].

*1.3 Gravitational lensing with ordinary matter*

Shown below is an explanation of the effect of normal matter on gravitational lensing caused by the effect of regular gravity exerted by the baryonic mass. The angle of bending of light by gravity in radians is calculated by the following Einstein's theory of General Relativity formula:

$$\theta = \frac{4GM}{c^2R}$$

Where,

$\theta$ = Angle of deflection in radians,

G = Gravitational constant = $6.6743 \times 10^{-11}\ m^3kg^{-1}s^{-2}$ ,

M = Mass of the object bending the light,

c = Speed of light = 299,729.458 $kms^{-1}$ or 299,729.458 $\times 10^3\ ms^{-1}$ , and

R = distance of the closest approach of the light to the object.

We know that for a single average galaxy,

Average mass per galaxy = 100 billion M⊙ (solar masses) = $10^{11}$ M⊙

Mass of sun = 1.989 x $10^{30}$ kg

Average mass per galaxy (M) = $10^{11}$ x 1.989 x $10^{30}$ kg

Min-max range of diameter = 1,000 – 100,000 ly (light year)

1 ly = 9.4607 x $10^{12}$ km = 9.4607 x $10^{15}$ m

Average radius of closest point of light = ( (0.1+10) /4 ) x $10^4$ x 9.4607 x $10^{15}$ m

Putting the above values in the Einstein's equation gives:

$\theta = 2.47422 \times 10^{-6}$ rad $= 0.00014176\,°$ or $0.000142\,°$

This value can be used to compute the average deviation or bending angle of light due to gravitational lensing by major galaxy clusters. The calculations for the values are shown in the **Table 1** & **2** below.

**Table 1: Pre-calculation for the comparison of calculated & observed angle of deviation for major galaxy clusters**

| Galaxy Cluster | Avg. range for number of galaxies per $Mpc^3$ | Avg. number of galaxies per $Mpc^3$ | Avg. range for distance between 2 galaxies ($Mpc$) | Avg. distance between 2 galaxies per $Mpc^3$ | Avg. number of galaxies per distance between 2 galaxies per $Mpc^3$ | Angle of deflection by one average galaxy (° degrees) |
|---|---|---|---|---|---|---|
| Coma Cluster | 60-100 | 80 | 0.1-1 | 0.166375 | 13.31 | 0.000142 |
| Abell 2744 | 200-350 | 275 | | | 45.753125 | |
| Bullet Cluster | 50-500 | 275 | | | 45.753125 | |
| Leo Cluster | 15-30 | 22.5 | | | 3.7434375 | |

**Table 2: (Continued from Table 1 above) Comparison of the average calculated & observed angle of deviation for a galaxy cluster**

| Galaxy Cluster | Calculated angle of deflection by avg. number of galaxies by avg distance between 2 galaxies (°) | Observed avg. range of angle of deflection by the galaxy cluster (°) | Observed avg. of angle of deflection by the galaxy cluster (°) | Deviation of Calculated from Observed angle of deflection (°) |
|---|---|---|---|---|
| Coma Cluster | 0.001886854 | 0.00083-0.0033 | 0.002065 | 0.000178146 |
| Abell 2744 | 0.006486061 | 0.0027-0.0138 | 0.00825 | 0.001763939 |
| Bullet Cluster | 0.006486061 | 0.0027-0.0138 | 0.00825 | 0.001763939 |
| Leo Cluster | 0.000530678 | 0.00027-0.00139 | 0.00083 | 0.000299322 |
| | | | Std. Deviation | 0.000881966 |

Comparison of the calculated and observed values of the average deviation angle of light for the 4 galaxy clusters (Coma, Abell 2744, Bullet & Leo) where major gravitational lensing is observed are calculated. This is based on the assumption that the angle of bending of light by one average sized galaxy can be prorated to an average number of galaxies that fit in an average volume of space that exists between two galaxies in any given cluster. This is the average centre of mass in the galaxy cluster anywhere that will deflect light at the average angle of bending that is the product of the average galaxies from the above proration and the angle of bending from one average sized galaxy. As can be seen from the table that the values closely match each other with the standard deviation of the error as mere $+ 8\,x\,10^{-4}$ degrees. This error can be easily accounted for by irregularities in the collection of observed values, the effect of residual gravity from the centre and edges of the galaxy cluster as an outlier mass and the assumptions itself for the bell curve in the average model of calculation for the calculated values.

*1.4 Conclusion*

The similarities in the values of the calculated and observed angle of deviation due to gravitational lensing proves that the phenomenon is caused purely due to normal baryonic matter in the galaxies. This is based on the fact that the gravitational force exerted on the ray of light by one aggregated single galaxy fitted in the average volume space occupied between two galaxies is the average force valid anywhere in a particular galaxy cluster. There is no extra mass in the gap that causes this bending other than the usual gravitational force from the normal matter in the galaxy cluster.

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## 2. Galaxy rotation curves

*2.1 Definition*

The spiral galaxies have arms that rotate around the centre of the galaxy. The mass density of the spiral galaxy decreases from the centre to the outer ends of the spiral. The luminous mass as all the matter, can be modelled with the galaxy as a point mass in the centre and test masses orbiting around it, similar to the solar system. Figure 1 shows how the rotational curve is predicted with curve A showing that the velocity decreases as the distance from the centre increases. This prediction is as per the Kepler's Second Law that is assumed to be universally applicable and is also valid for our solar system. The actual rotational curve B, instead remains flat as distance from the centre increases and keep going higher [7], [8] & [20][30].

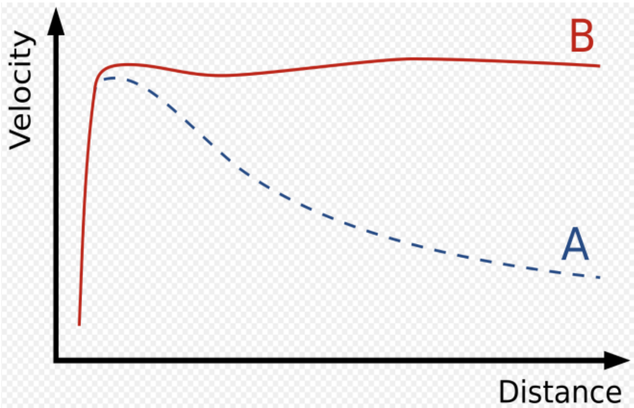


**Figure 1 Rotation curve of a typical spiral galaxy with predicted (A) and observed (B) values. Current thinking attributes the 'flat' appearance of the velocity curve for larger radius to Dark matter**

*2.2 Galactical velocity curve and dark matter*

As Kepler's laws is universal, hence the mass distribution in spiral galaxies is not similar to that of the solar system. This leads the scientists to believe that there is a lot of non-luminous matter called dark matter in the outer regions of the galaxy. This dark matter is the theoretical matter that can account for the large amount of mass that appears to be missing from our observational universe. Galaxy rotation curves and dark matter are thus though to be two interconnected phenomenas in the study of astrophysics that have significantly changed our vision of the universe in general [18] & [19].

*2.3 Galactical velocity curve explained by new laws*

A simple geometric model of the spiral galaxy is all that is need to explain the anomalies in the velocity curve of the galaxy. New laws of physics for cosmic bodies thus define their rotation around the centre of mass where the Kepler's second law of motion is no longer valid. In addition, general laws for the galactical rotation has been proposed that is universally applicable for all observable parameters of the entire universe.

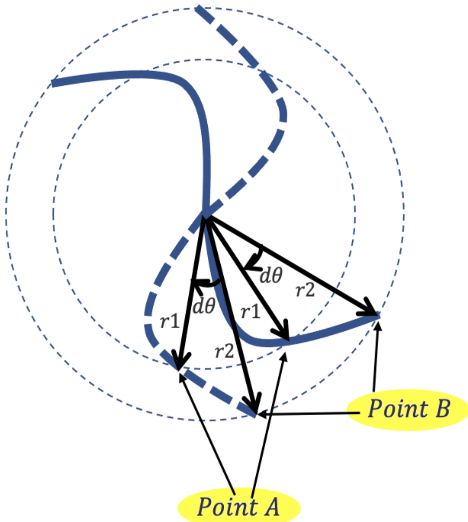


**Figure 2 Rotation of a spiral galaxy with cosmic matters (e. g. stars) referencing points A & B revolving in concentric circles around the centre of the galaxy, sweeping equal areas of delta change in rotation**

As stated earlier for spiral galaxies, the spiral arms moves around the centre of the galaxy with points along the spiral path moving in roughly concentric circles around the centre of mass (as also observed and confirmed by various studies). Figure 2 shows a spiral galaxy with arms in dark blue that has two reference points A and B (can be cosmic masses, a star or other cosmic body) moving in unison around the centre in concentric circles. If they move an angle of $d\theta$ in time $dt$ with the points located at a distance of $r1$ and $r2$ respectively from the centre of the galaxy then the following is true:

$$r2 > r1$$

Then,

$$r2^2 > r1^2$$

Multiplying both the sides of the equation by $\frac{d\theta}{2}$ gives,

$$\frac{d\theta\, r2^2}{2} > \frac{d\theta\, r1^2}{2}$$

Or,

$$\mathrm{A2} > \mathrm{A1}$$

Where A1 & A2 are the areas of the arcs swept by points A and B respectively.

Multiplying both sides by $\frac{1}{\mathrm{dt}}$ gives,

$$\frac{dA2}{\mathrm{dt}} > \frac{dA1}{\mathrm{dt}}$$

Or,

$$\mathrm{v2} > \mathrm{v1}$$

Or the areal velocity of point B is greater than A or the velocity of mass B is greater than mass A. This proof is consistent with the observed velocity curve of the spiral galaxy where the velocity of the cosmic masses increases as we move further away from the spiral.

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This also shows that the Kepler's second law is no longer valid for the above case of spiral body rotation which is more applicable to cosmic systems where the velocity decreases with distance from the centre of the cosmic body, like our solar system. The following general laws governing the rotation of galaxies in this universe can thus be inferred from the two known laws discussed so far:

**Law# 1**: The spiral galaxies follows the new law where the velocity curve increases with distance from the centre of the spiral. As the spiral galaxy shows a progressive increase of the distance, so does the velocity curve also shows a progressive rise of the velocity after the initial spiked increase around the centre.

**Law#2**: The elliptical galaxies show a decrease in the velocity of the cosmic masses with the increase of distance from the centre. These follow the Kepler's second law as the motions are consistent with our solar system configuration. The rotations of the masses are not like spiral counterparts and are mostly random without a clear axis of rotation.

**Law# 3**: The irregular and lenticular galaxies have velocity distribution that are disordered and unpredictable than the spiral galaxies that can follow both the laws, or one of the two or neither of the two (as they are random and not necessarily around the centre).

### *2.4 Conclusion*

Thus it proves that there is a no non-luminous matter called dark matter that appears to be missing from the total mass of the universe as all matter are normal luminous baryonic matter that moves and behaves as per the laws of physics. Also the Kepler's law is no longer universal as originally thought but case specific. This has to significantly change our vision of the universe in general consisting of single matter only that has so far been seen by scientists as consisting of two kinds of matter.

## 3. Bullet Cluster

### *3.1 Definition*

The Bullet Cluster (1E 0657-56) consists of two colliding cluster of galaxies. The name Bullet Cluster refers to the smaller subcluster, moving away from the larger one [25]. Gravitational lensing studies of the Bullet Cluster are claimed to provide the best evidence to date for the existence of dark matter. Also it is observed that the cluster's centre of mass is far displaced from the baryonic centre of mass [9], [10], [11] & [12] [29].

### *3.2 Normal Matter in Bullet Cluster explained*

The following points explain why the existence of dark matter in the bullet cluster as previously thought is wrong:

1. The region of the maximum gravitation lensing in the bullet cluster or the so called "hotspots" are located near the centres of the X-ray emission. The X-ray emission is mainly concentrated in the hotspots, where the gas is denser and hotter due to the collision.
2. The centre of mass of the entire bullet cluster is believed to be between the two colliding subclusters, about 72 Kpc away from the centre of the X-ray emission.
3. The dark matter as seen in the Figure 3 is located on the right and left edges of the bullet cluster. If the dark matter is really non-interacting with the ordinary matter and bypassed the collision of the two clusters, then all of it should be concentrated on the right hand side of the bullet cluster. This is as the smaller sub-cluster's baryonic mass passed through the larger cluster's mass thus making the intergalactic gases of the former look like a bow or a bullet. There should not be any dark matter in the sub-cluster that passed through and all of it should be concentrated on the right at the last location in the momental snapshot before actual collision of the two.

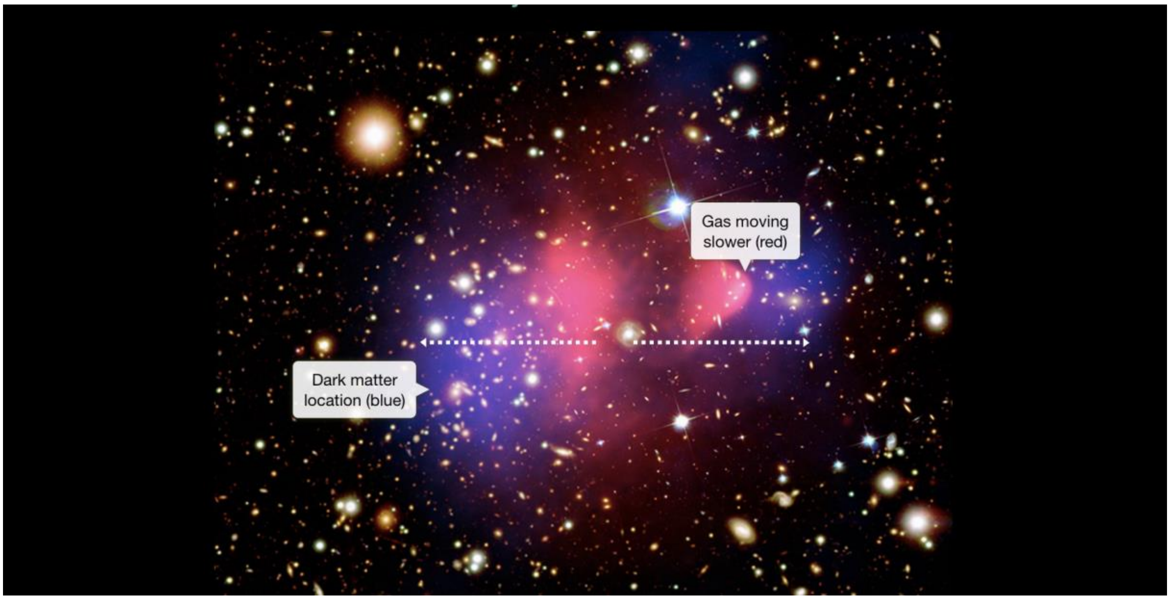


**Figure 3 Dark matter (in blue) is supposed to be moving ahead as it is non-collisional and cannot be slowed down as opposed to the gas (in red, emitting X-rays, a hotspot) that is a normal matter**

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The centre of mass of the entire bullet cluster coincides with the baryonic mass centre. The gravitational lensing is also strongest in the X-ray region which is the hot plasma gas region that usually has the highest density of normal matter in any galaxy cluster. Also from point 3 above, if the dark matter exists, it would have been located entirely on the right side of the cluster. Then the centre of mass of the entire bullet cluster should then have been more towards the larger cluster centre than near the X-ray emission centre.

*3.3 Conclusion*

The centre of mass, the gravitational lensing and the location of the dark matter all point towards the existence of normal matter, explained by ordinary physics theory and not any extra mass of dark matter that lies unexplained by any modern theory.

## 4. Cosmic Microwave Background (CMB)

*4.1 Background*

Cosmic microwave background radiation (CMB) refers to the light that was produced during the Big Bang event. CMB radiation is often described as a 'fossil' of the Big Bang event. It is essentially the afterglow of the white-hot plasma that filled the universe after the Big Bang. Because CMB comes from the early universe, it holds important clues about what the cosmos was like at the time of the Big Bang and our cosmic ancestry [13].

CMB radiation can be used to study the distribution of dark matter. The power spectrum of CMB radiation describes the distribution of fluctuations in CMB radiation due to temperature variations as a function of the angular scale. The power spectrum has distinct peaks, each corresponding to a particular angular scale and providing insight into the nature of the universe. By comparing the observed power spectrum to theoretical models, astronomers can infer the content of the universe and the distribution of dark matter.

Total gravity is one of the factors that contribute to the distribution of matter that gravitationally lens the CMB photons. Total gravity includes all sources of gravity, including the gravity from visible matter, dark matter, and dark energy. While dark matter does not interact directly with the CMB photons, its presence can be inferred from its gravitational effects on visible matter and, consequently, the CMB photons. As photons from the CMB pass through the universe's gravitational potentials, they are deflected. This deflection, or gravitational lensing, is caused by the mass within the light's path bending its path in space-time, leaving a signature in the CMB's power spectrum [16] & [17]. By analysing the CMB power spectrum, scientists can infer the total amount of matter and, therefore, the amount of dark matter, present in the universe. If we remove dark matter from the equation then the amplitude and position of the CMB acoustic peaks are also altered without which fewer and smaller peaks are also seen. Dark matter provide the additional gravitational pull necessary to cause the acoustic oscillations (also known as BOA or Baryonic Acoustic Oscillations which are the fluctuations in baryonic matter due to pressure waves generated by dark matter) that form the CMB peaks [14] & [15].

*4.2 Explanation for normal matter in CMB & other simulation techniques*

As can be inferred that total gravity is only input for dark matter representation in the CMB power spectrum simulations. And as previously seen from the observations of gravitational lensing, galaxy velocity curves and bullet cluster formations that the only source of total gravity is from the normal baryonic luminous matter and not the dark matter. This means that the CMB BOA fluctuations are only and only caused by normal matter as one of the peaks and that dark matter is another name for gravity that a normal matter exert on one another. The same total gravity (supposed to be from the dark matter) is used as basis in other simulation techniques like hydrodynamic simulations or primordial nucleosynthesis that is used for capturing the density, velocity and spatial clustering of dark matter.

*4.3 Conclusion*

The above facts show that the only way to represent dark matter is gravity and this gravity exits because of normal matter. Once the simulations are plugged in with the above variables the actual total normal matter can be calculated with the dark matter never coming into picture in this equation. This way, the true simulation of the early universe and its formation into its present state can be predicted accurately.

## III. RESULTS AND DISCUSSIONS

It can be seen from the above facts and explanations described so far that the dark matter is a myth and that the normal matter can explain all of the major phenomena's seen so far. The scientific proofs described can easily be extended to other phenomena's in this universe that prove the existence of dark matter but have not been included in this study for sake of brevity. Additionally, scientists have still not discovered even a single particle of dark matter and they have gone miles and miles deep underground, remote regions on this earth and even into darker outer space using ultra-sensitive, high fidelity and hi-tech experimental methods and instruments (making it an elusive problem in astrophysics and cosmology). This paper proves that normal matter is the only matter that exits in the universe and it is better to direct our time, effort and costs here rather than search for an unknown matter that is dark to knowledge but for an empty space with gravity.

## IV. CONCLUSION

From all the discussions and facts described so far it can be easily proved that dark matter does not exist and all such phenomenon's described in the present day or any such in the future needs to be re-evaluated using normal matter theory and their gravitational effects. New general laws of physics for galactical rotation that cannot be explained by Kepler's law alone is also derived which further speaks on the areas that needs focus to explain the unexplained phenomena's in outer space.

## DECLARATION

| | |
|---|---|
| Funding/ Grants/ Financial Support | No, I did not receive. |
| Conflicts of Interest/ Competing Interests | No conflicts of interest to the best of our knowledge. |
| Ethical Approval and Consent to Participate | No, the article does not require ethical approval and consent to participate with evidence. |
| Availability of Data and Material/ Data Access Statement | Not relevant. |
| Authors Contributions | I am only the sole author of the article |

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