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Dark Matter in Modern Physics and itself

Kirill Vankov

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Abstract

The primary origin of the puzzle of hypothetical Dark Matter (DM) in galaxies is due to the apparent failure of Newtonian gravity to explain flat rotation curves (RC), first of all, in spiral galaxies, like the Milky Way. Contrarily, I show that the galactic DM puzzle is resolvable in the Newtonian Gravitation framework, provided the initial/boundary conditions in galactic Cores are appropriately estimated. To make it, I suggest a novel approach to analysis of the Core structure. As concern a central Black Hole properties, I revised the conventional conception of gravitational collapse into a singularity point and introduced the Principle of Ultimate Gravitational Compression of matter. Altogether, this is a novelty of fundamental importance in Galaxy Dynamics. Also, I briefly discuss a reality of “dark” entities such as Cold/Hot Dark Matter and Dark Energy in Cosmology and other theories. To Conclusion, the impact of new breakthrough space technologies on Physics Frontiers and perspective of changes are briefly discussed.

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1 Purpose and novelty of this work

There are two typical opinions about the problem of galactic Dark Matter (DM). First, one either argues or believes in the DM physical reality and tries to explain it in different models of DM Halo. Second, one tries to justify DM reality and explain it by Modifying Newtonian Physics as a New Physics in Modern Physics branches. The proof of DM fiction would be an excusable misfortune for Kepler's laws, but for the established Modern Physics, it must be a historic not wanted catastrophe.

The purpose of this work is more straightforward: to demonstrate that the DM puzzle is resolvable by means of Newton's Universal Gravitational Law with some elaborate development. In particular, I developed a novel physical treatment of the super-massive Black Holes (SBH) in a galactic center. The solution is illustrated in the simplified model of the Milky Way galaxy, other types of galaxies are also discussed. This is the principal novelty.

2 Newtonian Gravitation

2.1 Physics of Kepler's laws, and concept of test particle

Kepler's laws have great historical and pedagogical values in presenting planetary orbits in the elliptic form in terms of two geometrical parameters,- eccentricity and semi-latus rectum in the absence of time variable. They are a phenomenological reflection of Newton's Universal Gravitational Law without the equations of motion. As such, they tell nothing about Gravitation Dynamics governed by the laws of conservation of total energy and angular momentum in gravitationally bounded isolated systems of material bodies in motion in space and time. Those laws are formulated in terms of physical parameters and substantiated by the famous Space-Time Symmetry Theorem by Emmy Noether. On top of it, there is the so-called Virial Theorem related to dynamical stability of complex N-body systems. Kepler's laws described orbital motion of test particle that is, in One-Body approximation.

Equations of orbital motion of test particle are constrained by the laws of conservation of total energy ϵ_0 and angular momentum l_0 . The type of orbit depends on initial conditions, which are given below along with conservation laws

and equations of motion: $r = r_0$, $\beta = \beta_0$, $\theta = 0$.

$$\epsilon_0^2 = 1 - 2\frac{r_g}{r} + \beta_r^2 + \frac{l_0^2}{r^2}, \quad l_0 = r\beta_\theta = r_0\beta_0, \quad (1)$$

$$(d\xi/d\theta)^2 = (1 - 2\sigma) + 2\sigma\xi - \xi^2, \quad (2)$$

$$r(\theta)/r_0 = (\sigma + (1 - \sigma) \cos(\theta))^{-1}, \quad (3)$$

Denotations:

- the radial speed $\beta_r = dr/dt$,
- the angular rotation speed β_θ ,
- the angle of rotation θ ,
- the radial (inverted) coordinate $\xi = r_0/r$,
- the mass of the source M ,
- the gravitational radius $r_g = G M/c_0^2$,
- parameter of orbit type $\sigma = r_g/r_0\beta_0^2$.

By definition, the test particle is a point-like particle of however small mass $m \ll M$. The above equations, except for the angular momentum l , are given in a dimensionless form so that the speed of light is $c_0 = 1$, and the test particle mass is $m = 1$. In the formula for the conserved energy ϵ_0 , the first term implies the standard test particle mass $m c_0^2 = 1$. The above expression for ϵ_0 is actually given in the quadratic form taking from the Special Relativity approximation of small speed $\beta_0 \ll 1$. In this way, the total mass $m c_0^2 = 1$ of the test particle at rest is introduced in the equation for ϵ_0 , as a form of potential energy gauge. For this reason, this concept should be defined as the standard test particle of mass scaled to a fixed unit, e.g. kg or Solar mass M_\odot .

The orbiting galactic materials consist of a variety of objects like stars, Black Holes, gas, debris, etc. Consequently, the test particle concept should account for relative amount of each component in a mass density unit, $d_0 = \sum_{n=i} d_i$, where $d_i = x_i d_0$ with x_i -components $\sum_{n=i} x_i = 1$.

The simple equations of test particle motion and its solution describe all possible classical orbits in the One-Body approximation. One-parameter classification of orbits is illustrated in the Fig. 1. There are 5 orbits:

- a circle, $\sigma = 1$,
- elliptic sub-circle $\sigma < 1$,
- elliptic over-circle $1 < \sigma < 0.5$,
- parabolic (unstable) $\sigma = 0.5$,
- hyperbolic (unbounded) $\sigma > 0.5$.

2.2 Test particle in the ring of self-sustained disc

To get into the issue deeper in terms of test particles, let me introduce the term of a R -ring containing all kinds of galactic materials. Its mass is calculated as $\Delta m(r) = \pi r^2 \Delta r H d(r)$ in a ring of the radial thickness ΔR , where $d(r)$ is an average mass density at $r = R$. The differential increment Δr can be however small. The mass of ring $\Delta m(r)$ at $r = r_i$ will be denoted m_i .

A rotation of any R_i -ring is due to the source, which is the inner mass $M_R(r_i)$ in the whole region of $r < R$ assuming the ring mass smallness $\Delta m(r) \ll M_R$. As we know, the inner mass increases with r_i supporting a rotation of the R_i -ring. In other words, the whole disc consists of a huge number of R_i -rings each having its own source $M_R(r_i)$, altogether composing the self-sustained rotating galactic disc after its being energized by the Core. A small influence of outer mass at $r > R$ on the R_i -rings can be neglected to the next order approximation. This is true because an addition of new r -rings $r > R$ for a given $r = R$ does not affect its stability till external conditions are changed, for example, caused by external Halo.

Notice that the masses of all R -rings $m_i = \Delta M(r)$ are equal, therefore, every ring can be considered the standard test particle of a real mass $m_i = m_{tp}$ gauged to, for example 1kg. Because $m_i \ll M_i$, it is not counted in the energy balance, hence, does not appear in the equation of motion. The rings of the disc play a doubly role, - test particles probing the field, and ingredient of field sources. In Astronomical observations, the sources are seen as excited atoms and molecules emitting light with frequencies shifted depending on the speed of the ring. Measuring the shift, Astronomers calculated the speed regardless of luminosity of matter but they must be sure that their detectors' sensitivity is sufficient to catch the light from far away sources.

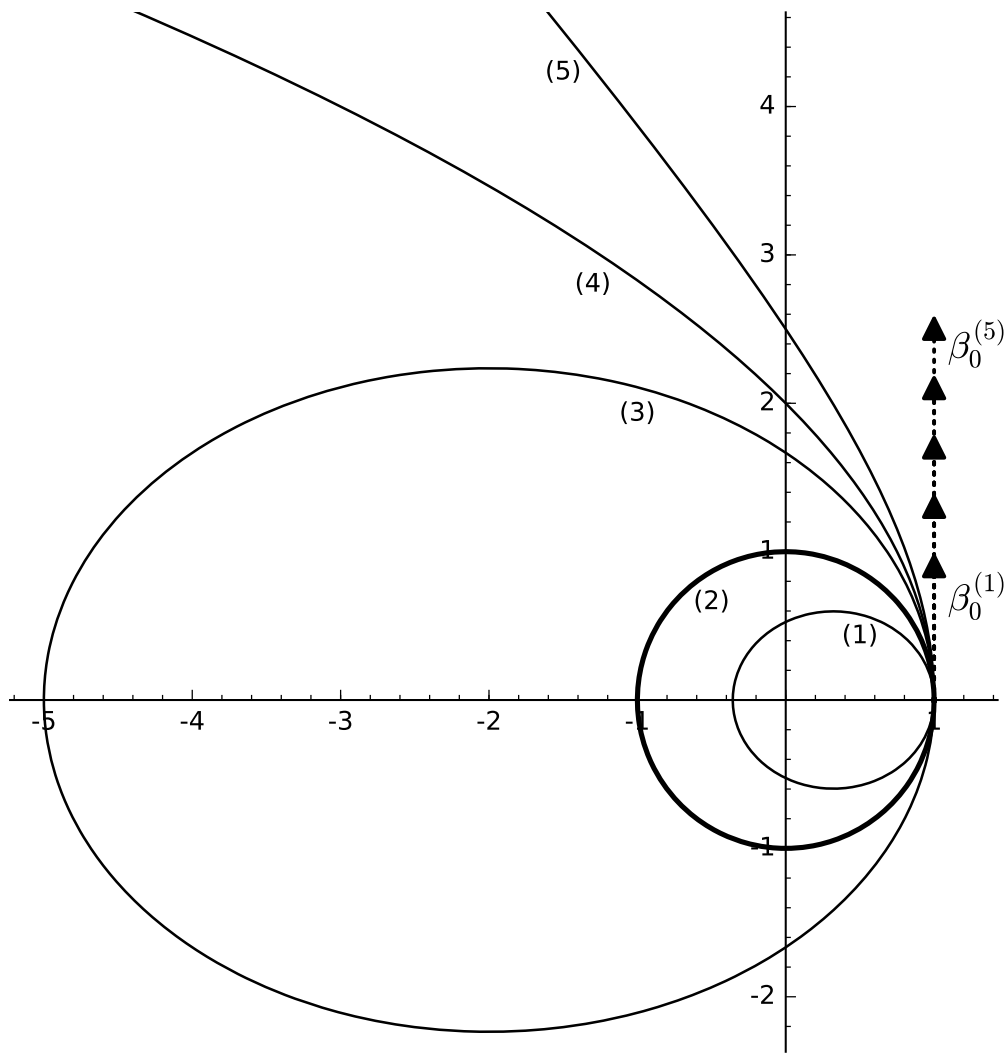


Figure 1: Five possible classical orbits in the framework of One-Body Newtonian Gravitation.

3 Milky Way galactic structure

3.1 Black Holes and the Principle of Ultimate Gravitational Compression

Astronomers used to notice but did not paid much attention to that the average density of a black hole inside the Schwarzschild sphere is inversely proportional to the square of its mass. My new statement is that the above proportion comes from Newtonian gravity: the greater size and mass, the lesser density under a special condition. I call it the *Principle of ultimate compression*, which tells that the critical (nuclear) density $d_{\text{cr}} \approx 1 \times 10^{19}$ cannot be physically exceeded. Such an ideal condition must occur when a natural radius of solid ball is brought near a theoretical radius $r_g = G M / c_0^2$, when the speed of test particle approaches infinity. Notice, we are talking about the Gravitational radius r_g , which is half the Schwarzschild radius.

Assuming that BH mass M is measured, one can calculate theoretical values of the other two parameters d and R . We have

$$R = r_g = r = \frac{G M}{c_0^2}, \quad d = \frac{3 c_0^2}{4 \pi G R^2}, \quad (4)$$

where $R \sim M$, $M \sim R^3 d$, and $d \sim R^{-2}$. The equality $R = r_g$ imposes a constraint on the 3 parameters R , M , d . Given any of them, the other two can be calculated using the above proportionality rules. If you double the mass, the radius is doubled too, the volume jumps cubic, hence, the density falls in square. Such a scheme of mass compression in BH physically meaningful in a certain range of masses above the Solar mass M_\odot . The smallest one is the Neutron star (NS), which can be considered the lightest stellar BH.

The proposed Principle of Ultimate Gravitational Compression to the critical density d_{cr} is principally different from the conventional conception of gravitational collapse, it changes understanding Galactic Dynamics. Next, it is illustrated in relation with galaxies.

In the case of the Milky Way, measured mass of SgrA* is $M = 4.1 \times 10^6 M_\odot$. Then, the calculation gives values of

- $R_{\text{cal}} = 6.0 \times 10^9$ m,
- $d_{\text{cal}} = 6.0 \times 10^6$ kg/m³.

The actually measured radius is about $R = 2.4 \times 10^{10}$ m but I am not sure about the precision.

In another example of galaxy NGC 1052-DF2 of Ultra Diffuse type, the measured SBH of mass is $M = 1.5 \times 10^8 M_{\odot}$. The calculated values are

- $R_{\text{cal}} = 2.3 \times 10^{11}$ m,
- $d_{\text{cal}} = 6000 \text{ kg/m}^3$.

That is, the mass density significantly drops. For comparison, a metal rope of density 6000 kg/m^3 has a breaking stress $9.8 \times 10^8 \text{ N/m}^2$.

The heaviest SBH is identified in the center of Messier 87 galaxy at the distance about 16 Mpc with the measured BH mass about $M = 6 \times 10^9 M_{\odot}$ (1500 times heavier than SgrA*). By the above proportionality rules, the calculated quantities are

- $R_{\text{cal}} = 9 \times 10^{12}$ m,
- $d_{\text{cal}} = 3 \text{ kg/m}^3$,

The density drastically drops to a level $d = 3 \text{ kg/m}^3$. This is the evidence of upper limit of BH solidity. Such Black Holes cannot exist in a stable spherical form. Observations of them and treatments could be confusing and misinterpreted. I assume that this SBH remains gravitationally bounded and can rotate.

Back to the Neutron Star. Let us believe that the measured parameters of SgrA* are reasonably true, in particular, the SgrA* mass density $d_{\text{sgr}} = 9.0 \times 10^6 \text{ kg/m}^3$. Then, one can assess the NS parameters by take one of them given and finding the rest using the proportionality rule. For example, let us take the critical density $d_{\text{cr}} = 1.0 \times 10^{19} \text{ kg/m}^3$ to compare it with d_{sgr} . From the square proportionality factor $k^2 = 1.1 \times 10^6$, the values of radius and mass of the Neutron Star follow

- $R_{\text{cal}} = 5.67 \times 10^3$ m,
- $M_{\text{cal}} = 3.84 M_{\odot}$,

what is physically reasonable. Of course, one can assess any BH and NS case individually.

3.2 The Core and the Disc

The MW galaxy is a barred spiral galaxy having a bulge and central SBH. The bulge is much heavier than that of the central SBH SgrA*. Its shape looks like two eggs, back-to-back glued and bar-connected, see recent review in (Sofue, 2020). The SBH and the bulge constitute a galactic Core, the zone of transition from spherical geometry to a disc in polar or cylindrical coordinates, where sizes and masses are not strictly defined. Judging by observations, the RC becomes flattened at some point about $R_1 = 1$ Kpc at the speed level about $V_1 = 220$ km/s. Strictly speaking, the origin of radial variable r must be $r = 0$ and it be appropriate to shift the origin to $r = R_1$ by introducing a new variable $r' = r - R_1$. However, in view of a large range of the flatness, such a difference can be ignored.

The Core issue is actually about a formulation of initial/boundary conditions in the galactic dynamics problem, which should be solved by a numerical simulation. Such a work is beyond the scope of this work. The only thing we should know is that a critical mass and mass density in the Core is sufficient for energizing a self-suatened disc rotation. In fact, the Core mass kin the Milky Way is about $5 \times 10^{12} M_\odot$, what must be sufficient, more details are given further.

3.3 Newtonian Galactic Dynamics, and the abuse of Kepler's laws

Consider the circular orbit by the criterion $\sigma = 1$, that is $G M m/R = m V^2$. Then the RC formula is $V(R) = (G M/R)^{1/2}$, where M is a mass of source supporting an orbital motion of the test particle of mass is $m \ll M$. If a dominating mass M is fixed in some range of R , then the RC declines with R , as in the example of Solar planetary system. For Astronomers, this is a set of “true Keplerian” orbits. All others are considered “not-Keplerian” that is, indicating the DM presence. It will be seen that in Newtonian Gravitation all kinds of observable gravitational orbits are Keplerian.

Astronomers use *ad hoc* parametric models aimed at a formal fitting of DM conception to observations out of a specific theoretical framework. In particular, they calculate a galactic potential function $\Phi(R) = G M/R$ in a manner of the electrostatic problem of a charge distribution over a solid frame, albeit, in the galactic structure, there is no such a thing as a solid frame at rest. A galactic disc exists solely due to the rotation of bounded massive matter. Theoretically, stopping the rotation would ruin the whole galactic structure.

In this work, the equations of Newtonian gravitation in the One-Body approx-

imation are used for describing observations of galaxies in terms of measured parameters. One can see how much explanatory and predictive information comes out from as little as a few measurements. The criterion of truth is an unambiguous explanation of observations in terms of real physical parameters with no DM. It proves that the existing galactic models with the DM Halo are fundamentally flawed.

3.4 Milky Way: flat stable RC and dynamics instability

In general, the MW Core must have a sufficient mass and density to energize the disc rotation with the speed dependent radius, $V(R) = (G M(R)/R)^{1/2}$ in the transition from spherical to cylindrical geometry. Obviously, the RC flatness requires that the source mass $M(r)$ increases with r : $M(r) \sim r$ to make $G M(r)/r = \text{Cont}$. Hence, the density of matter $d(r)$ must decrease inversely proportional to radius $d(r) \sim 1/r$, what is a natural proportionality in cylindrical geometry.

From RC observations in RC flat region, let us choose the measured speed V_0 at $r = R_0$, as the reference quantities, for example, at the Solar place $R_0 = 8 \text{ Kpc}$, $V_0 = 2,40 \times 10^5 \text{ m/s}$. Also, there is the measured disc thickness $H = 0.3 \text{ Kpc} = 9.3 \times 10^{18} \text{ m}$. Having this and using the above proportionality rules, one can define and calculate other MW important quantities, like a differential mass increment $\Delta M(r) = 2\pi H r d(r) \Delta r$, and the mass density $d_0 = M_0/2\pi H R_0$, $d(r) = R_0 d_0/r$.

At $R_0 = 8 \text{ Kpc}$, we have

- $M_0 = 2.16 \times 10^{41} \text{ kg} = 1.0 \times 10^{11} M_\odot$,
- $d_0 = 6 \times 10^{-18} \text{ kg/m}^3 = 0.9 M_\odot/\text{Kpc}^3$,
- $r_g = 1.6 \times 10^{14} \text{ kg/m}$.

The density of matter in the MW on average is about one Sun-like star in a cubic Kpc, that is extremely low and favorable for collisionless motion of stars. Hence, the concept of test particle is justified.

At $R_1 = 1 \text{ Kpc}$, we have

- $M_0 = 1.7 \times 10^{42} \text{ kg} = 1.7 \times 10^{12} M_\odot$.

This is consistent with the requirement of the Core engagement to make the disc to grow and rotate by itself.

It is remarkable that the potential function at the disc is constant, $\Phi = r_g/R = 6.4 \times 10^{-7} = \text{const}$. At the same time, the acceleration $g(R)$ decreases with the radius, $g(R) = V^2/R$. At $R = 8 \text{ Kpc}$, it is $g = 2.3 \times 10^{-10} \text{ m/s}^2$. It is extremely small, nevertheless, in a cosmic scale it can develop a relativistic radial motion of matter. Because the MW galaxy is fairly transparent, a heavy galactic material entering from the Halo can be sucked in and strike the Core with a high radial speed. As a result, Astronomers may observe different kind of huge energy explosion and electromagnetic emission.

Having measured V_0 and H and using the above proportionality rules, one can calculate other galactic quantities in the range of the MW RC flatness. In particular, one can calculate a time period P of orbit rotation at any radius r . This quantity implicitly reveals the 3d Kepler's law $P^2 \sim r^3$. In particular, at Sun's position $r = R_0$, the period is $P_0 = 2.3 \times 10^8$ per year. Using the law $P^2 \sim R^3$, one can calculate $P(R)$ at any R in comparison with P_0 . The RC flatness is only one of the physical features of Keplerian orbits. One should be aware that all types of orbits in the gravitational potential $1/r$ are Keplerian in Newtonian Physics.

The relationship $P^2 \sim r^3$ may look strange. It is the consequence of formula $G M_0/R_0 = V_0^2$, which reflexes the Virial Theorem statement that in a circular gravitation orbit of particle of mass $m \ll M$, the potential energy $\Phi \sim 1/R$ is a doubled kinetic energy $K = m V^2/2$. At the same time, the period of rotation $P = 2 \pi R/V$ is, equivalently, $P = (R^3/G M)^{3/2}$. In elliptic orbits, one should use the semi-major axis a instead of radius R .

In reality, the RC is not exactly flat. After reaching a maximal point, it declines for some reasons. One of them is an interaction of the disc with a large Halo. It can lead to the precession of the orbital momentum vector about axis of disc rotation. If so, the mass density of the disc decreases with the following decrease of the rotational speed. This is the problem of quasi-stationary galactic dynamics of galaxy evolution involving the spiral structure. One can speculate that the orbits in spiral arms can be turn hyperbolic ($\sigma > 0.5$) so that disc material is flowing out through the spiral arms. This would indicate that that our Observed Universe is in a state of decay.

4 Diversity of galaxy types, examples

4.1 Spiral galaxy Messier-33

I think we observe a great variety of galaxies, which are in their own stage of some law of cosmological evolution. For example, the M-33 is half the size of MW and presents puzzles. It does have neither a visible SBH nor a Bulge. The RC measured in the range up to about 15 Kpc shows the proportionality $V(r) \sim r^{1/2}$ that is, $V(r) = (GM(r)/r)^{1/2}$. According to the discussed above proportionality rules, the disc density must be constant, what makes the mass proportional to the square of r , $M(r) \sim r^2$. How could it be possible with no MBH?

My explanation goes to the *Principle of Ultimate Gravitational Compression*. Suppose, the galaxy should have a rotating MBH of mass somehow greater than in the MW. If so, the density becomes so low that such a MBH cannot exist as a sphere. By rotation, the MBH must flatten down to the density of solid matter in a form similar to the Disc form of very large size. Astronomers can consider it a galactic Core, which should ignite the rotation of galaxy. Unfortunately, I have no numerical data on the RC, there is available only a rude graphic plot up to 15 Kpc. Actually, the above range seems to be the Core rather the Disc itself. From my calculation based on the proportionality rules, my approximate value of M at $R = 8$ Kpc is $M = 5 \times 10^{10} M_{\odot}$, about half that in MW. One can try detailed fitting calculations. It is possible that the RC above the Core $R > 15$ Kpc will approach a maximal value and then slowly decline without forming a large SSD. Based on the current RC data, Astronomers decided a need for the DM Halo in this galaxy.

4.2 Elliptical galaxy Messier-87

The considered above M-87 galaxy has some similarity with M-33. It has the estimated heaviest SBH of mass about 1500 of times that of SgrA* mass. Correspondingly, the calculated density is about the Earth's air density. Similarly to the case of M-33, the SBH cannot exist as a spherical mass. Instead, it could be flattened by rotation to the spheroidal shape containing significantly suppressed mass. If so, we observe a solid galactic Core rather than the galaxy itself. The Core size visibly extends up to 200 Kpc of diameter.

The M-87 galaxy is approximately double in size that of the MW, and it has the substantially larger mass. As an elliptical galaxy, the galaxy is a spheroid rather than a flattened disc surrounded by a huge Halo. Obviously, it cannot be

characterized by the RC. This is the case when a more sophisticated simulations of observations are needed. Nevertheless, some Astronomers found signs of the DM existence in the hypothetical Halo (Murphy et al., 2011).

4.3 Ultra-diffuse galaxies

To Astronomers' surprise, there are galaxies lacking the DM, in particular, ultra-diffuse galaxies (UDG) that is, having extremely low density, often, they have an elliptic form rather than a disc. Their evolution peculiarity is a non-flat RC looking "Keplerian", meaning no DM. In my explanation, their disc rotation is not self-sustained due to the Core mass smallness. In other words, the mass and its density are not sufficient to start the disc self-sustained rotation at the speed reached in the Core zone. Consequently, the RC(r) starts going down with the radius.

By the above examples, my task to demonstrate the DM-free Newtonian Dynamics of galaxies is accomplished with the following recipe. Any galaxy should be studied starting from the initial/boundary conditions in the Core area. Special attention should be paid to the Ultimate Compression Principle applied to a central SBH to determine its physical role in the RC formation. One needs to assess the Core mass balance if it is sufficient to ignite a self-sustained disc rotation and then to analyze the observed RC in Newtonian terms of mass density distribution over radius.

5 Modern Physics with and without DM

5.1 Observation and treatment of Dark entities in Cosmology

As noted, the original DM conception in galaxies echoed in some Modern Physics branches. A denial of the galactic DM can disarray the theories employing dark matter entities like Cold/Hot Dark Matter and Dark Energy. Therefore, the physical problem of the DM and its reality in Cosmological Matter evolution is non less important than the galactic DM. The question to pursue is how much we are sure about the correctness and precision of contemporary Astronomical observations and their theoretical treatments.

Concordance Cosmology, - the current Λ -CDM (cold dark matter) Big Bang Model, has matured at the end of the last century bearing the CDM mystery. It has a few main adjusting parameters and many fine-tuning ones, in addition, a long list

of controversies and other puzzles (Wikipedia, 2022). The Model seems to explain everything that looks “strange” but predicts nothing. Moreover, it is considered verifiable but cannot be falsified, provided General Relativity is a correct theory. This makes one critical and feel that something is ugly and wrong with the Model.

Notably, the DM *hypothetical* phenomenon in Concordance Cosmology is often associated with WIMP, a *hypothetical* weakly interacting massive particle suggested by theorists of the Standard Model of Particle Physics. The greatest idea is to explain how galaxies were born in the cosmic dark epoch. For this, WIMPs must be “cold”, i.e. moving slowly and sticking together under the influence of self-gravity. This is the preferred bottom-up scenario of matter evolution. There is another variant with the Hot Dark Matter, a top-down scenario when full-scale galaxies were born and then disintegrated. With the hope to unveil the secret of Nature, the US Department of Energy decided to approve the costly international project of detecting the DM (LZ experiment) (Akerib et al., 2021). Since the beginning of measurements in 2020, there were no signs of DM observed, with no surprise.

Among other facilities and laboratories, the Large Hadron Collider is also on the hunt for any kind of Dark Matter. It is not easy to search for a hypothetical phenomenon, a hypothesis of which is fuzzy.

Similarly to the CDM, the cosmological constant Λ (Einstein’s “greatest blunder”) has been introduced in Cosmology as a hypothetical phenomenon, the Dark Energy (DE). The purpose was to explain the amazing observations by the Hubble Cosmic Telescope with the model interpretation that the Universe is accelerating (1998). The further Hubble observations of Deep and Ultra-Deep Fields (1995-2014) occurred shocking. They revealed normal galaxies more than 12 Billion years ago, where it should be nothing. This requires changes in the standard scenario of the Early Universe Model with the fixed redshift timeline and the role of DR and DE there. This is the pain for Astronomers, who believed that the Standard Model was true for many years in a row. Yet, many other questions remained open (Conselice et al., 2016).

5.2 WEBB era of discoveries

In past years, Cosmologists craved clarity and the good news of truth from the WEBB telescope but not expected the Big Bang blown-up, “a panic” (Ferreira et al., 2022). Now they see galaxies 200 million years after the Big Bang very much similar to existing today, and new discoveries are coming. The fundamental question arises: has the Big Bang ever happened? And are we still sure that its

companion, the General Relativity, is correct?

It is amazing how Engineers and Scientists have designed and built such breakthrough cosmic technologies, results of which Astronomers could not expect, predict, and explain now within their established theories, I repeat, the theories they believed true and trusted for many years in a row. Many praises to Engineers for miraculous technologies.

My personal tolerating opinion is that, with the WEBB, today becomes the right time to open forums on revisions and Alternatives in Modern Physics branches. Today is the beginning of the paradigm shift in Physics for the sake of its inevitable progress. Next section section must contributes to that.

5.3 Our critical Opinion: Why Dark entities and Bang beginning are not needed in Cosmology

We (I and my Father, Physics Professor, A. V.) are critical on Cosmology and its basis, General Relativity. There are too many arguments for that in literature, and we have to add more. We suggest the Alternative, as next.

The Universe exists in an unlimited space and time. Such a Universe we call “the Grand Universe” consisting of unlimited number of “Typical Universes” symmetrically composed of matter and anti-matter. They are floating in the Grand Universe Background, mix and collide with each other in the process of evolution of their generations making the Grand Universe in a stationary state on a large scale. We live in and observe Our Local Universe in an after-collision state (Big Bump), when a matter-dominated Typical Universe collided with somehow smaller anti-matter Universe, significantly annihilated. So we likely observe a slow decay of Our Universe.

In our approach, Newtonian Physics with its potential extension to the Special Relativity Dynamics is used, (Vankov, 2010, 2008, 2016, 2017). It explains the observations differently. It explains why the Observed Universe is matter dominated and its origin, mysterious releases of huge energy in form of various types of radiation and explosions, the Cosmic Rays origin and other phenomena. The Dark Matter is presented there as a fictitious notion explainable in Newtonian Physics. We do not see questions or problems, which could not be in principle answered or explained in this Model.

5.4 Our Opinion: Philosophy and Methodology in current Modern Physics

Philosophy, particularly, Epistemology and Ontology, historically served as an unalienable part of Natural Sciences, but not today. From the concise review of the DM in Modern Physics and itself, let me express our opinion against the mainstream that the current Modern Physics today has reached an apotheosis of stagnation, more likely, a crisis noticed by no one living philosopher in epistemology. We have physical theories about Nature created by Physicists and Mathematicians in joined collective thinking and, as such, it could be, or it is a subjective perverted image in a human mind.

Optionally and preferable, the real objective Nature outside is harmonious in its beauty and perceptibility through the hierarchy ladder of knowledge. Therefore, physicists and their physical theories must possess a respect for physical heritage and show their inherent consistency, and power of explanation and prediction with no ugliness. Such attitude should provide a researcher with inspiring pleasure of beauty, intuition for new discoveries, and guidance to the truth. Modern Physics branches hardly contain enough of those intellectual ingredients. Definitely, it lacks the respect for the Physical Heritage, like Newtonian Physics.

6 Conclusion

The purpose of this work in the first place is the explanation of the longstanding Dark Matter puzzle seen in a “strange” behavior of galactic Rotation Curves. They believe that Newtonian Physics is unable to solve it. Contrarily, I show that the DM phenomenon is principally described in the framework of Newtonian Gravitation. It is demonstrated in sufficient details in examples of “strange” galaxies, including our Milky Way. For deeper studies, an extension of Special Relativity Dynamics is recommended. This is the novelty of fundamental importance.

I also recognized that the galactic Dark Matter problem too deeply spread to Modern Physics, in which the “dark entities”, such as Cold/Hot Dark Matter and Dark Energy appeared for different reasons than the galactic DM. They constitute Fundamentals of the contemporary Cosmology. So, I question their physical reality and the impact of breakthrough discoveries on Physics Frontiers due to Hubble and WEBB technologies. In agreement with many Scientists, the experts in the field, I conclude that today is the time of paradigm shift in Physics.

I thank in advance Colleagues who would argue or could respond to this work

and put questions and comments.

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