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Decreasing Universe Theory: Galaxies without Dark Matter (NGC 1052-DF2, DF4, and DF9)

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Abstract
In the DUT (Decreasing Universe Theory) model, "Dark Matter" is explained as an effect of the differential contraction of stars relative to their distance from the massive core of the galaxy. We will see that there may exist galaxies in which this effect is very small, whose causes corroborate the evidence of this model.

Introduction

We have seen that in our DUT model, "Dark Matter" is nothing more than an effect on the redshift of stars relative to the massive center of their galaxies [10,11].

In the vast majority of galaxies, each galaxy presents a region of high gravitational density (near its core), and the gravitational field decreases as we move away from this massive center.

However, according to the DUT, the contraction rate (of space, atoms, and everything else) is proportional to the intensity of the gravitational field.

Thus, stars farther from the strong gravitational field of the central region of the galaxy exhibit a lower contraction rate than those in the central region.

This causes the light emitted by these more distant stars to have a greater redshift than those that contract more rapidly (located closer to the center of the galaxy).

Dark Matter

Since the velocity of stars is measured by their redshift, this produces, apparently, an orbital velocity greater than the velocity expected from the observed baryonic mass. This higher velocity is explained by adopting the hypothesis of "dark matter": the missing mass necessary to allow a greater orbital velocity without the star escaping its orbit.

Thus, the greater the differential of the gravitational field of the star relative to the massive center of the galaxy, the greater the redshift difference between the central stars and the peripheral stars, and therefore, the greater the "dark matter" needed to explain this apparent higher velocity.

Galaxies Without "Dark Matter"

Since, according to the DUT, dark matter is an effect of the gravitational field (gradient) between the stars closer to the center of the galaxy and those farther away, if there is no such gradient, there will be no dark matter.

On the other hand, the opposite may occur: If almost all stars are concentrated under the same gravitational field with little difference between the center and the edge, there will also be no need for dark matter, since the contraction rate of all of them will be very similar.

We can verify this through the equation of wavelength contraction as a function of mass, distance, and contraction time:

Let us copy some equations from the article "**Decreasing universe: the 'Dark Matter' effect" [10]:**

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If λ_0 is the wavelength of stars near the center of the galaxy and $\lambda^M{}_0$ is the wavelength at a distance R from the center of the galaxy (assuming that the mass is concentrated at the center), then the wavelength of a Star at a distance R from the center will be:

$$\lambda^M{}_0 = \lambda_0 / F_j(T_0, M, R) \quad [F1]$$

Where:
$\lambda^M{}_0$ = wavelength of photon in Messier_33 Earth after T_0
$F_j(T_0, M, R)$ = generalized Jocaxian Factor
M = Messier_33 Mass (1.4E39 Kg)
R = Distance of star to center of Messier_33

and

$$F_j(\Delta t, M, R) = e^{\wedge}(J_0\, M\, \Delta t / R^2) \quad [F2]$$

and

$$J_0 = (H_0\, R_t^2) / M_t \quad [F3]$$

(Jocax Constant ≈ 1.37E-18 $m^2 \cdot s^{-1} \cdot kg^{-1}$).

Where
H_0 = Hubble Constant (≈ 2.2E-18 s^{-1})
R_t = Distance from Earth to center of Milky Way (≈ 2.5E20 m)
M_t = Mass of Milky Way (≈ 1E41 Kg)

We can observe from formula F1 above that:
— The factor J_0 is very small (~ 1E-18); therefore, if the central mass of the galaxy is very small or nonexistent (M ≈ 0) at its center, then F_j will be practically equal to unity ($e^0 = 1$), and therefore $\lambda^M{}_0 \approx \lambda_0$, that is, there will be practically no wavelength difference (no dark matter).

Likewise, when the distance from the most peripheral star to the gravitational nucleus is very small, all radii are close, and they share the same contraction factor F_j since all stars are concentrated at the center.

Below we will see examples of both cases:

The Galaxies NGC 1052-DF2, DF4, DF9, and AGC 114905
The main galaxies identified by astronomers with total absence or extreme scarcity of dark matter are:

The Trio of Ultra-Diffuse Galaxies
These three galaxies are small, faint, and aligned in cosmic space:
- **NGC 1052-DF2** (or simply **DF2**): Discovered in 2018, it was the first galaxy identified without significant dark matter.
- **NGC 1052-DF4** (or simply **DF4**): Found shortly after, it confirmed that DF2 was not an isolated measurement error.
- **NGC 1052-DF9** (or simply **DF9**): The most recent confirmed example of the group, completing a rare linear trail of galaxies without the invisible substance.
- **AGC 114905:** An ultra-diffuse dwarf galaxy that underwent more than 40 hours of detailed measurements with the *Very Large Array* (VLA) telescope. The data showed that the rotation of its gases can be entirely explained solely by visible matter.

They possess an extremely diffuse or nonexistent core, presenting a central structure radically different from that of most normal galaxies.

The anatomy of these galaxies without dark matter reveals that the lack of this substance directly affects how their center is organized:

Absence of a Defined Central Region
Spiral galaxies (like the Milky Way) and elliptical galaxies possess a central "bulge" or a highly bright and dense nucleus, where millions of stars are squeezed close to one another. In the case of galaxies such as **NGC 1052-DF2** and **DF4,** this nucleus simply does not exist. They look like spatial "ghosts," so transparent that telescopes can perfectly see other galaxies located behind them. [1-5]

No Active Supermassive Black Holes
In common galaxies, the nucleus harbors a supermassive black hole that attracts matter and stabilizes the rotation of the center. Analyses of DF2 and DF4 indicate that they do not possess this dense or active gravitational heart. The distribution of their stars is uniform, scattered, and faint from the center to the edges.

Globular Clusters Replace the Nucleus
What intrigues astronomers the most is that, instead of a bright nucleus of dense stars, the center and body of these galaxies are populated by **bizarre globular clusters.** These star clusters function almost like isolated points of brightness floating in a transparent gas cloud, being twice as large and much more luminous than the clusters seen in normal galaxies.

The Structural Exception: NGC 1277
It is worth noting that **NGC 1277** is the only major exception on this list. It is a giant and compact "relic" galaxy. It lost its dark matter, but maintained an extremely massive and dense nucleus because it formed in a completely different manner from the diffuse dwarf galaxies.

NGC 1277 is considered one of the greatest mysteries of modern astrophysics. Unlike the dwarf "ghost" and transparent galaxies (such as DF2 and DF4), NGC 1277 is a **giant, hyperdense, and compact galaxy** that also possesses no dark matter.

It is located in the Perseus Cluster, about **240 million light-years from Earth,** and completely defies current cosmological models. [1, 2]

- **A "Relic Galaxy" Frozen in Time:** It functions as a cosmic fossil. All of its stars formed in a very short interval of 100 million years, about **12 billion years ago**. Since then, it has never interacted with other galaxies and remained totally isolated and intact. [1, 3, 4, 5, 6]
- **Ultra-Compact, but Extremely Heavy:** It has only a quarter of the diameter of the Milky Way (about 20,000 to 25,000 light-years). However, it manages to squeeze within

this reduced space a mass of **120 billion suns** — which makes it incredibly dense.

- **A Monstrous Black Hole at the Center:** The heart of NGC 1277 harbors one of the largest known supermassive black holes, with **17 billion solar masses.** In common galaxies, the central black hole represents about 0.1% of the galaxy's mass. In NGC 1277, it devours an impressive **14% of the entire galactic mass,** breaking the known rules of cosmic evolution.
- **Only Old Stars (No New Gas):** The galaxy has a striking reddish color because it is composed exclusively of very old stars. It consumed or lost all of its cold gas billions of years ago, which means it **completely stopped manufacturing new stars.**

The Mystery of the Lack of Dark Matter

Given its size and mass, physics predicts that NGC 1277 should be composed of up to 70% dark matter. However, detailed spectrography data showed that dark matter represents **less than 5% of its composition** (it being perfectly possible that it has 0%). The rotation of its stars is entirely explained by the gravity of visible matter. [3,7-10].

Conclusion

We recall that in the DUT model, dark matter is an illusory effect in which, in normal galaxies, the gradient of the gravitational field relative to the center of the galaxy causes [a redshift effect] in the stars.

However, there are two cases in which this gradient is very weak or nonexistent: Ultra-diffuse galaxies, in which there is no massive nucleus, and extremely dense galaxies where the most distant stars still remain relatively close to the nucleus of the galaxy. In both cases the gradient is weak or nonexistent, preventing a large variation in the redshift of the central and peripheral stars, thereby diminishing the "dark matter" effect.

In summary: The DUT predicts that the apparent dark matter effect is approximately proportional to the gradient of the internal gravitational potential of the galaxy. Applying this prediction to the galaxies DF2, DF4, DF9, and NGC 1277, a very small contribution from the effect is expected due to their reduced internal gradients.

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