

## **On the Absence of Dark Matter in the Milky Way\***

Pavle I. Premović

Laboratory for Geochemistry, Cosmochemistry & Astrochemistry,  
University of Niš, pavleipremovic@yahoo.com, Niš, Serbia

The Milky Way is one of billions of galaxies in the Universe. Cosmologists estimated that the Milky Way is approximately 13.6 billion years old. It is a large spiral system containing hundreds of billions of stars embedded in a large gas reservoir - mostly hydrogen and helium. Most stars in this galaxy exist either as single stars or as double stars. One of the single stars is the Sun. Besides these two, there are clusters of stars and stellar groups with tens to thousands of stars. Most stars, as our Sun, have at least one planet orbiting them.

Current cosmology estimates that 25 % of the Universe is made up of “dark matter” and about 70 % of “dark energy” and the rest about 5% is ordinary matter. These two things do not interact with ordinary matter and light (and other forms of electromagnetic radiation) so it is impossible to detect employing modern instrumentation. Their existence is mainly based on the observable indirect evidence of their strong gravitational effect on the galaxy’s stars. We will here focus our attention on some recent concerns related to the dark matter of the Milky Way.

The current astronomical data suggest that the stars in the outer part of the Milky Way orbit much faster than the inner ones which is against Kepler’s laws. This observation is explained by the presence of dark matter associated with this galaxy<sup>1</sup> whose gravitational effect makes the faster-than-expected orbital speeds of outer stars. This matter forms a halo around our galaxy but the ordinary matter is mainly situated in its central part where most of the stars dwell. It is important to note here that the Earth resides in the halo of the Milky Way.

Based on the effects of gravity in the Milky Way, scientists believe that there is a high concentration of dark matter near the galaxy’s center, around the supermassive black hole that resides there. The current cosmology states that during the history of the Milky Way, this matter has guided and sustained the formation and evolution of our galaxy. It seems that dark matter prevents the disintegration of the Milky Way due to its rotation and thus the disintegration of its star systems with their planets, including the Earth. The gravitational attraction of this matter keeps stars, dust, and gas together in our galaxy. In other words, dark matter maintains the existence of the Milky Way. Simply speaking no dark matter, no Milky Way, no the Solar system and its planets including the Earth and its life.

Recently, Ou et al [2] published their measurement of the speed of the stars in the Milky Way and suggested the stars closer to the edge of the Milky Way rotate more slowly than expected.

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\* See also [1].

<sup>1</sup> The evidence for dark matter in the Milky Way comes from the rotation curve of this galaxy.

They reason that there is less dark matter in the center of our galaxy. Moreover, recent research carried out by Gupta [4] appears to indicate dark matter is absent from the Universe.<sup>2</sup> If this is true the following intriguing question arises: how a massive galaxy such as the Milky Way was formed without dark matter?

Now, the second intriguing question appears: how does this galaxy survive without dark matter for 13.6 Gy? The origin of the Milky Way in the Universe without dark matter and its existence for so many billion years is a cosmological mystery. We leave this mystery in the hands of cosmologists.

Entropy is a fundamental concept in thermodynamics and statistical mechanics that measures the degree of disorder or randomness in a system. This is a key concept for understanding the behavior of physical systems.

In physical science, a system may be an isolated system, a closed system, or an open system. A physically isolated system that does not exchange matter or energy with its surroundings. A closed physical system allows only the energy exchange with its surroundings but not matter. An open physical system can interact with its surroundings by exchanging both matter and energy. The Milky Way is a thermodynamically closed system. The current definition of the Second law (of thermodynamics) states that the entropy of a closed system tends to increase over time. So, the entropy of the Milky Way tends to increase.

The Milky Way can be considered a highly organized complex cosmic structure. In a first approximation, this galaxy can be thermodynamically viewed as a low-entropy physical system. Without dark matter, for this structure to be stable during 13.6 there would have to be a constant external input of energy. The question is, what is the source of this energy? Dark energy? Unlikely. Cosmologists have to deal with this issue too.

Within biblical teaching, one can hypothesize that the Spirit of God maintains, instead of dark matter, the survival of the Milky Way, the Solar system, the Earth, and its life. For this reason, we remind the reader again of the sayings in the Letter to Diognetus: "*God loved men. For their sake, He made the cosmos and subjected everything on earth to them. To them alone He gave understanding and speech, them alone He allowed to look up to heaven, them alone He formed in His image,...*" {See also [1]}.

## References

- [1] P. I. Premović, *On the absence of dark matter in the galaxy NGC 1277*. GSJ, April 2024.
- [2] X. Ou, A.-C. Eilers, L. Necib, A. Frebel, *The dark matter profile of the Milky Way inferred from its circular velocity curve*. MNRAS, 528, 693-710 (2024).
- [3] S. Comerón, I. Trujillo, M. Cappellari, et al., *The massive relic galaxy NGC 1277 is dark matter deficient - From dynamical models of integral-field stellar kinematics out to five effective radii*. A&A, 20, 1-30 (2023).

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<sup>2</sup> Of note, there are few galaxies without dark matter. For instance, new findings by the research team led by Comerón [3] indicate dark matter is absent from the massive lenticular galaxy NGC 1277.

[4] R. J. Gupta, *Testing CCC+TL cosmology with observed baryon acoustic oscillation features*. ApJ, 55, 964-971 (2024).