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Research Article

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COLD DARK MATTER: THE ASSOCIATION BETWEEN TIME REVERSIBILITY AND THE ENTROPY

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ABSTRACT

Entropy is a key thermodynamic concept centred on randomness and irreversibility. Its link to time suggests that time itself is also fundamentally irreversible. However, in our hypothetical scenario like as and putting into a glass of water, sand could seem to sink into the bottom, which mean time may flow balance between disorder and order. In this case, time might be reversible, not as a continuous process of entropy increase. For instance, flipping an hourglass in a bottle causes the sand to flow backward, demonstrating that under specific spatial conditions, the process can be reversed and is not strictly unidirectional. Visualizing the universe as a bottle, the direction of time could appear to change depending on the observer's viewpoint. Modifying space's curvature implies that time could indeed be reversible. This research paper examines the possibility of time's reversibility from different perspectives and conditions. We focus on dark matter, super black holes, and the potential for time reversal. Additionally, we suggest that random is not a purely random element. Instead, entropy might change in certain following patterns, which could render time reversible if conditions allow.

Keywords: Entropy, Reversibility of Time, Cold Dark Matter, Sand-like-Time Matter, Time reversibly, Super black-hole, Super black-hole >=2

INTRODUCTION

Cold dark matter (CDM) consists of slow-moving particles that weakly interact with ordinary matter and light. As part of the Lambda-CDM model, CDM explains how these particles influenced the universe's large-scale structure, evolving from an initially uniform state to the galaxies we see today. CDM particles are characterized by their speed, which is much slower than light, hence the term "cold," in contrast to faster-moving "hot" dark matter like neutrinos. Their sluggish movement enables density fluctuations to grow under gravity, leading to galaxy and cluster formation. Candidates for CDM include WIMPs, axions, and primordial black holes, all non-relativistic and invisible to electromagnetic detection. In simulations, the cosmic web visualization shows CDM (represented in blue) forming filaments and halos around galaxies, matching observations. CDM plays a crucial role, accounting for about 27% of the universe's mass and holding galaxies together against their rotation speeds. Hierarchical clumping of cold particles results in small structures merging into larger ones, whereas hot dark matter tends to smooth out structures too extensively.

Hot vs. Cold Comparison

Aspect	Cold Dark Matter	Hot Dark Matter
Particle Speed	Slow (non-relativistic)	Fast (relativistic, e.g., neutrinos)
Structure Formation	Bottom-up: dwarfs merge to galaxies	Top-down: large sheets fragment
Observational Fit	Matches galaxy clusters, CMB	Fails large-scale structure

From: physicsforums.com [4]

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DISCUSSION

Dark Matter Massive gravitations in Deep IR

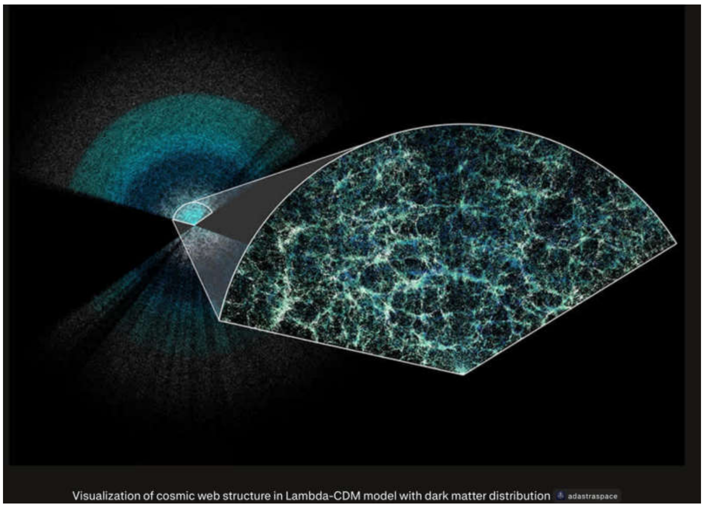

Figure 1: Dark Matter image in Lambda-CDM model

As long as the boundary conditions are adjusted correctly, reversing spacetime dynamics could theoretically be achieved. Significantly, the framework presented here remains completely consistent with the Cold Dark Matter paradigm. If dark matter has an hourglass-shaped distribution, then our proposed hourglass mechanism fits the central assumptions and theoretical bases of Cold Dark Matter theory, possibly offering a quantum field theory perspective on dark matter interactions mechanism in a curved spacetime manifold.

When considering the revisability of time, we need to emphasize the core principles set by Sadi Carnot. Recognized in 1824 as the founder of thermodynamics, Carnot, a French engineer and physicist, established thermodynamics as a distinct branch of physics. His groundbreaking work introduced the Carnot cycle and formed the basis for the second law of thermodynamics. The concept of absolute zero temperature was later introduced as a key reference point. According to the zeroth law of thermodynamics, thermal equilibrium occurs when heat flows from the hotter object to the colder one until balance is achieved. Applying this to space's vacuum implies that thermal energy will continually dissipate into the universe, causing heat transfer over vast periods. This process is similar to adding milk to coffee: molecules spread out until a uniform temperature is reached. These ideas led to the development of the second law of thermodynamics, which describes entropy as a measure of disorder that tends to increase in isolated systems, driving spontaneous processes and energy distribution [1][2][3].

Entropy is a core concept in thermodynamics [1][2], describing the level of disorder or randomness in a system. It is closely tied to irreversible processes, illustrating why entropy tends to increase, as stated by the Second Law of Thermodynamics. This unidirectional aspect of entropy underpins the arrow of time, contributing to the observed temporal asymmetry in large-scale phenomena. However, in a hypothetical scenario with a reversible notion of time, such as within a controlled, theoretical environment, certain conditions could make processes reversible. For instance, imagine an idealized hourglass sealed in a rigid container. If this container is rotated, the granular sand, which normally falls from the top to the bottom, could, hypothetically, flow back in the opposite direction if factors like friction and air resistance are removed. This suggests that under specific spatial or boundary conditions, like certain spacetime curvatures or engineered setups, time might be modeled as reversible. In that context, the typical asymmetric increase in entropy could appear symmetric, indicating that entropy's irreversibility relies on specific circumstances.

From a broader cosmological perspective, if we think of our universe as a closed system similar to a sealed container, then observations of the direction of time could heavily depend on the observer's frame of reference and the geometric properties of spacetime. Different viewpoints or spacetime curvatures can lead to contrasting interpretations of whether processes move forward or backward in time; what appears as entropy increasing from one frame might be seen as entropy decreasing from another. This indicates that the apparent arrow of time is, at least in part, relational and relies on the geometry of the spacetime manifold.

Therefore, by adjusting the curvature of spacetime or changing the observational perspective, the fundamental irreversibility associated with entropy can, in theory, be made reversible within certain moment (our Sand-Water-Glass-Time Dynamic (SWGT) Framework Hypothesis).

Exploring such scenarios involves examining how spacetime geometry, boundary conditions, and initial states affect the direction of time and related thermodynamic processes. This discussion aims to carefully analyze the conditions under which time may appear reversible and how these conditions connect to the fundamental physical principles that govern entropy and the structure of spacetime.

While the idea that entropy always increases as a core part of the second law of thermodynamics is widely accepted, the strength of the entropy increase idea is not absolute. It's important to understand that entropy growth can, under certain conditions, behave in steps rather than continuously, which challenges the traditional view of a steady increase. If we imagine time as a granular, discrete foundation like a grain of sand, then how we perceive and measure the flow of time can differ greatly depending on the observer's perspective and the specific thermodynamic and quantum states involved. These views emphasize the subtle and context-dependent nature of how entropy changes in complex thermodynamic systems.

This research paper try to explore whether the second law of thermodynamics, particularly the principle of ever-increasing entropy, applies universally to all specific thermodynamic and non-equilibrium situations. It aims to critically explore the fundamental nature of time through a new theoretical framework, challenging the traditional view that entropy always increases. The study seeks to determine whether the process of entropy production is fundamentally irreversible or if certain conditions allow for reversibility within thermodynamics. Using advanced concepts from quantum mechanics and non-equilibrium thermodynamics, this work strives to offer a comprehensive reinterpretation of the arrow of time and evaluate the universality of the entropy increase hypothesis.

The second law of thermodynamics states that in an isolated system of the universe, entropy, measured as the system's disorder, tends to increase naturally and irreversibly, showing a one-way progression. This means that in an isolated system, entropy will never decrease, reflecting an inherent arrow of time. Many physicists interpret this entropy increase as the foundation of the arrow of time, creating a fundamental connection between thermodynamic irreversibility and the direction of time. However, if we see time as a non-essential concept that emerges from more basic spatial and temporal structures in different quantum “state,” the classical idea of time moving in one direction might not always apply. Although entropy appears to grow continuously and is statistically likely, this view only holds under specific boundary and initial conditions. Its relevance can change when considering quantum gravity or multiverse theories that question traditional ideas of time.

Using the hourglass analogy to illustrate the nature of time provides a fundamentally different perspective. In this analogy, time might appear reversible because the granular material, such as sand, can fall back into its initial shape, implying a reversible process under specific conditions involving matter states and spatial configurations. This indicates that, in some cases, the arrow of time could be bidirectional, depending on whether the underlying physical processes are reversible.

As thermodynamics typically relies on a limited, non-generalized idea of time, the notion of entropy increase isn't universally applicable across all physical conditions. If our new hypothesis holds true, then integrating a fundamentally reversible concept of time into thermodynamic models would necessitate a reexamination of the second law of thermodynamics.

This research paper presents a conceptual experiment to challenge the idea that time is an irreversible concept. Instead, we suggests that temporal phenomena result from the interaction of multiple, intersecting spatial-temporal manifolds within a higher-dimensional framework. According to our (SWGT) model assumption, the conventional concept of a one-way thermodynamic arrow of time loses its validity, as the flow of time becomes dependent on context. Although entropy, as outlined by the Second Law of Thermodynamics, generally increases steadily, this pattern only applies under specific boundary conditions and assumptions about initial low-entropy states, which may not be valid in a universe where time is emergent rather than fundamental.

Using the hourglass analogy, when sand is sprinkled into a cup of very hot water, it initially disperses evenly but later settles and sinks in a structured way; this is not just random diffusion. Similarly, once cooled after heating and dispersion, the sand does not scatter randomly but sinks in an orderly pattern. Under this new perspective, time within the isolated water system doesn't initially spread randomly but gradually converges in a coordinated manner.

Using our conceptual framework of an hourglass, the dispersion of granular particles, similar to sand, into a water medium at high temperatures initially seems to happen in a random, ballistic way. However, over time, the granular material gradually settles through thermodynamically driven, organized layering rather than random diffusion. When the heated granular material cools and disperses again, it does not return to random diffusion; instead, it follows a predictable pattern of sedimentation influenced by gravity and particle interactions within the fluid. As a result, within this closed thermodynamic system, like a cup of water, the changing distribution of particles over time does not randomly likely. Instead, it shifts toward an organized-driven aggregation, consistent with non-equilibrium thermodynamics and the kinetic theory relevant to granular flows.

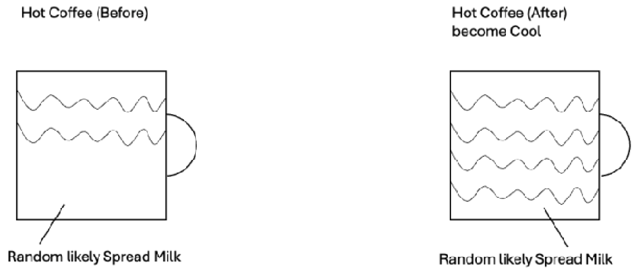

Figure 2: A random splash of milk spread through the coffee pot

This phenomenon illustrates a reversible thermodynamic process rather than a one-way increase in entropy. Imagine a vessel with hot water into which sand particles are added. Initially, the heat causes the sand to disperse chaotically, raising the system's entropy. As the system cools, the kinetic energy decreases, and the sand particles shift from a scattered, disordered state to a more organized, aggregated form. This spontaneous reorganization, driven by thermodynamic equilibrium, contrasts with the traditional view of entropy always increasing irreversibly. It shows that entropy is not exclusively a marker of irreversibility; under certain quantum state, spacetime curvatures, thermal and energetic conditions, it can be reversible. Aligning with the quantum mechanic concept.

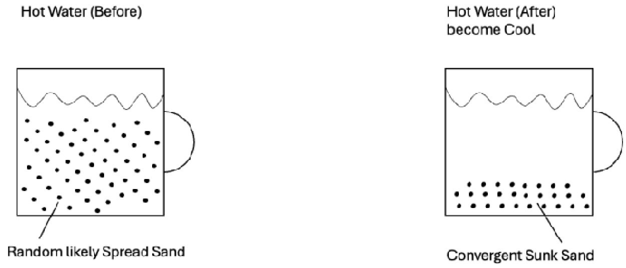

Figure 3: Random likelihood Spread Sand & Convergent Sunk Sand

When sand is first added to hot water, the particles spread out randomly, mainly due to thermal movement. As the water cools, the particles lose energy, shifting from random spread to forming organized clusters. This steady, downward settling of sand suggests a change from random behavior to a semi-structured state, similar to a systematic, cohesive formation.

Applying this idea to the fabric of spacetime, we can hypothesize that such continuous and organized aggregation might serve as an analogy for a new kind of matter or energy. In particular, this could be related to a new type of matter that shows temporal coherence, what we might call "sand-like-time matter, "which could differ from traditional entropy-based models. This hypothetical form might give us insights into dark matter, offering an alternative explanation based on organized, non-entropy-driven particle behavior that follows a consistent downward aggregation within the cosmic spacetime continuum.

This phenomenon can be explained by the fact that different substances, each in separate independent states, can be applied to various physical systems, such as spacetime. Changes in spacetime geometry, dimensionality, and the intrinsic properties of these substances can greatly affect how time is perceived and measured. These effects result from the interaction between the substance's quantum state, the curvature of spacetime, and the dimensional framework in which these systems exist, we call it “Li-siri” particle.

Applying a one-way process to the coffee example leads to a practically irreversible change because of entropy increase in thermodynamics. When viewing the system as made up of separate, isolated parts, like warm water, hot water, or hot milk, and adding substances of different masses such as sand, the resulting state of each part can vary greatly. This variation is influenced by the physicochemical properties, including their specific heats, densities, and how they interact with the liquids.

Therefore, the increase in entropy is not always consistent; it depends entirely on the nature of the substances and quantum state involved. Changes in conditions will lead to different equilibrium states due to the varying properties of the substances.

Applying the principle of unidirectional entropy increase to the thermodynamic example of a coffee system shows that the entropy change is essentially irreversible in this context. However, when examining the systems like (SWGT) framework made of sand and hot water, the apparent irreversibility of entropy increase may not apply.

It can depend on factors such as the system's mass and the observation time scale, which can make the process potentially reversible under certain conditions. Therefore, considering different experimental or theoretical viewpoints that yield varying results challenges the common idea that entropy increase is always linked to the unidirectional arrow of time. This discussion aims to show that the flow of time in thermodynamic systems is not necessarily diffusive; it is shaped by the specific variables and boundary conditions of the system.

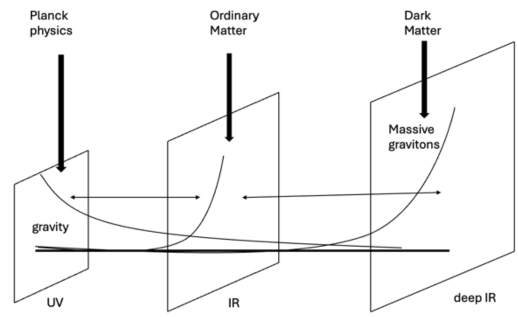

Figure 4: Dark Matter Massive gravitations in Deep IR

Figure 5: Dark Matter in Cosmic Web from NASA

Assuming the boundary conditions change properly, it is theoretically possible to reverse spacetime dynamics. Crucially, the framework described here remains fully compatible with the Cold Dark Matter paradigm. If dark matter has an hourglass-shaped distribution, then our proposed hour-sand-glass mechanism fits within the core assumptions of Cold Dark Matter theory. This could even provide a quantum field theoretic explanation for dark matter interactions within a curved spacetime (figure 4, 5).

So, as discussed in the first part, dark matter is still an unknowable substance. We only know it does not interact with light and electricity, but it may interact with gravity. The gravitational attraction of stars and planets could be coherent and interact with dark matter. However, dark matter is a special type of substance in which it will only fall-&-sink and be hard to detect. In this research paper, we refer to it as a sand-like particle that interacts with gravity.

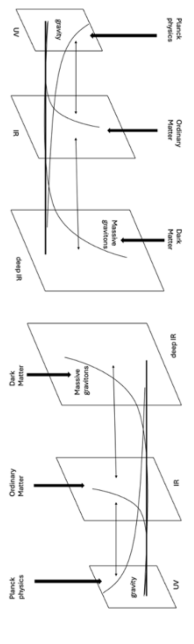

Figure 6: An upside-down circular model

As illustrated in Figures 6 and 7, this research study postulates that dark matter may exist in a circulating, fall and sink dynamic form. From this perspective, dark matter exhibits a continuous motion that can be described as a form of "falling" occurring in any direction of the vector field. Consequently, depending on the point of observation, the perceived "head" and "tail" of this circulation may appear reversed. Thus, although dark matter seems to follow a fall and sink pattern when observed from a planetary standpoint, it may in fact be engaged in a continuous, circulating motion. This circulation plays a crucial role in holding galaxies together and interacting with gravitational forces.

It is well-established that the Milky Way galaxy hosts a central super massive black hole, Sagittarius A*, with a mass of approximately four million solar masses. However, emerging hypotheses in astrophysics propose the existence of a binary super massive black hole system within our galaxy, with one black hole situated near the galactic core on the right side and another symmetrically positioned on the opposite side. This dual black hole configuration could play a significant role in the gravitational dynamics and stability of the galaxy, potentially influencing the retention of galactic structure despite the cosmological expansion driven by dark energy. In this research paper, we postulate, our galaxy may have more than 2 super-massive-blackhole, **4 super massive blackhole** which our innovative suggestion (figure 7), our model challenges traditional single-black-hole paradigms and further exploration in theoretically into super massive black hole interactions and galaxy evolution.

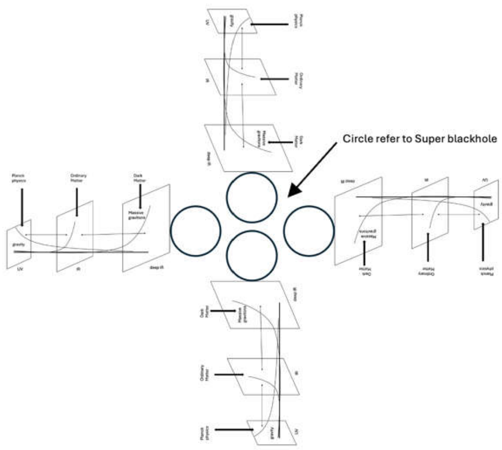

Figure 7: Circular form of Dark matter Model

To illustrate this concept (see Figure 7), this research postulates that in our galaxy, and possibly in other similar galaxies, there may exist more than two super massive black holes (i.e., assuming >=2) that collectively bind stars and planets through their gravitational influence. This phenomenon might be evidenced by the observed behavior of dark matter, particularly in the directional flow or "sinking" movement on the opposite side of the galactic rotation. Such interactions in the circulation of dark matter could contribute to the stable positioning of planets and stars within the galactic structure. Our proposed circulation model (Figure 7) therefore provides a potential mechanism for maintaining the coherence and boundary alignment of the entire galaxy.

Furthermore, the hypothesized super massive black hole may exert a significant gravitational influence that contributes to the orbital stability of the planetary body, effectively preventing it from dispersing into interstellar space. In our ongoing study into dark matter, it is plausible that the apparent infalling motion of dark matter particles results from complex gravitational interactions, including a push-pull mechanism driven by multiple massive constituents. Specifically, while observations suggest dark matter appears to be sinking towards a certain region, this could be an optical effect caused by the attraction of dark matter particles toward an underlying super massive black hole. From an inertial frame of reference, what appears to be a downward movement might instead be a response to gravitational gradients established by an array of super massive black holes situated within or beneath the galactic core. Analogous to the conventional two-body gravitational interaction, the presence of multiple super massive black holes within the Milky Way could create a dynamic gravitational potential landscape, leading to in fall patterns among dark matter components.

CONCLUSION

In conclusion, entropy remains a fundamental principle in thermodynamics, representing the level of disorder or randomness within a system. Its inherently irreversible nature aligns with the unidirectional flow of time, but we find that it does not apply well in all situations. In our research paper, we suggest that when considering spacetime curvature and specific boundary conditions, scenarios such as the hypothetical reversal of an hourglass “sand” indicate that the perceived arrow of time may not be absolute under certain conditions, such as within the “sand-like particle and sand like bottle.”

In this research paper, we inventively call the cold dark matter the **sand-like cold dark particle matter**. Under specific geometric and topological configurations of the universe, processes that appear irreversible could, in theory, be reversible (Time). Therefore, our research proposes that by manipulating spacetime geometry, the fundamental irreversibility associated with entropy and temporal evolution might be bypassed, implying that cosmic anisotropies and curvature could influence the true nature of temporal asymmetry, and suggesting that "time" may, in fact, be reversible. Our paper also postulates that there may exist an undiscovered super-black hole that attracts dark matter. Since dark matter is believed to move slower than the speed of light, this deceleration could potentially result in a form of time suspension. These consequences may arise from the interaction of dark matter's properties. If entropy is a correct theory, then dark matter's properties might not behave as traditionally thought. Instead, this paper suggests that dark matter may sink in a structured, ordered pattern rather than randomly, indicating it might follow a more organized sequence, perhaps representing a more orderly form of matter. Hope my research paper can contribute to the world and mankind.

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