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RESEARCH ARTICLE

CLOSE CIRCUIT UNIVERSE AND OPEN CIRCUIT UNIVERSE (Dual Universes Model)

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ABSTRACT

According to Hopkins's theory, the universe was created through compression, where all materials, matter, and space were folded into a very tiny state. During this extreme compression, it blows off at the critical moment and explodes. This big bang movement then creates the universe [1]. Albert Einstein considers it as space-time since he views the universe as a whole, where time and space cannot be separated. Therefore, time needs space to grow, and space needs time to expand. This time-to-space relationship is the core concept of Einstein's field theory of the universe [2]. Although their ideas can help explain why the universe begins and how it expands, they rarely discuss the existence of multiple universes or the possibility of different universes. In this research paper, we aim to explore a new idea for the formation of universes, considering the closed-circuit and open-circuit concepts of universes. That may provide insight into how we see the universe's mechanism differently. In addition, we will utilize the topology of Hamilton's hypothesis as a tool to develop a new assumption that explains that other universes may exist beyond our origin, so that, we may explore the origins of space and time, in a different way of perspective, which may go beyond the traditional concept of the origin.

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INTRODUCTION

In the context of Planck-scale physics, we consider the early universe as a blackbody thermal system characterized by a Planck temperature. During the rapid expansion phase of the universe, often modeled as cosmic inflation, the entropy associated with the cosmic horizon increases, but as the universe expands and cools, the temperature decreases inversely with scale factor expansion. We propose that in the late stages, as the temperature approaches extremely low values, gravitational effects may induce a contraction phase, since the decrease in thermal pressure might be insufficient to counteract gravitational attraction. This negative feedback could result in a deceleration of cosmic expansion, or even eventual contraction, as the dynamic Hubble parameter evolves. Over cosmological timescales, this deceleration might lead to a scenario where the rate of expansion diminishes to the point that the temperature approaches a limiting value, potentially approaching absolute zero asymptotically. As temperature drops, entropy production via thermodynamic processes diminishes, potentially halting further entropy increase. According to the generalized second law of thermodynamics extended to relativistic spacetime manifolds, when the total entropy production ceases, simplifying a thermodynamic equilibrium, the flow of cosmic time, governed by the arrow of time associated with entropy, would effectively come to a halt. In such a state, spacetime would

reach a quasi-static configuration where both temporal and spatial degrees of freedom are frozen. Ultimately, the universe might undergo a gravitational collapse or 'Big Crunch' when the entropic and energetic conditions can no longer sustain an expanding spacetime manifold, leading to a singularity. This research article discusses the potential scenario of a cosmological contraction, commonly known as a 'Big Crunch,' where extreme gravitational forces could cause the universe to shrink dramatically. In this process, all matter and energy might be compressed into a singular, infinitesimal point of infinite density, effectively a gravitational singularity. With our postulate of cyclic models of the universe, we propose that such contraction (our Universe) could be followed by a rebound (big bang) or a phase transition leading to subsequent expansion. As we suggested, it may cause our universe to experience a significant big bang effect again. (When our universe shrinks into a point of the origin). The universe can be conceptualized as an open circuit system within the framework of theoretical physics. In this model, the process of extracting or observing one segment of the universe can be interpreted as an effective extension or expansion of its complementary region. This conceptualization leads us to hypothesize the existence of a dual cosmological domain that undergoes contraction concurrently with the expansion of our observable universe. Analogous to considering two symmetrical cylindrical structures in a duality universes

framework, the topology of a conical manifold could represent a distinct but related sector of the multiversal landscape. Such a duality implies the existence of two interrelated universe regions exhibiting mirror-symmetrical gravitational and metric properties: while one region experiences metric expansion consistent with (FLRW) solutions while other universes being shrink at the same time as we postulate. Our suggestion is that there is a dual region of the universes while we expand, others will shirk, and vice versa. It means, when we expand, the other corresponding region will undergo contraction. This duality resonates with the broader conceptual dichotomy between our close and open cosmological models, we suggesting an interconnected multiverse where boundary conditions at the asymptotic limits govern the evolution dynamics of each sector. This paragraph presents a well-reasoned discussion on the theoretical framework underpinning the proposed cosmological model, which is grounded in the fundamental principle of energy conservation as articulated by the law of conservation of energy an inviolable principle in both classical and modern physics. Our model considers both closed and open universe configurations, adhering to the energy conservation law within each framework. The 'expand-contract' cosmological paradigm employed here aligns with the classical and quantum mechanical interpretations of universe models, The (FLRW) solutions can provide strong support for our new model with different curvatures parameters which refer to dual universe concept. Furthermore, the reflectance of these models on entropy considerations correlates with the thermodynamic arrow of time, consistent with the second law, which states that entropy tends to increase in an isolated system. The conservation law manifests in binary states, affiliated to the logical dichotomy of 0 (absence of energy exchange or static state) and 1 (active energy transfer or dynamic state), thereby encapsulating the fundamental quantized nature of physical states. This approach integrates thermodynamic principles, quantum information theory, and relativistic cosmology, offering a comprehensive perspective on the energy dynamics governing the universe's evolution.

Utilizing the harmonic oscillator lattice phonon model as an overarching conceptual framework for the mechanistic support of measurement processes enables a comprehensive theoretical justification for its continued application as an analytical tool within condensed matter physics and quantum information science. This framework exploits the quantization of lattice vibrational modes—phonons—as fundamental bosonic quasiparticles, which facilitate a detailed understanding of phonon-mediated interactions, decoherence mechanisms, and energy transfer processes. By modeling the lattice vibrations through these quantized vibrational eigenmodes, we can enhance the precision, reproducibility, and coherence properties of measurement protocols, thereby providing a robust microscopic foundation for interpreting complex quantum phenomena and designing more stable, high-fidelity quantum measurement schemes. The harmonic oscillator concept can be generalized to a one-dimensional crystalline lattice composed of a multitude of identical particles, typically atoms or ions arranged periodically. Consider a one-dimensional quantum harmonic chain consisting of N identical atoms that are coupled via elastic interatomic forces. This model constitutes a fundamental quantum mechanical framework for understanding lattice dynamics, serving as a simplified yet insightful representation of more complex solid-state systems. Within this model, quasiparticles known as phonons emerge as

quantized collective excitations of lattice vibrational modes. The theoretical formalism developed for this one-dimensional lattice system can be systematically extended to higher-dimensional frameworks, such as two- or three-dimensional crystal lattices, facilitating the exploration of a broad spectrum of vibrational phenomena in condensed matter physics.

Suggestion: The positions of the masses within the lattice are denoted as x_1, x_2 , etc., measured relative to their respective equilibrium positions, which are defined as $x_i = 0$ when the i -th particle is exactly at its equilibrium state. In multidimensional systems, these position vectors are treated as multi-component quantities, i.e., vectors. The Hamiltonian describing this system can be expressed in terms of the atomic mass m , as well as the position operators x_i and the conjugate momentum operators p_i for the i -th atom. This sum encompasses interactions between nearest neighbors, indexed by j , with the summation over the adjacency of the lattice (i.e., nearest neighbor pairs). Formally, the Hamiltonian can be written as:

$$H = \sum_{\{i\}} [(m/2)(x_i^2 + p_i^2)] + \sum_{\{i, j\}} V(x_i - x_j),$$

where m is the uniform atomic mass, and $V(x_i - x_j)$ represents the potential energy associated with the displacements between neighboring atoms. To facilitate analysis, especially for systems with periodic boundary conditions, it is standard practice to (Fourier) transformation the Hamiltonian into reciprocal space. This is achieved by expressing the displacement and momentum operators in terms of normal mode coordinates characterized by wave-vector q , which simplifies the problem by decoupling the equations of motion for collective excitations (phonons). Such a transformation enables an elegant and powerful analysis of lattice dynamics, capturing the essence of vibrational spectra in crystalline solids. This can provide a theoretical explanation to support our new model (Closed Circuit and Open Circuit Universes).

Expansion & Contraction of either side of the universes (Close~Open Circuit of Universes)

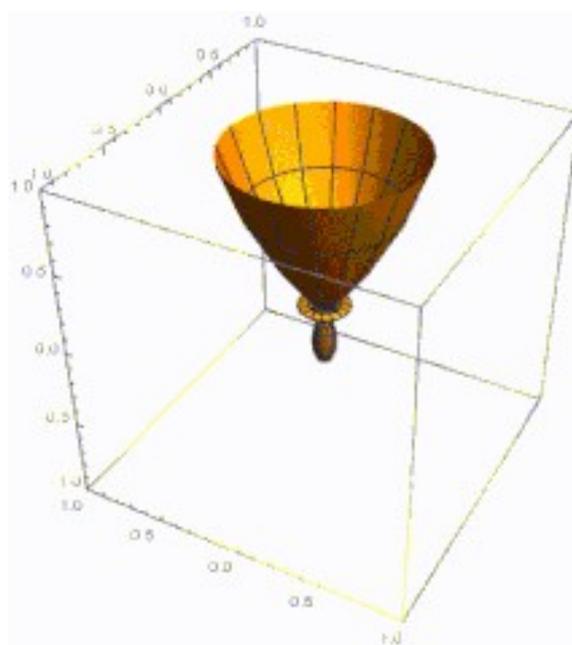


Figure 1. Cc: Oscillating Dipoles. Wiki

The provided excerpt discusses the superposition principle applied to a system comprising the oscillating dipoles, emphasizing the temporal evolution of the combined wave function associated with various quantum numbers (n, l, m). It introduces a set of N generalized normal-mode coordinates, denoted as Q_k , which are constructed as discrete Fourier transforms of the displacement vectors (x_s), facilitating the analysis of vibrational modes in reciprocal space. Additionally, it defines N conjugate momenta, Π , as Fourier transforms of the corresponding momentum operators (p_s). Here, the parameter m signifies the uniform atomic mass assumed for each constituent atom, while x_i and p_i represent the position and momentum operators for the i th atom within the lattice. The summation notation indicates interaction terms limited to nearest-neighbor coupling (nn). Typically, the Hamiltonian formalism is reformulated by expressing it in terms of normal mode wavevectors rather than direct particle coordinates, thereby enabling the application of Fourier space techniques to simplify the analysis of collective excitations and phonon dispersion relations.

The parameter " k_n " denotes the phonon wave vector, which is quantitatively defined as 2π divided by the phonon wavelength. Owing to the finite size of the atomic lattice, the permissible values of " k_n " are discretized, ensuring the compliance with the canonical commutation relations within both real space and reciprocal (wave vector) space. This discretization stems from the boundary conditions imposed by the finite number of atoms in the crystal lattice, leading to a quantization of phonon modes. In the canonical formalism, the coupling terms that connect the displacement and momentum operators have been systematically eliminated to simplify the Hamiltonian representation. The operators Q and Π , representing the generalized position and momentum variables in this framework, are inherently non-Hermitian when considered in their current form. If these operators were Hermitian, the subsequent transformed Hamiltonian would correspond to a collection of N independent harmonic oscillators, each describing a distinct vibrational mode of the lattice, thereby facilitating straightforward analysis of quantum states and energy spectra.

The mode of quantization is heavily dependent on the prescribed boundary conditions of the system. For the sake of clarity and computational simplicity, periodic boundary conditions are typically assumed. This implies that the atomic chain is considered to be topologically equivalent to a closed loop—effectively, the $(N + 1)$ -th atom is identified with the first atom, creating a seamless, cyclic lattice. This boundary condition enforces discrete translational symmetry and leads to a specific quantization condition for the wave vectors. The maximum quantum number, n , is constrained by the shortest admissible wavelength mode, which is twice the lattice constant, a , consistent with the Nyquist sampling criterion. The quantized wave vectors, k , correspond to eigenmodes of the vibrational excitations and their associated energy levels can be modeled as eigenvalues of a quantum harmonic oscillator Hamiltonian. When zero-point energy contributions are neglected, the resulting energy eigenvalues form an equally spaced ladder, with spacing determined by the vibrational frequency ω_k , reflecting the harmonic nature of lattice vibrations in the phonon depiction. The discussion pertains to the conceptual framework of multiverse theories, specifically contrasting closed and open universe models, with an analogy

to circuit proton dynamics. We examine the superposition principle involving three additional oscillating dipoles, aiming to illustrate the temporal evolution of a shared wave function across varying quantum numbers n_2, l_2 , and m_2 . Subsequently, a set of N 'normal modes' or 'normal coordinates'—denoted as transformant Q_k —is introduced; these are formally defined

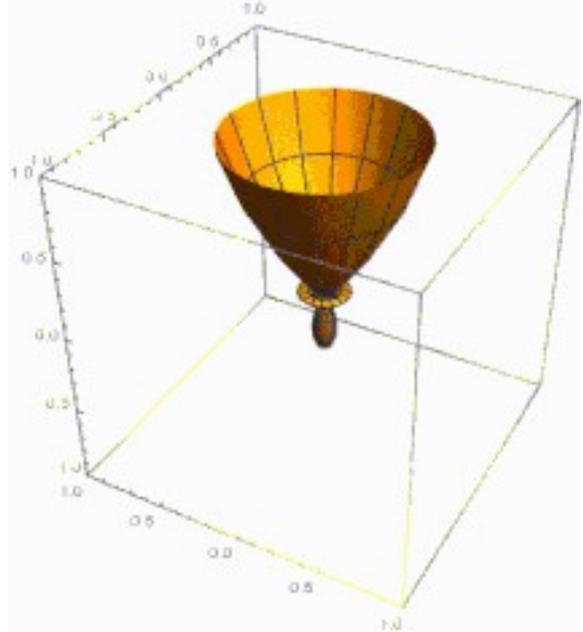


Figure 2. Cc. Harmonic Oscillator.Wiki

as discrete Fourier transforms of spatial variables ' x_s '. Additionally, N conjugate momenta, represented as Π , are introduced, corresponding to Fourier transforms of the momentum variables ' p_s '. Another visualization depicts the time evolution of the joint wave function for three distinct atomic systems, highlighting the influence of angular momentum quantum numbers on the probability distributions. This effect emerges due to transformations that are conceptually mapped onto alternate regions of a multiversal landscape, emphasizing the interplay between angular momentum and the wave function's spatial-temporal behavior in a multiverse context. The parameter " kn " denotes the proton's wave number, which is mathematically defined as the ratio of 2π to the wavelength. This quantized value emerges due to the finite number of atomic constituents in the system, ensuring the preservation of canonical commutation relations in both real space and reciprocal (wave scattering) space. Building upon fundamental quantum mechanical principles, it can be demonstrated—using elementary trigonometric identities—that the potential energy component corresponds to the Hamiltonian operator's representation in the scattering state space. In the momentum (or wave vector) basis, the Hamiltonian can be expressed as a quadratic form, often represented as one-half of the effective mass (exit $[M]$) multiplied by the squared magnitude of the wave vector operator $\text{extbf}[Qa_i]$. This formulation implies that, upon quantization and in the presence of perturbations, the total energy can be developed as a sum over the eigenstates of $\text{extbf}[Qb_i]$, considering the temporal evolution as a steady-state flow of quantum information within the system. This methodological modification is employed in the current research study concerning the Hamiltonian formulation of a one-dimensional lattice system. The Hamiltonian, initially expressed as $H = (1p^p/2M) \Sigma Q_i$, which is akin to the K.E.,

has been transform and reformulated to $2H = (\hbar^2/M) \sum Q_i$, where the coupling terms between the position variables have been explicitly eliminated, effectively decoupling the degrees of freedom. The operators Q_s and Π_s are assumed, for the sake of illustration, to be Hermitian; however, it is important to note that in the actual physical system these operators are generally non-Hermitian. Under the hypothetical scenario where they are Hermitian, the resulting Hamiltonian would correspond to a set of N independent quantum harmonic oscillators, each characterized by its own eigenfrequency. The form of the quantization scheme adopted is sensitive to the boundary conditions applied. In this study, periodic boundary conditions are imposed, meaning that the n th atom and the $(N+1)$ th atom are identified as equivalent, effectively forming a closed loop or a circular chain. Physically, this boundary condition corresponds to connecting the ends of the linear chain, thereby creating a topologically closed system. Within this framework, the wavevector k becomes quantized, approaching the integer I in the limit as N tends to infinity, which defines the allowed momentum eigenstates in the reciprocal space. Temporal and spatial boundary conditions are incorporated into the quantization procedure, ensuring a consistent description of the phonon modes. Lastly, the symbol P denotes the momentum operator conjugate to the position variables, crucial for describing the dynamics within the quantum Hamiltonian formalism.

The expression for the wavevector K can be rewritten in the form: $(K = K_n = \text{segm} \{p_{i_n/2}\} / a)$, where (n) is an integer representing the discrete mode index in the spatial dimension. Here, (a) denotes the lattice spacing. The upper limit for (n) is constrained by the shortest detectable wavelength, which is twice the lattice spacing, $(2a)$, adhering to the Nyquist sampling criterion to prevent aliasing effects. Regarding the quantum harmonic oscillator modes, the energy spectrum for a mode characterized by wavevector (k) is quantized as: $(E_{n_i} = \{n_i\} E)$ Right, which mean the $\text{segm} \{1\} \{2\} = \hbar k$, where (n_i) is a non-negative integer $(0, 1, 2, \dots)$ indicating the excitation level of the (i) -th mode.

This must be in balanced shape between the two categories of energy forms, which adhere to the law of conservation of energy (in the long run). This formulation captures the zero-point energy contribution, represented by $(\text{segm} \{1\} \{2\} = \hbar \omega_{mk})$ constant). Alongside the quantized excitation energies corresponding to different phonon occupation numbers. Ignoring the zero-point energy contribution, the quantized energy spectrum of the harmonic oscillator exhibits evenly spaced, discrete energy levels. Which means at any time of the dual universes, their energy level must be the same in the Total Sum of the two parts of the universes, which it must follow the law of conservation of energy. Specifically, the energy difference between adjacent levels is quantified as $\hbar \omega$, signifying the minimal quantum of vibrational energy required to elevate the system from one state to the next. This quantization process is analogous to the photon case in quantum electrodynamics, where the electromagnetic field, when subjected to quantization, introduces the concept of the photon as the fundamental quantum of electromagnetic radiation. Similarly, in the context of lattice vibrations, the quantum of vibrational energy is termed the phonon, representing a quasiparticle that embodies quantized vibrational modes within the lattice structure. All quantum systems inherently display both wave-like and particle-like behaviors, reflecting the dual nature dictated by

quantum mechanics. To elucidate the particle-like properties of phonons, it is advantageous to employ the formalism of second quantization, utilizing creation and annihilation operators that systematically describe quantized excitations. In the continuum limit—characterized by the lattice spacing " a " approaching zero and the total number of lattice sites ' N ' tending toward infinity—while maintaining the product ' Na ' as a finite constant—the canonical coordinate modes Q_k transform into the independent momentum modes of a quantized scalar field, denoted as $\phi(x)$. Here, the discrete site index ' i ,' which signifies lattice position, transitions into the continuous spatial variable " x " in the field's argument, facilitating a field-theoretic description. This transformation leverages Fourier analysis to diagonalize the Hamiltonian, effectively decoupling the normal modes, and allowing a more tractable analysis of phonon dynamics within the continuum field theory framework. The vibrational modes of a diatomic molecule serve as a quintessential illustration of a two-body quantum harmonic oscillator. In this quantum system, the angular frequency (ω) is a function of both the reduced mass (m) and the individual atomic masses $(m_1$ and $m_2)$. Hooke's atom provides a simplified, idealized model of a helium atom, employing the principles of the quantum harmonic oscillator to facilitate analytical tractability. This model is instrumental in elucidating the behavior of phonons—quanta of lattice vibrations—as previously discussed in condensed matter physics. Drawing an analogy, if we conceptualize the universe as a bipartite system with two entities separated within a single overarching framework, this conceptualization gains intuitive clarity. Furthermore, the dynamics of a charged particle with mass m subjected to a uniform magnetic field B exemplify a one-dimensional quantum harmonic oscillator, characterized by Landau quantization. This phenomenon underpins the discretization of energy levels arising from the cyclotron motion of charged particles in magnetic fields. Therefore, the conceptual framework distinguishing between closed-circuit and open-circuit configurations will be further substantiated through the enhancements in auxiliary support mechanisms that we have delineated, which serve to reinforce the operational integrity and analytical clarity of each system.

CONCLUSION

In conclusion, this research paper aims to explore an innovative conceptual framework for the genesis of the universe by considering the theoretical models of closed-circuit and open-circuit universes. Employing Hamilton's hypothesis on topology, we formulated novel assumptions and mathematical constructs that elucidate the origins of the cosmos. Furthermore, we delve into the implications of these models for understanding the nature of pre-creation conditions, including the characteristics of temporal and spatial dimensions beyond the conventional origin point, thereby offering a comprehensive analysis of universe nucleation and the topology of spacetime. Hope this research article can benefit the world and humanity [3].

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