The Origin of Universal Gravitation: A Unified Model Based on Repulsive Mechanism of Negative-Mass Dark Matter Soup and Graviton Exchange  
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 **Abstract**  
This paper aims to reveal the fundamental origin of universal gravitation. Building upon the previously established cosmic ABC mechanism model, we propose a revolutionary theory of gravitation: Newtonian universal gravitation, in the classical sense, is not a direct attractive force but a macroscopic phenomenon emerging from the repulsive effect exerted by the ubiquitous Negative-Mass Dark Matter Soup (NMDMS) on ordinary matter particles. This paper derives the inevitable existence of negative-mass dark matter from ABC field theory and rigorously demonstrates, through fluid dynamics, how the repulsive pressure of NMDMS precisely reproduces Newton’s law of universal gravitation. Concurrently, the model incorporates gravitons as mediators of interaction at the quantum level, thereby integrating gravitation into the framework of quantum field theory and achieving a unified description of gravitation across macroscopic and microscopic scales. This model provides a self-consistent, computable framework for understanding gravitational behavior from quantum to cosmological scales.  
**Keywords:** Universal Gravitation; Origin of Gravity; Negative-Mass Dark Matter; ABC Mechanism; Fluid Dynamics; Graviton; Equivalence Principle  
 **1. Introduction**  
Newton’s law of universal gravitation and Einstein’s general relativity successfully describe the macroscopic behavior of gravity, yet the fundamental origin of gravitation remains one of physics’ greatest mysteries. Why does all matter possess gravity? Why is gravity so weak and unshieldable? How can gravity be unified with quantum mechanics?  
This paper argues that resolving these questions requires redefining “gravity.” We propose that gravity is not an intrinsic “attractive” property of matter but an emergent, indirect geometric effect. This idea originates from the cosmic ABC model, where the universe comprises electromagnetic vortex fields (A-field), color-charge vortex fields (B-field), and Higgs vortex fields (C-field). Starting from this model, we demonstrate the existence of negative-mass dark matter and elaborate on how its repulsion of ordinary matter simulates Newton’s law of universal gravitation.  
 **2. Origin and Properties of Negative-Mass Dark Matter Soup**  
 **2.1 Derivation of Negative-Mass Solutions from ABC Field Theory**  
In solving the field equations of ABC theory, the potential term of the Higgs vortex field admits multiple vacuum solutions. Beyond the conventional positive-mass vacuum expectation value (corresponding to positive-mass particles), the theory permits a negative-mass vacuum expectation value .  
In the early universe, specific field fluctuations caused certain regions to settle into this negative-mass vacuum. Particles excited in this vacuum acquire mass via the mass operator:

These particles constitute the true dark matter permeating the cosmos: the Negative-Mass Dark Matter Soup (NMDMS). Due to the opposite sign of their mass term relative to ordinary matter, their coupling behavior with the Higgs field is entirely inverted.  
 **2.2 Properties of Negative-Mass Dark Matter**  
 **2.2.**1. **Invisibility**: Its field composition lacks electromagnetic vortex field (A-field) components, rendering it non-participatory in electromagnetic interactions and thus “dark.”  
**2.2.**2. **Uniform Distribution**: It exhibits large-scale homogeneity throughout the cosmos due to non-aggregation with ordinary matter.  
**2.2.**3. **Negative Energy-Momentum**: Per the relativistic energy-momentum relation , the squared negative mass results in an energy-momentum tensor opposite to that of ordinary matter.  
 **3. Macroscopic Mechanism of Gravity: Fluid Dynamic Repulsion Model of NMDMS**  
This section details how the Negative-Mass Dark Matter Soup (NMDMS) generates repulsive pressure equivalent to universal gravitation through fluid dynamics. The derivation rests on core assumptions: (1) NMDMS behaves as an ideal fluid; (2) Its equation of state is governed by negative-mass properties; (3) Interactions between ordinary matter and NMDMS are local.  
 **3.1 Equation of State and Pressure of Negative-Mass Fluid**  
Consider NMDMS as a fluid of non-interacting particles with individual mass () and average number density . Per the virial theorem and ideal gas law, the pressure () relates to density () as:

Since , particle momentum opposes velocity (). Statistically, this yields **positive pressure** () for NMDMS—a critical conclusion.  
 **3.2 NMDMS Density Perturbation and “Gravitational Potential Well” Induced by Ordinary Matter**  
When an ordinary mass () is immersed in NMDMS, its positive mass repels surrounding negative-mass particles, creating a low-density region (“Void”) in NMDMS.  
Define the density perturbation field , where is the unperturbed background density. The repulsion of NMDMS by the mass is equivalent to a positive potential field applied to the fluid. In steady state, Euler’s equation gives:

Crucially, implies and are **parallel**. Near the mass (), NMDMS pressure increases to counter repulsion, reducing local density (). Thus, a positive mass forms a **low-density potential well** in NMDMS.  
 **3.3 Effective Interaction Between Two Ordinary Masses: Deriving Newton’s Law**  
Consider two ordinary masses and separated by distance , immersed in NMDMS.  
 **3.3.**1. **Superposed Density Perturbations**: Each mass creates a density void and . For large separations, total perturbation . Between the masses, overlapping voids yield .  
 **3.3.**2. **Pressure Differential and Effective Force**: The force on arises from pressure imbalance induced by :

Using Gauss’s theorem and the equation of state (: sound speed):

Substituting Euler’s equation :

For a point mass , (: constant). After integration (see Appendix):

The volume integral scales with , yielding:

**3.3.**3. **Emergence of Newton’s Constant**: Define , recovering Newton’s law:

**emerges** from NMDMS properties: . This explains ’s smallness—it scales with the absolute density of negative-mass dark matter.  
 **3.4 Explanation of the Equivalence Principle**  
The equivalence of inertial mass () and gravitational mass () arises naturally. The repulsive force (effective gravity) on an object is proportional to both (ability to repel NMDMS) and (response to pressure gradients). In ABC theory, both masses originate from coupling strength to the Higgs field , ensuring . The equivalence principle is thus inevitable.  
 **4. Quantum Mechanism of Gravity: Graviton Exchange**  
While the macroscopic repulsion model is effective, microscopic mediation requires a carrier particle. ABC theory inherently incorporates quantum mechanics.  
 **4.1 Field Composition of the Graviton**  
In ABC theory, the graviton is not fundamental but a specific excitation of the Higgs vortex field . Its field composition is:

This state is a massless, spin-2 tensor boson. Gravitons emerge inevitably from quantization of the -field.  
 **4.2 Graviton Exchange Process**  
4.2.1. An ordinary matter particle (e.g., proton ) perturbs the background Higgs field via its -field component, exciting a graviton .  
4.2.2. The graviton propagates.  
4.2.3. Another matter particle () absorbs the graviton. As the graviton represents -field vibrations, its energy-momentum acts on the absorber.  
4.2.4. At low energies, virtual graviton exchange generates an attractive potential .  
Critically, this “effective attraction” stems from the repulsive NMDMS background dictating . Microscopic quantum processes and macroscopic fluid dynamics are perfectly unified, resolving quantum gravity as a natural consequence of theoretical consistency.  
**5. Conclusion and Outlook**  
This paper presents a unified model for the origin of universal gravitation:  
5.1. **Gravity is not attraction**: Classical gravitation emerges as an equivalent geometric effect from the repulsion of ordinary matter by the uniformly distributed NMDMS.  
5.2. **Origin of** : is determined by the density () and individual mass () of NMDMS, not a fundamental constant.  
5.3. **Quantum gravity realized**: Microscopically, gravity is mediated by gravitons—excitations of the Higgs vortex field —with interactions consistent with the macroscopic picture.  
The model naturally explains gravity’s universality, weakness, and unshieldability. It predicts negative-mass dark matter and attributes “dark energy” to its inherent repulsive effect.  
**Future work** will focus on:  
1. **Precise calculations**: Relating NMDMS properties () to observed and Hubble constant, and comparing with cosmological data.  
2. **Experimental verification**: Seeking indirect evidence of NMDMS, e.g., detecting minute variations in across density gradients.  
3. **Theoretical refinement**: Studying graviton interactions with other ABC field excitations, extending the theory to strong-field/high-energy regimes, and exploring deeper connections to spacetime geometry in general relativity.  
This theory opens a new path toward a “Theory of Everything” incorporating gravity, unifying forces from quantum to cosmological scales.  
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 **Appendix: Outline of Derivation Details**  
The full derivation solves the Poisson equation for negative-mass fluid under point-source perturbation:

With boundary conditions, is solved explicitly. Integrating the pressure gradient then yields the inverse-square force law. The proportionality constant emerges, combining with to define Newton’s constant .