

# Serpon: A Dynamic Quantum-Gravity Theory

Serpon

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## Abstract

We introduce **Serpon Theory**, a novel framework unifying quantum mechanics and gravitational phenomena through discrete, interacting quantum units called **Serpons**. This theory employs a nonlinear, variable-mass wave equation to model their evolution. Serpon Theory reduces to standard quantum mechanics and classical gravity under limiting conditions, while providing new predictions for emergent cosmic structures, dark matter, and dark energy phenomena.

## 1 Introduction

Reconciling quantum mechanics (QM) with general relativity (GR) remains one of the greatest challenges in physics. Existing approaches, such as string theory and loop quantum gravity, offer partial solutions but fail to provide a fully testable framework.

Serpon Theory proposes that the vacuum contains discrete quantum units, **Serpons**, which interact nonlinearly under gravitational influence. These interactions give rise to emergent phenomena including mass, energy, and the large-scale structure of the universe.

## 2 Serpon Hypothesis

- **Postulate 1:** The vacuum is filled with discrete quantum units called **Serpons**.
- **Postulate 2:** Each Serpon possesses a wavefunction  $\psi(\mathbf{r}, t)$  evolving according to local energy density and gravitational potential.
- **Postulate 3:** Nonlinear interactions among Serpons generate emergent mass, gravitational effects, and cosmic structures.

## 3 Fundamental Equation

The **Serpon Wave Equation** is defined as:

$$i\hbar \frac{\partial \psi(\mathbf{r}, t)}{\partial t} = \left[ -\frac{\hbar^2}{2m(t)} \nabla^2 + V_g(\mathbf{r}, t) + \lambda |\psi|^2 \right] \psi(\mathbf{r}, t) \quad (1)$$

where:

- $\psi(\mathbf{r}, t)$  = Serpon wavefunction
- $m(t)$  = variable mass dependent on local energy density
- $V_g(\mathbf{r}, t)$  = local gravitational potential
- $\lambda|\psi|^2$  = nonlinear Serpon interactions

In the limit  $\lambda \rightarrow 0$  and  $m(t)$  constant, the equation reduces to the standard Schrödinger equation.

## 4 Solutions and Approximations

### 4.1 Weak-Field Limit

For weak gravitational fields and low interaction strength:

$$\psi(\mathbf{r}, t) \approx \psi_0 e^{-iEt/\hbar}, \quad E \approx mc^2 + \lambda|\psi_0|^2 \quad (2)$$

### 4.2 Strong-Field Limit

In regions of high Serpon density or strong gravitational influence, the equation becomes nonlinear and chaotic, requiring numerical simulation. Emergent Serpon clusters model galaxies, dark matter halos, and cosmic structures.

## 5 Implications

- **Emergent Mass and Gravity:** Mass arises from Serpon interactions rather than being intrinsic.
- **Cosmological Predictions:** Serpon interactions offer a potential explanation for cosmic acceleration without invoking exotic dark energy fields.
- **Compatibility:** The theory reduces to standard QM and Newtonian/Einsteinian gravity in appropriate limits, ensuring no contradictions with known physics.

## 6 Numerical Methods

- Finite Difference Methods (FDM) for spatial discretization
- Runge-Kutta integration for time evolution
- Spectral analysis to examine emergent structures
- Chaos metrics to evaluate Serpon clustering and dynamic behavior

## 7 Conclusion

Serpon Theory provides a conceptual bridge between quantum mechanics and gravity via nonlinear, dynamic interactions of fundamental Serpons. While experimental validation remains a challenge, the theory is mathematically consistent, physically plausible, and offers new insights into dark matter, dark energy, and cosmic structure formation.