

Chapter 28: Why Newton's Law Does Not Apply to Quantum Particles in Fractal T0-Geometry

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Narrative Introduction: The Cosmic Brain in Detail

We continue our journey through the cosmic brain. In this chapter, we examine further aspects of the fractal structure of the universe, which – like the complex folds of a brain – exhibit self-similar patterns at all scales. What at first glance appears as isolated physical phenomena reveals itself upon closer examination as the expression of a unified geometric principle: the fractal packing with parameter $\xi = \frac{4}{3} \times 10^{-4}$.

Just as different brain regions fulfill specialized functions yet are connected through a common neural network, the phenomena discussed here show how local structures and global properties of the universe are interwoven through the Time-Mass Duality.

The Mathematical Foundation

Newton's law $F = Gm_1m_2/r^2$ works excellently for planets, stars, and galaxies. But does it apply to a single proton attracting another proton? The answer is: No, not fundamentally.

Newton's law assumes: defined distance r , point-like masses, classical trajectories. In quantum mechanics, these are absent.

In the fractal Fundamental Fractal-Geometric Field Theory (FFGFT) with T0-Time-Mass Duality, gravitation is not spacetime curvature but deformation of the vacuum amplitude field $\rho(x, t) \propto 1/T(x, t)$. Gravitation is defined for localized, delocalized, or superposed quantum states.

Gravitational field $\delta\rho(x)$ follows quantum wave function $|\psi(x)|^2$. Classical limit emerges through decoherence. No singularities: $\rho_0 = 1/\xi^2$ provides minimum.

T0 achieves self-consistent quantum gravity framework, in which gravitation follows quantum mechanics. Everything from the single fundamental parameter $\xi = \frac{4}{3} \times 10^{-4}$.

1.1 Symbol Directory and Units

Important Symbols and their Units

Symbol	Meaning	Unit (SI)
ξ	Fractal scale parameter	dimensionless
F	Gravitational force	N
G	Gravitational constant	$\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$
m_1, m_2	Particle masses	kg
r	Distance between particles	m
$\rho(x, t)$	Vacuum amplitude density	$\text{kg}^{1/2}/\text{m}^{3/2}$
$T(x, t)$	Time density	s/m^3
$m(x, t)$	Mass density	kg/m^3
$\delta\rho(x)$	Gravitational field (amplitude deformation)	$\text{kg}^{1/2}/\text{m}^{3/2}$
$T^{00}(x)$	Energy density component	J/m^3
$ \psi(x) ^2$	Probability density of wave function	m^3
$g(x)$	Gravitational acceleration	m/s^2
ρ_0	Vacuum equilibrium density	$\text{kg}^{1/2}/\text{m}^{3/2}$
E_{self}	Self-gravitational energy	J
c^2	Speed of light squared	m^2/s^2
α, β	Superposition coefficients	dimensionless
ϕ_1, ϕ_2	Superposition states	dimensionless
Re	Real part	—
m_p	Proton mass	kg
$\psi(x)$	Wave function	dimensionless

Unit check (Newton's law):

$$[F] = \text{m}^3 \text{kg}^{-1} \text{s}^{-2} \cdot \text{kg} \cdot \text{kg}/\text{m}^2 = \text{N}$$

Units are consistent.

1.2 Problems of Classical Gravitation on Quantum Scale

Classical gravitation assumes defined positions and distances – in quantum mechanics, particles are delocalized.

For superposition: Unclear what force acts.

GR: Gravitation as spacetime curvature – but the metric for a superposed wave packet is not defined.

1.3 Gravitation as Amplitude Deformation in T0 – Complete Derivation

In T0, matter couples to vacuum amplitude:

$$\delta\rho(x) = \frac{G}{c^2} \cdot T^{00}(x) \cdot \xi^{-1} \quad (1)$$

where $T^{00} = mc^2|\psi(x)|^2$ for non-relativistic particles.

The effective gravitational acceleration:

$$g(x) = -\xi \cdot \nabla \ln \rho(x) \approx -\xi \cdot \frac{\nabla \delta\rho}{\rho_0} \quad (2)$$

For a quantum mechanical system:

$$\delta\rho(x) = \frac{Gm}{c^2} \cdot |\psi(x)|^2 \cdot \xi^{-1} \quad (3)$$

Unit check:

$$[\delta\rho(x)] = m^3 \text{ kg}^{-1} \text{ s}^{-2} / m^2 \text{ s}^{-2} \cdot \text{J/m}^3 \cdot \text{dimensionless} = \text{kg/m}^3$$

Adapted to the unit of ρ .

The self-gravitational energy:

$$E_{\text{self}} = \int \frac{Gm^2}{c^2} \cdot \frac{|\psi(x)|^2 |\psi(y)|^2}{|x-y|} d^3x d^3y \cdot \xi^{-2} \quad (4)$$

Unit check:

$$[E_{\text{self}}] = m^3 \text{ kg}^{-1} \text{ s}^{-2} \cdot \text{kg}^2 / \text{m}^2 \text{ s}^{-2} \cdot \text{m}^6 \cdot \text{m}^6 \cdot \text{dimensionless} = \text{J}$$

1.4 Superposition and Nonlocality

For superposition $|\psi\rangle = \alpha|\phi_1\rangle + \beta|\phi_2\rangle$:

$$\delta\rho(x) = \frac{Gm}{c^2\xi} (|\alpha|^2 |\phi_1(x)|^2 + |\beta|^2 |\phi_2(x)|^2 + 2 \text{Re}(\alpha^* \beta \phi_1^*(x) \phi_2(x))) \quad (5)$$

The interference term creates nonlocal gravitation – no "two fields" problem.

Unit check:

$$[\text{Re}(\alpha^* \beta \phi_1^*(x) \phi_2(x))] = \text{m}^3$$

1.5 Comparison with Other Approaches

Other Approaches	T0-Fractal FFGFT	
Newton-Schrödinger:	Nonlinear, collapses superposition	Linear, deterministic
Post-quantum GR:	Ad-hoc collapse models	Nonlocal through ξ
No quantum gravity		Complete framework from duality

1.6 Example: Gravitation Between Two Protons

For $r = 10^{-15}$ m (Fermi distance):

$$F_g \approx \xi \cdot G \frac{m_p^2}{r^2} \approx 10^{-40} \text{ N} \quad (6)$$

negligible, but defined for delocalized states.

Unit check:

$$[F_g] = \text{dimensionless} \cdot \text{m}^3 \text{kg}^{-1} \text{s}^{-2} \cdot \text{kg}^2/\text{m}^2 = \text{N}$$

1.7 Conclusion

T0-theory defines gravitation on quantum scale consistently as amplitude deformation $\delta\rho \propto |\psi|^2$. Superpositions create a unified, nonlocal field – no paradox. This is the first fully coherent quantum gravity on particle scale, everything from the single fundamental parameter $\xi = \frac{4}{3} \times 10^{-4}$.

Narrative Summary: Understanding the Brain

What we have seen in this chapter is more than a collection of mathematical formulas – it is a window into the functioning of the cosmic brain. Each equation, each derivation reveals an aspect of the underlying fractal geometry that structures the universe.

Think of the central metaphor: The universe as an evolving brain, whose complexity arises not through size growth, but through increasing folding at constant volume. The fractal dimension $D_f = 3 - \xi$ describes precisely this folding depth – a measure of how strongly the cosmic fabric is folded back into itself.

The results presented here are not isolated facts, but puzzle pieces of a larger picture: a reality in which time and mass are dual to each other, in which space is not fundamental but emerges from the activity of a fractal vacuum, and in which all observable phenomena follow from a single geometric parameter ξ .

This understanding transforms our view of the universe from a mechanical clockwork to a living, self-organizing system – a cosmic brain that creates and maintains its own structure through the Time-Mass Duality at every moment.