Time and Mass: A New Look at Old Formulas – and Liberation from Traditional Constraints

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Zusammenfassung

This work presents a new perspective on time and mass, the time-mass duality, which challenges traditional views in quantum mechanics and relativity. Through extended natural units, physical constants are reinterpreted as dimensionless energy ratios. Without introducing new equations, the approach highlights the incompleteness of existing theories and proposes a more unified, intuitive description of reality, with implications for quantum gravity, entanglement, and cosmological phenomena.

Inhaltsverzeichnis

1 Introduction: Traditional Views and the Hidden Perspective

Physics has achieved impressive successes with concepts like quantum fields and spacetime curvature, but sometimes I wonder if we've strayed too far from a simple, intuitive description of the world. The way we view time and mass—shaped by historical units and traditional theories—might be preventing us from gaining a deeper, more unified understanding of nature. In this work, I aim to return to the fundamentals and liberate physics from its traditional constraints by introducing a new perspective: time-mass duality. This approach, developed in the T0 model, questions conventional assumptions and demonstrates how a reconsideration of familiar formulas can lead us to a clearer view of reality.

My goal is not to overburden physics with entirely new equations but to see the existing formulas of quantum mechanics and relativity in a new light—one that highlights energy as the central quantity and removes the artificial barriers of traditional units. This journey begins with a rethinking of physical constants, guides us through time-mass duality, and concludes with concrete implications for some of the greatest mysteries of modern physics.

2 Natural Constants and Units: More Than Arbitrary Numbers?

When we talk about meters, seconds, and kilograms, we rarely consider that these units are historical accidents—human constructs that don't necessarily reflect the fundamental nature of the world. Natural constants like the speed of light c, the reduced Planck constant $\hbar$, the gravitational constant G, or the fine-structure constant α_{EM} are often set to 1 in natural units to simplify mathematics. However, in the T0 model, we take a step further: we view these constants not as independent quantities but as expressions of a single fundamental quantity—energy.

In this perspective, c, $\hbar$, and G are not arbitrary numbers but dimensionless ratios derived from energy. The T0 model, as described in "Time-Mass Duality Theory: Derivation of Parameters"[2], interprets the physical world as a framework where energy is the unifying force. This redefinition may seem subtle, but it frees us from the limitations of traditional units and opens the way to a more intuitive description of reality.

3 Time-Mass Duality: An Alternative Perspective

Traditional physics, particularly special relativity, describes the world with a relative time that adjusts via time dilation ($t' = \gamma_{\mathrm{Lorentz}}t$) while rest mass remains constant ($m_0 = \mathrm{const.}$). The T0 model reverses this view: time is treated as an absolute quantity T_0, while mass is variable ($m = \gamma_{\mathrm{Lorentz}}m_0$). But the approach goes further by introducing an intrinsic time field that governs each particle's dynamics:

$$T(x) = \frac{\hbar}{\max(mc^2, \omega)} \tag{1}$$

This time field, detailed in "Parameter Derivations"[2], links a particle's mass to its internal timescale and leads to a modified Schrödinger equation, developed in "The Necessity of Extending Standard Quantum Mechanics"[7]:

$$i\hbar T(x)\frac{\partial}{\partial t}\Psi + i\hbar\Psi\frac{\partial T(x)}{\partial t} = \hat{H}\Psi \tag{2}$$

This perspective reveals that time and mass do not exist independently but are in a dual relationship that transcends the traditional boundaries of physics.

4 All Constants Become Natural: Energy as the Unifying Principle

In the T0 model, physical constants lose their status as standalone quantities and become dimensionless ratios of a single fundamental quantity—energy. The speed of light c becomes the unit of motion, $\hbar$ the measure of action, and G an expression of gravitational interaction—all derived from energy. This view liberates physics from the arbitrary units of the past and establishes energy as the true centerpiece of nature. It requires no new formulas, only a reconsideration of the ones we already know from quantum mechanics and relativity.

5 No New Formulas, But a Liberated View

The beauty of this approach lies in its avoidance of entirely new equations. Instead, it takes the familiar formulas of physics—the Schrödinger equation, Lorentz transformations, gravitational laws—and views them in a new framework where all constants are natural. This seemingly small shift has profound consequences. It shows that traditional quantum mechanics is incomplete: when transferred to this new system, its formulas no longer fully describe all phenomena because they fail to capture the dynamic interplay of mass, time, and energy.

This incompleteness is not a flaw but a clue that we must extend quantum mechanics—not through arbitrary assumptions but by more consistently applying the principles we already know, particularly energy conservation and the connection between time and mass. The wave-particle duality and time-mass duality are not mere interpretations but keys to a more real perspective, showing us that we've overlooked aspects of reality by clinging to traditional constraints.

6 Lagrangian Formulation

The mathematical foundation of the T0 model is provided by a total Lagrangian density, as elaborated in "Mathematical Core Formulations"[5]:

$$\mathcal{L}_{\text{Total}} = \mathcal{L}_{\text{Boson}} + \mathcal{L}_{\text{Fermion}} + \mathcal{L}_{\text{Higgs-T}} + \mathcal{L}_{\text{intrinsic}}, \quad \mathcal{L}_{\text{intrinsic}} = \frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - V(T(x)) \quad (3)$$

This formulation integrates the dynamics of the intrinsic time field and provides a unified description of fundamental interactions, overcoming the traditional divide between quantum mechanics and gravity. The complete derivation of this Lagrangian and its implications for field theory are further explored in [11].

7 Concrete Implications: Toward a More Comprehensive Theory

This liberated view of physics leads to concrete implications that shed light on some of the greatest mysteries of modern science. In quantum gravity, unification becomes more tangible as gravity emerges as a property of the time field's gradients:

$$\nabla T(x) = -\frac{\hbar}{m^2 c^2} \nabla m \tag{4}$$

Where both sides have dimension $[E^{-1}]$, ensuring dimensional consistency.

The resulting gravitational potential is:

$$\Phi(r) = -\frac{GM}{r} + \kappa r, \quad \kappa^{\mathrm{SI}} \approx 4.8 \times 10^{-11}\,\mathrm{m\,s^{-2}} \tag{5}$$

Where κ has dimension $[E]$ in natural units.

This approach, detailed in "Mass Variation in Galaxies"[3] and Ëmergent Gravitation in the T0 Model"[10], offers a new perspective on gravity without the need for separate dark matter models. For quantum entanglement, the model shows how intrinsic time can influence correlations between particles, an idea further explored in "Dynamic Mass of Photons"[6] and "Field Theory and Quantum Correlations"[11].

In cosmology, redshift is interpreted not as expansion but as energy loss, described by:

$$1 + z = e^{\alpha d}, \quad \alpha^{\mathrm{SI}} \approx 2.3 \times 10^{-18}\,\mathrm{m^{-1}} \tag{6}$$

with a wavelength-dependent component:

$$z(\lambda) = z_0(1 + \beta_{\mathrm{T}}^{\mathrm{SI}} \ln(\lambda/\lambda_0)), \quad \beta_{\mathrm{T}}^{\mathrm{SI}} \approx 0.008 \tag{7}$$

These formulas, derived in "Measurement Differences"[4] and "Parameter Derivations"[2], demonstrate how dark energy and cosmological phenomena can be reunderstood without introducing additional exotic components. In natural units with $\beta_{\mathrm{T}}^{\mathrm{nat}} = 1$, this relationship takes the particularly elegant form $z(\lambda) = z_0(1 + \ln(\lambda/\lambda_0))$, as explained in Ünified Unit System in the T0 Model"[9].

Finally, we gain a deeper understanding of fundamental constants by reducing them all to energy, making physics a more unified science. This unification extends to electrodynamics as well, where setting $\alpha_{\mathrm{EM}} = 1$ leads to a coherent framework with energy as the foundational unit, as detailed in Ënergy as a Fundamental Unit"[8].
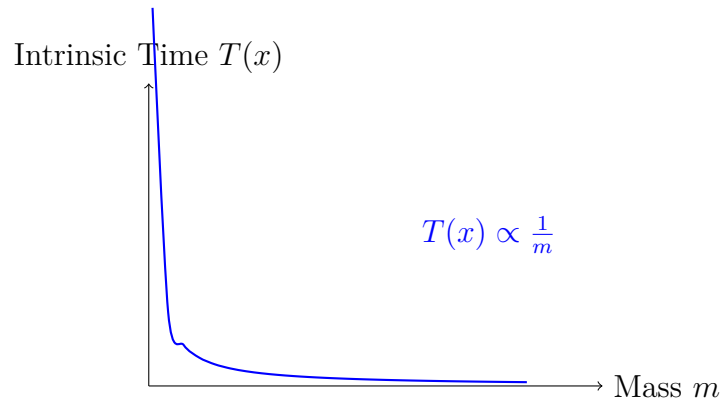

Abbildung 1: Relationship between mass and intrinsic time: Lighter particles have a slower internal clock.

8 Experimental Verification and Conclusion

This approach is not just a theoretical exercise but is experimentally testable. It makes predictions that differ from traditional quantum mechanics—such as through precision measurements

with clocks or entangled particles of different masses. The wavelength dependence of redshift offers a distinctive experimental signature that could be tested with high-precision spectroscopic observations from instruments like the James Webb Space Telescope, as discussed in [4].

The modified gravitational potential predicts flat rotation curves in galaxies without requiring dark matter, a prediction that aligns with observational data and can be further tested with improved measurements of galactic dynamics, as detailed in [3].

Time-mass duality and the reduction of all constants to energy offer a radical yet promising path to extend physics. The goal is not to discard proven formulas but to free them from their historical constraints and return to a more real, intuitive perspective. This could be the beginning of a more comprehensive theory that illuminates the universe's mysteries—from quantum gravity to dark energy—in a new light. For a comprehensive overview of how this theory relates to the fundamental forces of nature, see SSimplified Description of Fundamental Forces with Time-Mass Duality"[12].

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