# Overview of Publications on Time-Mass Duality

## A Theoretical Framework for Extending Modern Physics

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**Abstract**

This overview presents a coherent collection of works developing a novel theoretical framework for extending modern physics. At its core is the concept of time-mass duality, which proposes a fundamental reformulation of the relationship between time and mass. This approach offers not only a potential path to unifying quantum mechanics, quantum field theory, and general relativity, but also new perspectives on fundamental phenomena such as nonlocality, dark matter, and dark energy. The publications listed here form a coherent research program ranging from theoretical foundations to concrete applications and experimentally verifiable predictions.

# 1 Introduction

The publications listed below represent a coherent body of work developing various aspects of a new theoretical framework for modern physics. Central to this is the concept of time-mass duality, which proposes a fundamental reinterpretation of the relationship between time and mass, with far-reaching implications for our understanding of physical reality—from quantum mechanics to cosmology.

The works are organized into five thematic areas:

1. Fundamental Theory Development
2. Specific Applications and Implications
3. Fundamental Constants and Units
4. Cosmological and Boundary Areas
5. Summaries and Overview Presentations

All documents are available in the repository and directly accessible via the links provided.

# 2 Fundamental Theory Development

These publications establish the basic conceptual and mathematical foundations of time-mass duality and its extensions to standard physics.

## 2.1 Complementary Extensions of Physics

*(190.434 Bytes, 25.03.2025)*

This work presents the two complementary views that form the core of time-mass duality: the standard model with constant mass and variable time (time dilation) and the $T_0$ model with absolute time and variable mass. It demonstrates how these dual perspectives can be mathematically transformed into each other and describe the same physical phenomena, albeit with different conceptual foundations. The paper develops the formal structure for transformation between both models and discusses the philosophical implications of this duality.

## 2.2 Fundamental Constants and Their Derivation from Natural Units

*(236.985 Bytes, 25.03.2025)*

This work analyzes fundamental physical constants such as the fine structure constant, the gravitational constant, and Planck's constant from the perspective of time-mass duality. It explores how these constants can be derived as emergent quantities from a more fundamental theoretical framework. Special attention is given to the relationship between intrinsic time and these constants, with the aim of reducing the number of truly fundamental constants in physics.

## 2.3 Energy as Fundamental Unit alpha = 1

*(194.272 Bytes, 26.03.2025)*

This publication develops a revolutionary natural unit system in which the fine structure constant $\alpha = 1$ is set, as opposed to its empirical value of approximately 1/137. It argues that this unit system enables deeper theoretical insights and offers mathematical simplifications. The paper examines the consequences of this choice for the formulation of fundamental laws of physics and the interpretation of empirical measurements, particularly in the context of time-mass duality.

## 2.4 Field Theory and Quantum Correlations

*(384.765 Bytes, 28.03.2025)*

This paper presents a field theory perspective on quantum correlations, explaining apparent nonlocality as an inherent property of a fundamental quantum field. It connects the concepts of time-mass duality with field theory, where the Higgs field serves as a mediator between mass and intrinsic time scale. Modified field equations are presented that can explain experimental Bell tests and quantum entanglement within a coherent field model. The work offers a novel approach to unifying quantum phenomena with relativity theory without resorting to nonlocal processes.

## 2.5 Mathematical Formulation of the Higgs Mechanism in Time-Mass Duality

*(325.981 Bytes, 27.03.2025)*

This paper develops a precise mathematical formulation of the Higgs mechanism within the framework of time-mass duality. It shows how the Higgs field acts as a mediator

between the two complementary descriptions (standard picture with time dilation and duality picture with mass variation). The modified Higgs Lagrangian density and Yukawa couplings are derived, with the Higgs field determining both the rest mass and the intrinsic time scale of all particles. The work includes new predictions for mass-dependent quantum coherence and modified Higgs couplings that are experimentally verifiable.

### 2.6 Simplified Description of the Four Fundamental Forces with Time-Mass Duality

*(225.943 Bytes, 27.03.2025)*

This publication offers a comprehensive mathematical formulation of all four fundamental forces (gravity, electromagnetic, strong, and weak forces) within the framework of time-mass duality. It develops an extended Lagrangian formalism that connects the standard treatment of fundamental forces with the concept of intrinsic time. Particular attention is given to modified gravitational theory and the reformulation of the Standard Model of particle physics, with the aim of achieving a coherent unification of all forces.

### 2.7 Time as an Emergent Property in Quantum Mechanics

*(238.903 Bytes, 25.03.2025)*

This work examines how time itself can be understood as an emergent property from more fundamental quantum processes. It establishes connections between relativistic theories, the fine structure constant, and quantum dynamics through the concept of intrinsic time. The paper provides a detailed mathematical analysis of how this perspective resolves several conceptual problems in the standard formulation of quantum mechanics.

### 2.8 The Necessity of Extending Standard Quantum Mechanics and Quantum Field Theory

*(276.307 Bytes, 27.03.2025)*

This foundational work identifies critical conceptual limitations of existing quantum theories, particularly regarding the asymmetric treatment of time and space, and the static consideration of mass. It introduces the concept of intrinsic time $T = \hbar/mc^2$ and develops an extended Lagrangian formalism that integrates time-mass duality into quantum field theory. A central aspect is the possibility of returning to a deterministic understanding of the quantum world through variable mass as a fundamental hidden variable, without conflicting with experimental findings.

## 3 Specific Applications and Implications

These publications examine specific applications of time-mass duality to concrete physical phenomena and their implications.

### 3.1 Dynamic Mass of Photons and its Implications for Nonlocality

*(177.299 Bytes, 25.03.2025)*

This work extends the concept of time-mass duality to massless particles, particularly photons. By developing a dynamic mass concept for photons, correlated with their frequency, it offers a new perspective on phenomena such as quantum entanglement and nonlocality. It argues that the apparent instantaneous correlation of entangled photons can be explained by subtle, mass-dependent time structures without violating classical causality principles. The paper includes quantitative predictions for experimental tests of this hypothesis.

### 3.2 Beyond the Planck Scale

*(225.409 Bytes, 25.03.2025)*

This work investigates the consequences of time-mass duality for phenomena beyond the Planck scale, where conventional theories reach their limits. It argues that the new theoretical framework could potentially avoid singularities and lead to a more coherent understanding of extreme physical conditions. The paper develops mathematical models for the transition between classical and quantum mechanical regimes and discusses implications for the early universe and black holes.

### 3.3 A Mathematical Analysis of Energy Dynamics

*(265.907 Bytes, 26.03.2025)*

This publication presents a detailed mathematical analysis of energy dynamics within the time-mass duality framework. It develops novel equations for energy transfer processes across different scales, from quantum to cosmic. The paper particularly focuses on the relationship between energy and intrinsic time, offering potential insights into phenomena such as vacuum energy and the cosmological constant problem.

### 3.4 Unification of the T0 Model Foundations - Dark Energy and Galaxy Dynamics

*(264.279 Bytes, 27.03.2025)*

This comprehensive work synthesizes applications of the $T_0$ model to cosmological phenomena. It develops a theoretical framework that unifies cosmic expansion, the nature of dark energy, and the dynamics of galaxies in a coherent model. The central thesis is that systematic mass changes on cosmic scales can explain both the accelerated expansion of the universe and the observed anomalies in galaxy dynamics. The paper quantifies the interaction between baryonic matter and the postulated dark energy field through the coupling parameter $\beta \approx 10^{-3}$.

## 4 Fundamental Constants and Units

These publications explore the relationships between fundamental physical constants and develop new perspectives on natural unit systems.

# 5 Cosmological and Boundary Areas

This publication explores the implications of time-mass duality for our understanding of the most fundamental structures of the universe.

# 6 Summaries and Overview Presentations

These publications provide compact overviews of the main concepts and insights of the broader research program.

## 6.1 A New Perspective on Time and Space: Johann Pascher's Revolutionary Ideas

*(58.675 Bytes, 25.03.2025)*

This concise, somewhat poetic overview paper introduces the fundamental concepts of the time-mass duality framework to a broader audience. It summarizes the key innovations and potential impacts on our understanding of physics in an accessible, inspiring format, serving as an ideal entry point into the overall concept.

## 6.2 Summary - Complementary Dualism in Physics

*(145.939 Bytes, 25.03.2025)*

This summary document focuses specifically on the complementary nature of the standard model and $T_0$ model approaches, which form the core of the entire theory. It provides a compact explanation of how these dual perspectives can describe the same physical reality from different conceptual starting points, placing the main idea of the dual concept at the center.

## 6.3 Summary - Fundamental Constants

*(87.437 Bytes, 25.03.2025)*

This work presents a compact overview of how fundamental physical constants are reinterpreted within the framework of time-mass duality, highlighting the potential to reduce the number of truly fundamental constants in physics. Special attention is given to the fine structure constant Alpha and its possible reinterpretation.

## 6.4 Time and Mass: A New Perspective on Old Formulas – and Liberation from Traditional Constraints

*(87.137 Bytes, 25.03.2025)*

This overview document examines how traditional physical formulas can be reinterpreted through the lens of time-mass duality, potentially freeing theoretical physics from long-standing conceptual constraints and opening new research pathways.

# 7 English Publications

The following English-language publications form the core of the research program:

- The Necessity of Extending Standard Quantum Mechanics and Quantum Field Theory
- Complementary Extensions of Physics
- Mathematical Formulation of the Higgs Mechanism in Time-Mass Duality
- Simplified Description of the Four Fundamental Forces with Time-Mass Duality
- Time as an Emergent Property in Quantum Mechanics
- Dynamic Mass of Photons and its Implications for Nonlocality
- Unification of the T0 Model Foundations - Dark Energy and Galaxy Dynamics
- Fundamental Constants and Their Derivation from Natural Units
- Energy as Fundamental Unit alpha = 1
- Beyond the Planck Scale
- A Mathematical Analysis of Energy Dynamics
- Field Theory and Quantum Correlations

### 7.1 English Summaries

- A New Perspective on Time and Space: Johann Pascher's Revolutionary Ideas
- Summary - Complementary Dualism in Physics
- Summary - Fundamental Constants
- Time and Mass: A New Perspective on Old Formulas – and Liberation from Traditional Constraints

## 8 Conclusion and Outlook

Together, the presented publications form a coherent research program that develops a fundamentally new approach to unifying and extending modern physics. In contrast to other unifying approaches such as string theory or loop quantum gravity, which introduce complex additional structures, time-mass duality focuses on reformulating the most fundamental concepts—time and mass.

The central idea of intrinsic time $T = \hbar/mc^2$ and complementary models (standard model and $T_0$ model) offers not only new theoretical perspectives but also concrete experimentally verifiable predictions. These include mass-dependent time evolution in quantum systems, subtle effects in entanglement experiments, and alternative understanding of cosmological phenomena such as dark matter and dark energy.

Future research directions could include:

- Development of detailed experimental protocols to verify mass-dependent time evolution

- Refinement of the mathematical formulation, particularly regarding quantum gravity
- Advanced numerical simulations to verify modified galaxy dynamics
- Inclusion of additional fundamental particles and interactions in the theoretical framework
- Application of the theory to fundamental problems in quantum information and quantum computing

The overarching goal remains the development of a comprehensive, mathematically elegant, and experimentally confirmed "all-in-one" theory that unifies quantum mechanics, quantum field theory, and general relativity in a coherent framework while simultaneously addressing existing problems in modern physics such as nonlocality, dark matter, and dark energy.