

# Neutrinos

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# Kapitel 1

## Neutrinos

## Zusammenfassung

This document addresses the special position of neutrinos in the T0 Theory. In contrast to established particles (charged leptons, quarks, bosons), neutrinos require a fundamentally different treatment based on the photon analogy with double  $\xi_0$ -suppression. The neutrino mass is derived from the formula  $m_\nu = \frac{\xi_0^2}{2} \times m_e = 4.54$  meV, and oscillations are explained by geometric phases based on  $T_x \cdot m_x = 1$ , where the quantum numbers  $(n, \ell, j)$  determine the phase differences. An extension via the Koide relation introduces a weak hierarchy through exponent rotations, achieving  $\Delta Q_\nu < 1\%$  accuracy while maintaining near-degeneracy. A plausible target value for the neutrino mass ( $m_\nu = 15$  meV) is derived from empirical data (cosmological limits). The T0 Theory is based on speculative geometric harmonies without empirical basis and is highly likely to be incomplete or incorrect. Scientific integrity requires a clear separation between mathematical correctness and physical validity.

## 1.1 Preamble: Scientific Honesty

**CRITICAL LIMITATION:** The following formulas for neutrino masses are **speculative extrapolations** based on the untested hypothesis that neutrinos follow geometric harmonies and all flavor states have equal masses. This hypothesis has **no empirical basis** and is highly likely to be incomplete or incorrect. The mathematical formulas are nevertheless internally consistent and correctly formulated.

**Scientific integrity means:**

- Honesty about the speculative nature of the predictions
- Mathematical correctness despite physical uncertainty
- Clear separation between hypotheses and verified facts

## 1.2 Neutrinos as “Almost Massless Photons”: The T0 Photon Analogy

**Fundamental T0 Insight:** Neutrinos can be understood as “damped photons”.

The remarkable similarity between photons and neutrinos suggests a deeper geometric kinship:

- **Speed:** Both propagate nearly at the speed of light
- **Penetration:** Both have extreme penetrability
- **Mass:** Photon exactly massless, neutrino quasi-massless
- **Interaction:** Photon electromagnetic, neutrino weak

### 1.2.1 Photon-Neutrino Correspondence

**Physical Parallels:**

$$\text{Photon: } E^2 = (pc)^2 + 0 \quad (\text{perfectly massless}) \quad (1.1)$$

$$\text{Neutrino: } E^2 = (pc)^2 + \left( \sqrt{\frac{\xi^2}{2}} mc^2 \right)^2 \quad (\text{quasi-massless}) \quad (1.2)$$

**Speed Comparison:**

$$v_\gamma = c \quad (\text{exact}) \quad (1.3)$$

$$v_\nu = c \times \left( 1 - \frac{\xi^2}{2} \right) \approx 0.9999999911 \times c \quad (1.4)$$

The speed difference is only  $8.89 \times 10^{-9}$  – practically immeasurable!

### 1.2.2 The Double $\xi_0$ -Suppression

#### Neutrino Mass through Double Geometric Damping:

If neutrinos are “almost photons”, then two suppression factors arise:

1. **First  $\xi_0$  Factor:** “Almost massless” (like photon, but not perfect)
2. **Second  $\xi_0$  Factor:** “Weak interaction” (geometric decoupling)

**Resulting Formula:**

$$m_\nu = \frac{\xi_0^2}{2} \times m_e = \frac{(\frac{4}{3} \times 10^{-4})^2}{2} \times 0.511 \text{ MeV} \quad (1.5)$$

**Numerical Evaluation:**

$$m_\nu = 8.889 \times 10^{-9} \times 0.511 \text{ MeV} = 4.54 \text{ meV} \quad (1.6)$$

### 1.2.3 Physical Justification of the Photon Analogy

#### Why the Photon Analogy is Physically Sensible:

##### 1. Speed Comparison:

$$v_\gamma = c \quad (\text{exact}) \quad (1.7)$$

$$v_\nu = c \times \left(1 - \frac{\xi_0^2}{2}\right) \approx 0.9999999911 \times c \quad (1.8)$$

The speed difference is only  $8.89 \times 10^{-9}$  - practically immeasurable!

##### 2. Interaction Strengths:

$$\sigma_\gamma \sim \alpha_{EM} \approx \frac{1}{137} \quad (1.9)$$

$$\sigma_\nu \sim \frac{\xi_0^2}{2} \times G_F \approx 8.89 \times 10^{-9} \quad (1.10)$$

The ratio  $\sigma_\nu/\sigma_\gamma \sim \frac{\xi_0^2}{2}$  confirms the geometric suppression!

##### 3. Penetrability:

- Photons: Electromagnetic shielding possible
- Neutrinos: Practically unshieldable
- Both: Extreme ranges in matter

## 1.3 Neutrino Oscillations

### 1.3.1 The Standard Model Problem

**Neutrino Oscillations:** Neutrinos can change their identity (flavor) during flight - a phenomenon known as neutrino oscillation. A neutrino produced as an electron neutrino ( $\nu_e$ ) can later be measured as a muon neutrino ( $\nu_\mu$ ) or tau neutrino ( $\nu_\tau$ ) and vice versa.

The oscillations depend on the mass squared differences  $\Delta m_{ij}^2 = m_i^2 - m_j^2$  and the mixing angles. Current experimental data (2025) provide:

$$\Delta m_{21}^2 \approx 7.53 \times 10^{-5} \text{ eV}^2 \quad [\text{Solar}] \quad (1.11)$$

$$\Delta m_{32}^2 \approx 2.44 \times 10^{-3} \text{ eV}^2 \quad [\text{Atmospheric}] \quad (1.12)$$

$$m_\nu > 0.06 \text{ eV} \quad [\text{At least one neutrino, } 3\sigma] \quad (1.13)$$

**Problem for T0:** The T0 Theory postulates equal masses for the flavor states  $(\nu_e, \nu_\mu, \nu_\tau)$ , which implies  $\Delta m_{ij}^2 = 0$  and is incompatible with standard oscillations.

### 1.3.2 Geometric Phases as Oscillation Mechanism

#### T0 Hypothesis: Geometric Phases for Oscillations

To reconcile the hypothesis of equal masses ( $m_{\nu_e} = m_{\nu_\mu} = m_{\nu_\tau} = m_\nu$ ) with neutrino oscillations, it is speculated that oscillations in the T0 Theory are caused by geometric phases rather than mass differences. This is based on the T0 relation:

$$T_x \cdot m_x = 1,$$

where  $m_x = m_\nu = 4.54 \text{ meV}$  is the neutrino mass and  $T_x$  is a characteristic time or frequency:

$$T_x = \frac{1}{m_\nu} = \frac{1}{4.54 \times 10^{-3} \text{ eV}} \approx 2.2026 \times 10^2 \text{ eV}^{-1} \approx 1.449 \times 10^{-13} \text{ s.}$$

The geometric phase is determined by the T0 quantum numbers  $(n, \ell, j)$ :

$$\phi_{\text{geo},i} \propto f(n, \ell, j) \cdot \frac{L}{E} \cdot \frac{1}{T_x},$$

where  $f(n, \ell, j) = \frac{n^6}{\ell^3}$  (or 1 for  $\ell = 0$ ) are the geometric factors:

$$f_{\nu_e} = 1, \quad (1.14)$$

$$f_{\nu_\mu} = 64, \quad (1.15)$$

$$f_{\nu_\tau} = 91.125. \quad (1.16)$$

**WARNING:** This approach is purely hypothetical and without empirical confirmation. It contradicts the established theory that oscillations are caused by  $\Delta m_{ij}^2 \neq 0$ .

### 1.3.3 Quantum Number Assignment for Neutrinos

## 1.4 Integration of the Koide Relation: A Weak Hierarchy

#### T0-Koide Extension for Neutrinos:

To address the oscillation conflict ( $\Delta m_{ij}^2 \neq 0$ ), the T0 Theory integrates the Koide relation as a natural generalization (Brannen 2005). This introduces a weak hierarchy via exponent rotations around  $\xi_0$ , preserving the photon analogy while enabling small mass differences.

Neutrino Flavor	$n$	$\ell$	$j$	$f(n, \ell, j)$
$\nu_e$	1	0	1/2	1
$\nu_\mu$	2	1	1/2	64
$\nu_\tau$	3	2	1/2	91.125

Tabelle 1.1: Speculative T0 Quantum Numbers for Neutrino Flavors

**Eigenvector Representation:** The charged lepton masses follow Koide via:

$$\begin{pmatrix} \sqrt{m_e} \\ \sqrt{m_\mu} \\ \sqrt{m_\tau} \end{pmatrix} = \mathbf{U} \cdot \begin{pmatrix} m_1 \\ m_2 \\ m_3 \end{pmatrix}, \quad (1.17)$$

where  $\mathbf{U}$  is the unitary flavor-mixing matrix (CKM/PMNS analog).

**T0 Adaptation for Neutrinos:** Neutrino masses emerge as perturbed versions of the base  $m_\nu = 4.54$  meV:

$$m_{\nu_i} \approx \xi_0^{p_i + \delta} \cdot v_\nu, \quad \delta \approx \xi_0^{1/3} \approx 0.051 \quad (1.18)$$

with exponents  $p_i = (3/2, 1, 2/3)$  from charged leptons (rotated by  $\delta$  for weak hierarchy). This yields a quasi-degenerate spectrum:

$$m_{\nu_1} \approx 4.20 \text{ meV (normal hierarchy)}, \quad (1.19)$$

$$m_{\nu_2} \approx 4.54 \text{ meV}, \quad (1.20)$$

$$m_{\nu_3} \approx 5.12 \text{ meV}, \quad (1.21)$$

$$\Sigma m_\nu \approx 13.86 \text{ meV}. \quad (1.22)$$

**Neutrino Koide Relation:**

$$Q_\nu = \frac{m_{\nu_1} + m_{\nu_2} + m_{\nu_3}}{(\sqrt{m_{\nu_1}} + \sqrt{m_{\nu_2}} + \sqrt{m_{\nu_3}})^2} \approx 0.6667 = \frac{2}{3}, \quad (1.23)$$

with  $\Delta Q_\nu < 1\%$  accuracy, directly linking to PMNS mixing.

**Hybrid Oscillation Mechanism:** Geometric phases (from  $f(n, \ell, j)$ ) dominate, augmented by small  $\Delta m_{ij}^2 \approx (0.1-0.2) \times 10^{-4} \text{ eV}^2$  from  $\delta$ . This reconciles T0 with data without full hierarchy.

**WARNING:** Highly speculative; testable via future  $\Sigma m_\nu$  measurements (e.g., Euclid 2026+).

## 1.5 Experimental Assessment

### 1.5.1 Cosmological Limits

Cosmological Neutrino Mass Limits (as of 2025):

**1. Planck Satellite + CMB Data:**

$$\Sigma m_\nu < 0.07 \text{ eV} \quad (95\% \text{ Confidence}) \quad (1.24)$$

**2. T0 Prediction (with Koide Extension):**

$$\Sigma m_\nu = 13.86 \text{ meV} \quad (1.25)$$

**3. Comparison:**

$$\frac{13.86 \text{ meV}}{70 \text{ meV}} = 0.198 \approx 19.8\% \quad (1.26)$$

The T0 prediction is well below all cosmological limits!

**1.5.2 Direct Mass Determination****Experimental Neutrino Mass Determination:****1. KATRIN Experiment (2022):**

$$m(\nu_e) < 0.8 \text{ eV} \quad (90\% \text{ Confidence}) \quad (1.27)$$

**2. T0 Prediction (with Koide):**

$$m(\nu_e) \approx 4.54 \text{ meV} \text{ (effective)} \quad (1.28)$$

**3. Comparison:**

$$\frac{4.54 \text{ meV}}{800 \text{ meV}} = 0.0057 \approx 0.57\% \quad (1.29)$$

The T0 prediction is orders of magnitude below the direct mass limits.

**1.5.3 Target Value Estimation****Plausible Target Value for Neutrino Masses:**

From cosmological data and theoretical considerations, a plausible target value emerges:

$$m_\nu^{\text{Target}} \approx 15 \text{ meV} \text{ (per flavor, quasi-degenerate)} \quad (1.30)$$

**Comparison with T0 Prediction (incl. Koide):**

$$\frac{4.54 \text{ meV}}{15 \text{ meV}} = 0.303 \approx 30.3\% \quad (1.31)$$

The T0 prediction is about a factor of 3 below the plausible target value, which is acceptable for a speculative theory. Koide extension narrows this to 7% via hierarchy.

**1.6 Cosmological Implications****1.6.1 Structure Formation and Big Bang Nucleosynthesis****Cosmological Consequences of T0 Neutrino Masses:****1. Big Bang Nucleosynthesis:**

- Relativistic neutrinos at  $T \sim 1 \text{ MeV}$ : Standard BBN unchanged

- Contribution to radiation density:  $N_{\text{eff}} = 3.046$  (Standard)

### 2. Structure Formation:

- Neutrinos with 4.5 meV become non-relativistic at  $z \sim 100$
- Suppression of small-scale structure formation negligible

### 3. Cosmic Neutrino Background (C $\nu$ B):

- Number density:  $n_\nu = 336 \text{ cm}^{-3}$  (unchanged)
- Energy density:  $\rho_\nu \propto \Sigma m_\nu = 13.86 \text{ meV}$  (with Koide)
- Fraction of critical density:  $\Omega_\nu h^2 \approx 1.55 \times 10^{-4}$

### 4. Comparison with Dark Matter:

- Neutrino contribution:  $\Omega_\nu \approx 2.1 \times 10^{-4}$
- Dark matter:  $\Omega_{DM} \approx 0.26$
- Ratio:  $\Omega_\nu / \Omega_{DM} \approx 8.1 \times 10^{-4}$  (negligible)

## 1.7 Summary and Critical Evaluation

### 1.7.1 The Central T0 Neutrino Hypotheses

Main Statements of the T0 Neutrino Theory:

1. **Photon Analogy:** Neutrinos as “damped photons” with double  $\xi_0$ -suppression
2. **Uniform Mass (Base):** All flavor states have  $m_\nu \approx 4.54 \text{ meV}$  (quasi-degenerate)
3. **Geometric Oscillations + Koide:** Phases + weak hierarchy ( $\delta$ ) for  $\Delta m_{ij}^2$
4. **Speed Prediction:**  $v_\nu = c(1 - \xi_0^2/2)$
5. **Cosmological Consistency:**  $\Sigma m_\nu \approx 13.86 \text{ meV}$  below all limits,  $\Delta Q_\nu < 1\%$

### 1.7.2 Scientific Assessment

Honest Scientific Evaluation:

#### Strengths of the T0 Neutrino Theory:

- Unified framework with other T0 predictions (now incl. Koide/PMNS)
- Elegant photon analogy with clear physical intuition
- Parameter freedom: No empirical adjustment
- Cosmological consistency with all known limits
- Specific, testable predictions (e.g.,  $\Sigma m_\nu$ ,  $Q_\nu$ )

### Fundamental Weaknesses:

- **Contradiction to Oscillation Data:** Minimal  $\Delta m_{ij}^2$  vs. experimental evidence (hybrid helps, but unproven)
- **Ad hoc Oscillation Mechanism:** Geometric phases +  $\delta$  not fully derived
- **Missing QFT Foundation:** No complete field theory
- **Experimentally Indistinguishable:** Similar to Standard Model
- **Highly Speculative Basis:** Photon analogy and Koide extension unproven

**Overall Evaluation: Interesting Hypothesis, but Highly Speculative and Unconfirmed**

### 1.7.3 Comparison with Established T0 Predictions

Area	T0 Prediction	Experiment	Deviation	Status
Fine Structure Constant	$\alpha^{-1} = 137.036$	137.036	< 0.001%	Established
Gravitational Constant	$G = 6.674 \times 10^{-11}$	$6.674 \times 10^{-11}$	< 0.001%	Established
Charged Leptons	99.0% Accuracy	Precisely Known	~ 1%	Established
Quark Masses	98.8% Accuracy	Precisely Known	~ 2%	Established
Neutrino Masses (Koide Ext.)	$m_{\nu_i} \approx 4 - 5 \text{ meV}$	< 100 meV	Unknown ( $\Delta Q_\nu < 1\%$ )	Speculative
Neutrino Oscillations	Geometric Phases + $\delta$	$\Delta m^2 \neq 0$	Partially Compatible	Problematic

Tabelle 1.2: T0 Neutrinos in Comparison to Established T0 Successes (Updated with Koide)

## 1.8 Experimental Tests and Falsification

### 1.8.1 Testable Predictions

**Specific Experimental Tests of the T0 Neutrino Theory:**

#### 1. Direct Mass Determination:

- KATRIN: Sensitivity to  $\sim 0.2 \text{ eV}$  (insufficient)
- Future Experiments:  $\sim 0.01 \text{ eV}$  required
- T0 Prediction:  $m_{\nu_i} \approx 4 - 5 \text{ meV}$  (factor 2 below limit)

#### 2. Cosmological Precision Measurements:

- Euclid Satellite: Sensitivity  $\sim 0.02 \text{ eV}$
- T0 Prediction:  $\Sigma m_\nu = 13.86 \text{ meV}$  (testable!)

#### 3. Koide-Specific Tests:

- Measure  $Q_\nu$  via oscillation data: Expect  $\approx 2/3$  ( $\Delta < 1\%$ )
- PMNS correlations: Hierarchy from  $\delta$ -rotation

#### 4. Speed Measurements:

- Supernova Neutrinos:  $\Delta v/c \sim 10^{-8}$  measurable
- T0 Prediction:  $\Delta v/c = 8.89 \times 10^{-9}$  (marginal)

#### 5. Oscillation Physics:

- Test for small  $\Delta m_{ij}^2$  + phase effects (clearly falsifiable)

### 1.8.2 Falsification Criteria

The T0 Neutrino Theory would be falsified by:

1. Direct measurement of  $m_\nu > 0.1$  eV (or strong hierarchy  $|m_3 - m_1| > 10$  meV)
2. Cosmological evidence for  $\Sigma m_\nu > 0.1$  eV
3. Clear proof of  $\Delta m_{ij}^2 \gg 10^{-4}$  eV<sup>2</sup> without phases
4. Measurement of speed differences  $\Delta v/c > 10^{-8}$
5. Deviation from  $Q_\nu \approx 2/3$  in oscillation analyses

## 1.9 Limits and Open Questions

### 1.9.1 Fundamental Theoretical Problems

**Unsolved Problems of the T0 Neutrino Theory:**

1. **Oscillation Mechanism:** Geometric phases +  $\delta$  are ad hoc
2. **Quantum Field Theory:** No complete QFT formulation
3. **Experimental Distinguishability:** Difficult to separate from Standard Model
4. **Theoretical Consistency:** Partial contradiction to oscillation theory
5. **Predictive Power:** Enhanced by Koide, but still limited

### 1.9.2 Future Developments

1. **QFT Foundation:** Complete quantum field theory for geometric phases + Koide
2. **Experimental Precision:** Cosmological measurements with  $\sim 0.01$  eV sensitivity
3. **Oscillation Theory:** Rigorous derivation of hybrid effects
4. **Unified Description:** Full T0 integration with PMNS

## 1.10 Methodological Reflection

### 1.10.1 Scientific Integrity vs. Theoretical Speculation

#### Central Methodological Insights:

The neutrino chapter of the T0 Theory illustrates the tension between:

- **Theoretical Completeness:** Desire for unified description (now incl. Koide)
- **Empirical Anchoring:** Necessity of experimental confirmation
- **Scientific Honesty:** Disclosure of speculative nature
- **Mathematical Consistency:** Internal self-consistency of formulas

**Key Insight:** Even speculative theories can be valuable if their limits are honestly communicated.

### 1.10.2 Significance for the T0 Series

The neutrino treatment shows both the strengths and limits of the T0 Theory:

- **Strengths:** Unified framework, elegant analogies, testable predictions (enhanced by Koide)
- **Limits:** Speculative basis, lack of experimental confirmation
- **Scientific Value:** Demonstration of alternative thinking approaches
- **Methodological Importance:** Importance of honest uncertainty communication

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*This document is part of the new T0 Series  
and shows the speculative limits of the T0 Theory*

**T0-Theory: Time-Mass Duality Framework**

*GitHub: <https://github.com/jpascher/T0-Time-Mass-Duality>*

# Literaturverzeichnis

- [1] J. Pascher, *T0 Theory: Time-Mass Duality*, 2024. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_unified\\_report.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_unified_report.pdf)
- [2] J. Pascher, *T0 Theory: Fundamentals*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Grundlagen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Grundlagen_En.pdf)
- [3] J. Pascher, *T0 Theory: Quantum Mechanics*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/QM\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/QM_En.pdf)
- [4] J. Pascher, *T0 Theory: SI Units*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_SI\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_SI_En.pdf)
- [5] J. Pascher, *T0 Theory: The g-2 Anomaly*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Anomale-g2-9\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Anomale-g2-9_En.pdf)
- [6] J. Pascher, *T0 Theory: CMB Analysis*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zwei-Dipole-CMB\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zwei-Dipole-CMB_En.pdf)
- [7] A. Einstein, *On the Electrodynamics of Moving Bodies*, Annalen der Physik, 1905. <https://doi.org/10.1002/andp.19053221004>
- [8] P.A.M. Dirac, *The Quantum Theory of the Electron*, Proc. Roy. Soc. A, 1928. <https://doi.org/10.1098/rspa.1928.0023>
- [9] M. Planck, *On the Theory of the Energy Distribution Law*, 1900. <https://doi.org/10.1002/andp.19013090310>
- [10] E. Mach, *Die Mechanik in ihrer Entwicklung*, 1883.
- [11] Various Authors, *100 Authors Against Einstein*, 1931.
- [12] H. Dingle, *Science at the Crossroads*, 1972.
- [13] J. Terrell, *Invisibility of the Lorentz Contraction*, Phys. Rev., 1959. <https://doi.org/10.1103/PhysRev.116.1041>
- [14] R. Penrose, *The Apparent Shape of a Relativistically Moving Sphere*, Proc. Cambridge Phil. Soc., 1959. <https://doi.org/10.1017/S0305004100033776>
- [15] R. Penrose, *Twistor Algebra*, J. Math. Phys., 1967. <https://doi.org/10.1063/1.1705200>
- [16] R. Penrose, *The Road to Reality*, 2004.

- [17] J. Terrell et al., *Modern Terrell-Penrose Visualization*, 2025.
- [18] D. Weiskopf, *Visualization of Four-dimensional Spacetimes*, 2000.
- [19] T. Müller, *Visual Appearance of Relativistically Moving Objects*, 2014.
- [20] S. Hossenfelder, *YouTube: The Terrell Effect*, 2025.
- [21] C. Rovelli, *Quantum Gravity*, Cambridge University Press, 2004.
- [22] T. Thiemann, *Modern Canonical Quantum Gravity*, Cambridge University Press, 2007.
- [23] A. Ashtekar, J. Lewandowski, *Background Independent Quantum Gravity*, Class. Quant. Grav., 2004. <https://doi.org/10.1088/0264-9381/21/15/R01>
- [24] T. Jacobson, *Thermodynamics of Spacetime*, Phys. Rev. Lett., 1995. <https://doi.org/10.1103/PhysRevLett.75.1260>
- [25] J. Maldacena, *The Large N Limit of Superconformal Field Theories*, Adv. Theor. Math. Phys., 1998. <https://doi.org/10.4310/ATMP.1998.v2.n2.a1>
- [26] J. Polchinski, *String Theory*, Cambridge University Press, 1998.
- [27] L. Susskind, *The World as a Hologram*, J. Math. Phys., 1995. <https://doi.org/10.1063/1.531249>
- [28] E. Verlinde, *On the Origin of Gravity*, JHEP, 2011. [https://doi.org/10.1007/JHEP04\(2011\)029](https://doi.org/10.1007/JHEP04(2011)029)
- [29] F. Hoyle, *A New Model for the Expanding Universe*, MNRAS, 1948. <https://doi.org/10.1093/mnras/108.5.372>
- [30] H. Bondi, T. Gold, *The Steady-State Theory*, MNRAS, 1948. <https://doi.org/10.1093/mnras/108.3.252>
- [31] F. Zwicky, *On the Redshift of Spectral Lines*, Proc. Nat. Acad. Sci., 1929. <https://doi.org/10.1073/pnas.15.10.773>
- [32] C. Lopez-Corredoira, *Tests of Cosmological Models*, Int. J. Mod. Phys. D, 2010.
- [33] E. Lerner, *Evidence for a Non-Expanding Universe*, 2014.
- [34] A. Albrecht, J. Magueijo, *Variable Speed of Light*, Phys. Rev. D, 1999. <https://doi.org/10.1103/PhysRevD.59.043516>
- [35] J. Barrow, *Cosmologies with Varying Light Speed*, Phys. Rev. D, 1999. <https://doi.org/10.1103/PhysRevD.59.043515>
- [36] A. Riess et al., *A Comprehensive Measurement of the Local Value of the Hubble Constant*, ApJ, 2022. <https://doi.org/10.3847/2041-8213/ac5c5b>
- [37] DESI Collaboration, *DESI Year 1 Results*, 2025. <https://arxiv.org/abs/2404.03002>

- [38] E. Di Valentino et al., *Planck Evidence for a Closed Universe*, Nat. Astron., 2021. <https://doi.org/10.1038/s41550-019-0906-9>
- [39] P. Di Francesco et al., *Conformal Field Theory*, Springer, 1997.
- [40] Particle Data Group, *Review of Particle Physics*, 2024. <https://pdg.lbl.gov/>
- [41] CODATA, *Recommended Values of Fundamental Constants*, 2019. <https://physics.nist.gov/cuu/Constants/>
- [42] D. Newell et al., *The CODATA 2017 Values of  $h$ ,  $e$ ,  $k$ , and  $N_A$* , Metrologia, 2018. <https://doi.org/10.1088/1681-7575/aa950a>
- [43] Muon g-2 Collaboration, *Measurement of the Anomalous Magnetic Moment of the Muon*, Phys. Rev. Lett., 2023. <https://doi.org/10.1103/PhysRevLett.131.161802>
- [44] Fermilab, *Muon g-2 Results*, 2023. <https://muon-g-2.fnal.gov/>
- [45] ATLAS Collaboration, *Measurements at the LHC*, 2023. <https://atlas.cern/>
- [46] ATLAS Collaboration, *Higgs Boson Properties*, 2023. <https://atlas.cern/>
- [47] CMS Collaboration, *Top Quark Measurements*, 2023. <https://cms.cern/>
- [48] CMS Collaboration, *Heavy Ion Collisions*, 2024. <https://cms.cern/>
- [49] ALICE Collaboration, *Quark-Gluon Plasma Studies*, 2023. <https://alice-collaboration.web.cern.ch/>
- [50] M. Kasevich et al., *Atom Interferometry*, 2023.
- [51] A. Ludlow et al., *Optical Atomic Clocks*, Rev. Mod. Phys., 2015. <https://doi.org/10.1103/RevModPhys.87.637>
- [52] S. Brewer et al., *Al<sup>+</sup> Optical Clock*, Phys. Rev. Lett., 2019. <https://doi.org/10.1103/PhysRevLett.123.033201>
- [53] LISA Collaboration, *LISA Mission*, 2017. <https://www.lisamission.org/>
- [54] L. Nottale, *Fractal Space-Time and Microphysics*, World Scientific, 1993.
- [55] M.S. El Naschie, *E-Infinity Theory*, Chaos Solitons Fractals, 2004.
- [56] J.A. Wheeler, *Information, Physics, Quantum*, 1990.
- [57] J. Barbour, *The End of Time*, Oxford University Press, 1999.
- [58] D. Sciama, *On the Origin of Inertia*, MNRAS, 1953. <https://doi.org/10.1093/mnras/113.1.34>
- [59] K. Becker et al., *String Theory and M-Theory*, Cambridge University Press, 2007.
- [60] Muon g-2 Theory Initiative, *Standard Model Prediction for g-2*, arXiv, 2025. <https://arxiv.org/abs/2006.04822>

- [61] Muon g-2 Collaboration, *Final Report on the Anomalous Magnetic Moment of the Muon*, Fermilab, 2025. <https://muon-g-2.fnal.gov/>
- [62] J. Pascher, *T0 Theory: Complete Framework*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/systemEn.pdf>
- [63] M.E. Peskin and D.V. Schroeder, *An Introduction to Quantum Field Theory*, Westview Press, 1995.
- [64] R.H. Parker et al., *Measurement of the Fine-Structure Constant*, Science, 2018. <https://doi.org/10.1126/science.aap7706>
- [65] L. Morel et al., *Determination of  $\alpha$  from Rubidium Atom Recoil*, Nature, 2020. <https://doi.org/10.1038/s41586-020-2964-7>
- [66] T. Aoyama et al., *Theory of the Electron Anomalous Magnetic Moment*, Phys. Rep., 2020. <https://doi.org/10.1016/j.physrep.2020.07.006>
- [67] X. Fan et al., *Hadronic Contributions from Lattice QCD*, Phys. Rev. D, 2023.
- [68] D. Hanneke et al., *New Measurement of the Electron g-2*, Phys. Rev. Lett., 2008. <https://doi.org/10.1103/PhysRevLett.100.120801>
- [69] J. Pascher, *Higgs Connection in T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Energie\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Energie_En.pdf)
- [70] J. Pascher, *T0 Theory and SI Units*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_SI\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_SI_En.pdf)
- [71] J. Pascher, *Gravitational Constant in T0 Framework*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Gravitationskonstante\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Gravitationskonstante_En.pdf)
- [72] J. Pascher, *Fine Structure Constant Analysis*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Feinstruktur\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Feinstruktur_En.pdf)
- [73] J.S. Bell, *Muon Studies*, 1966.
- [74] J. Pascher, *Quantum Field Theory in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/QFT\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/QFT_En.pdf)
- [75] Planck Collaboration, *Planck 2018 Results*, A&A, 2018. <https://doi.org/10.1051/0004-6361/201833910>
- [76] J. Pascher, *T0 Theory Foundations*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Grundlagen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Grundlagen_En.pdf)
- [77] J. Pascher, *Geometric Formalism in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Geometrische\\_Kosmologie\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Geometrische_Kosmologie_En.pdf)
- [78] A. Riess et al., *Hubble Constant Measurements*, ApJ, 2019. <https://doi.org/10.3847/1538-4357/ab1422>

- [79] J. Pascher, *T0 Kosmologie*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Kosmologie\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Kosmologie_En.pdf)
- [80] S. Hossenfelder, *Single Clock Video*, YouTube, 2025. <https://www.youtube.com/c/SabineHossenfelder>
- [81] Various, *Video References*, 2025.
- [82] C.S. Unnikrishnan, *Gravity Studies*, 2004.
- [83] A. Peratt, *Plasma Cosmology*, 1992. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_peratt\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_peratt_En.pdf)
- [84] J. Pascher, *T0 Time-Mass Extension*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_tm-erweiterung-x6\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_tm-erweiterung-x6_En.pdf)
- [85] J. Pascher, *T0 g-2 Extension*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_g2-erweiterung-4\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_g2-erweiterung-4_En.pdf)
- [86] J. Pascher, *T0 Networks*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_netze\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_netze_En.pdf)
- [87] W. Adams, *Gravitational Redshift*, 1925. <https://doi.org/10.1073/pnas.11.7.382>
- [88] N. Ashby, *Relativity in GPS*, Living Rev. Rel., 2003. <https://doi.org/10.12942/lrr-2003-1>
- [89] B. Bertotti et al., *Cassini Doppler Test*, Nature, 2003. <https://doi.org/10.1038/nature01997>
- [90] A. Bolton et al., *Gravitational Lensing*, 2008.
- [91] M. Born, *Einstein's Theory of Relativity*, Dover, 2013.
- [92] C. Brans and R.H. Dicke, *Mach's Principle*, Phys. Rev., 1961. <https://doi.org/10.1103/PhysRev.124.925>
- [93] P.A.M. Dirac, *Quantum Mechanics*, Proc. Roy. Soc., 1927. <https://doi.org/10.1098/rspa.1927.0039>
- [94] P. Duhem, *Theory of Physics*, 1906.
- [95] A. Einstein, *Special Relativity*, Ann. Phys., 1905. <https://doi.org/10.1002/andp.19053221004>
- [96] R. Feynman, *QED: The Strange Theory of Light and Matter*, 2006.
- [97] D. Griffiths, *Introduction to Quantum Mechanics*, 2017.
- [98] J.D. Jackson, *Classical Electrodynamics*, 1999.
- [99] T. Kaluza, *Five-Dimensional Theory*, 1921.
- [100] O. Klein, *Quantum Theory and Relativity*, 1926.

- [101] T. Kuhn, *Structure of Scientific Revolutions*, 1962.
- [102] T. Kuhn, *Essential Tension*, 1977.
- [103] A. Ludlow et al., *Optical Atomic Clocks*, Rev. Mod. Phys., 2015. <https://doi.org/10.1103/RevModPhys.87.637>
- [104] J.C. Maxwell, *Treatise on Electricity and Magnetism*, 1873.
- [105] S. McGaugh et al., *Radial Acceleration Relation*, Phys. Rev. Lett., 2016. <https://doi.org/10.1103/PhysRevLett.117.201101>
- [106] P. Mohr et al., *CODATA Values*, Rev. Mod. Phys., 2016. <https://doi.org/10.1103/RevModPhys.88.035009>
- [107] Particle Data Group, *Review of Particle Physics*, Prog. Theor. Exp. Phys., 2020. <https://pdg.lbl.gov/>
- [108] R. Parker et al., *Measurement of  $\alpha$* , Science, 2018. <https://doi.org/10.1126/science.aap7706>
- [109] M. Peskin and D. Schroeder, *QFT*, 1995.
- [110] M. Planck, *Quantum Theory*, 1900.
- [111] Planck Collaboration, *Planck 2020 Results*, 2020. <https://doi.org/10.1051/0004-6361/201833910>
- [112] H. Poincaré, *Dynamics of the Electron*, 1905.
- [113] R.V. Pound and G.A. Rebka, *Gravitational Redshift*, Phys. Rev. Lett., 1960. <https://doi.org/10.1103/PhysRevLett.4.337>
- [114] W.V. Quine, *Two Dogmas of Empiricism*, 1951.
- [115] T. Quinn et al., *Gravitational Constant*, 2013. <https://doi.org/10.1103/PhysRevLett.111.101102>
- [116] L. Randall and R. Sundrum, *Extra Dimensions*, Phys. Rev. Lett., 1999. <https://doi.org/10.1103/PhysRevLett.83.3370>
- [117] A. Riess et al., *Type Ia Supernovae*, AJ, 1998. <https://doi.org/10.1086/300499>
- [118] I. Shapiro et al., *Time Delay Test*, Phys. Rev. Lett., 1971. <https://doi.org/10.1103/PhysRevLett.26.1132>
- [119] A. Sommerfeld, *Fine Structure*, 1916.
- [120] S. Suyu et al., *Time Delay Cosmography*, MNRAS, 2017. <https://doi.org/10.1093/mnras/stx483>
- [121] J. Pascher, *T0 Theory*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/systemEn.pdf>
- [122] J. Pascher, *Fine Structure in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Feinstruktur\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Feinstruktur_En.pdf)

- [123] J.-P. Uzan, *Constants Variation*, Rev. Mod. Phys., 2003. <https://doi.org/10.1103/RevModPhys.75.403>
- [124] J.K. Webb et al., *Fine Structure Constant*, Phys. Rev. Lett., 2001. <https://doi.org/10.1103/PhysRevLett.87.091301>
- [125] S. Weinberg, *Cosmological Constant*, Rev. Mod. Phys., 1979.
- [126] S. Weinberg, *Cosmological Constant Problem*, 1989. <https://doi.org/10.1103/RevModPhys.61.1>
- [127] S. Weinberg, *Quantum Theory of Fields*, 1995.
- [128] C. Will, *Theory and Experiment in Gravitational Physics*, 2014. <https://doi.org/10.12942/lrr-2014-4>
- [129] P.A.M. Dirac, *Principles of Quantum Mechanics*, 1930.
- [130] A. Einstein, *Cosmological Considerations*, 1917.
- [131] JWST Collaboration, *Early Universe Observations*, 2023. <https://www.jwst.nasa.gov/>
- [132] KATRIN Collaboration, *Neutrino Mass*, 2022. <https://doi.org/10.1038/s41567-021-01463-1>
- [133] J. Pascher, *T0 Fundamentals*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Grundlagen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Grundlagen_En.pdf)
- [134] J. Pascher, *g-2 Analysis Rev9*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Anomale-g2-9\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Anomale-g2-9_En.pdf)
- [135] J. Pascher, *ML Addendum*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-QFT-ML\\_Addendum\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-QFT-ML_Addendum_En.pdf)
- [136] J. Pascher, *Beta Derivation*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/DerivationVonBetaEn.pdf>
- [137] J. Pascher, *CMB Analysis in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zwei-Dipole-CMB\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zwei-Dipole-CMB_En.pdf)
- [138] J. Pascher, *Cosmos in T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/cosmic\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/cosmic_En.pdf)
- [139] J. Pascher, *Derivation of Beta*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/DerivationVonBetaEn.pdf>
- [140] J. Pascher, *Gravitation in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/gravitationskonstante\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/gravitationskonstante_En.pdf)
- [141] J. Pascher, *Lagrangian in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_lagrndian\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_lagrndian_En.pdf)
- [142] J. Pascher, *Lagrangian Framework*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/LagrandianVergleichEn.pdf>

- [143] J. Pascher, *Extended Lagrangian Formalism*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_lagrndian\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_lagrndian_En.pdf)
- [144] J. Pascher, *Mathematical Structure of T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Mathematische\\_struktur\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Mathematische_struktur_En.pdf)
- [145] J. Pascher, *Muon g-2 in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Anomale-g2-9\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Anomale-g2-9_En.pdf)
- [146] J. Pascher, *Pragmatic Approach*, 2025.
- [147] J. Pascher, *T0 Energy Formalism*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-Energie\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-Energie_En.pdf)
- [148] J. Pascher, *Unified T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_unified\\_report.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_unified_report.pdf)
- [149] Science Daily, *Physics News*, 2025. <https://www.sciencedaily.com/>
- [150] S. Weinberg, *The Cosmological Constant Problem*, Rev. Mod. Phys., 1989. <https://doi.org/10.1103/RevModPhys.61.1>
- [151] Wikipedia, *Bell's Theorem*, 2025. [https://en.wikipedia.org/wiki/Bell%27s\\_theorem](https://en.wikipedia.org/wiki/Bell%27s_theorem)
- [152] B. van Fraassen, *The Scientific Image*, Oxford University Press, 1980.
- [153] J. Terrell, *Single Clock Nature*, Nature, 2024.
- [154] J. Pascher, *The Number 137 in T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/137\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/137_En.pdf)
- [155] J. Pascher, *Ampere's Law in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Amper\\_Low\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Amper_Low_En.pdf)
- [156] J. Pascher, *Bell's Theorem in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Bell\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Bell_En.pdf)
- [157] J. Pascher, *Kinetic Energy in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Bewegungsenergie\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Bewegungsenergie_En.pdf)
- [158] J. Pascher, *E=mc<sup>2</sup> in T0 Framework*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/E-mc2\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/E-mc2_En.pdf)
- [159] J. Pascher, *Energy-Based Formulas*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Formeln\\_Energiebasiert\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Formeln_Energiebasiert_En.pdf)
- [160] J. Pascher, *Hannah Document*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Hannah\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Hannah_En.pdf)
- [161] J. Pascher, *H0 Analysis*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Ho\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Ho_En.pdf)

- [162] J. Pascher, *Markov Processes in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Markov\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Markov_En.pdf)
- [163] J. Pascher, *Elimination of Mass*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/EliminationOfMassEn.pdf>
- [164] J. Pascher, *Dirac Equation Mass Elimination*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Elimination\\_Of\\_Mass\\_Dirac\\_TabelleEn.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Elimination_Of_Mass_Dirac_TabelleEn.pdf)
- [165] J. Pascher, *Fine Structure Constant*, 2025. <https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/FeinstrukturkonstanteEn.pdf>
- [166] J. Pascher, *Neutrino Formula*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/neutrino-Formel\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/neutrino-Formel_En.pdf)
- [167] J. Pascher, *Neutrinos in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Neutrinos\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Neutrinos_En.pdf)
- [168] J. Pascher, *Koide Formula in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_koide-formel-3\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_koide-formel-3_En.pdf)
- [169] J. Pascher, *Particle Masses*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Teilchenmassen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Teilchenmassen_En.pdf)
- [170] J. Pascher, *T0 Particle Masses*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Teilchenmassen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Teilchenmassen_En.pdf)
- [171] J. Pascher, *Penrose Analysis in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_penrose\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_penrose_En.pdf)
- [172] J. Pascher, *Photon Chip Implementation*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_photonenchip-china\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_photonenchip-china_En.pdf)
- [173] J. Pascher, *Three Clock Experiment*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_threeclock\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_threeclock_En.pdf)
- [174] J. Pascher, *Redshift and Deflection*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/redshift\\_deflection\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/redshift_deflection_En.pdf)
- [175] J. Pascher, *Apparent Instantaneity*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/scheinbar\\_instantan\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/scheinbar_instantan_En.pdf)
- [176] J. Pascher, *Universal Derivation*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/universale-ableitung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/universale-ableitung_En.pdf)
- [177] J. Pascher, *Xi Parameter for Particles*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/xi\\_parmater\\_partikel\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/xi_parmater_partikel_En.pdf)
- [178] J. Pascher, *Origin of Xi*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_xi\\_ursprung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_xi_ursprung_En.pdf)
- [179] J. Pascher, *Time in T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zeit\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zeit_En.pdf)

- [180] J. Pascher, *Time Constant*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zeit-konstant\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zeit-konstant_En.pdf)
- [181] J. Pascher, *Summary of T0 Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zusammenfassung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/Zusammenfassung_En.pdf)
- [182] J. Pascher, *RSA in T0 Framework*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/RSA\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/RSA_En.pdf)
- [183] J. Pascher, *Quantum Atomic Theory*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_QAT\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_QAT_En.pdf)
- [184] J. Pascher, *QM, QFT and RT Unification*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_QM-QFT-RT\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_QM-QFT-RT_En.pdf)
- [185] J. Pascher, *QM Optimization*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_QM-optimierung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_QM-optimierung_En.pdf)
- [186] J. Pascher, *Complete Calculations*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Vollstaendige\\_Berchnungen\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Vollstaendige_Berchnungen_En.pdf)
- [187] J. Pascher, *T0 Theory vs Synergetics*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-Theory-vs-Synergetics\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0-Theory-vs-Synergetics_En.pdf)
- [188] J. Pascher, *T0 Model Overview*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Modell\\_Uebersicht\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Modell_Uebersicht_En.pdf)
- [189] J. Pascher, *MNRAS Analysis*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Analyse\\_MNRAS\\_Widerlegung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Analyse_MNRAS_Widerlegung_En.pdf)
- [190] J. Pascher, *Anomalous Magnetic Moments*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_Anomale\\_Magnetische\\_Momente\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_Anomale_Magnetische_Momente_En.pdf)
- [191] J. Pascher, *Seven Questions in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_7-fragen-3\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_7-fragen-3_En.pdf)
- [192] J. Pascher, *Detailed Lepton Anomaly*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/detailierte\\_formel\\_leptonen\\_anemal\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/detailierte_formel_leptonen_anemal_En.pdf)
- [193] J. Pascher, *Parameter Derivation*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/parameterherleitung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/parameterherleitung_En.pdf)
- [194] J. Pascher, *Absolute Ratios in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_verhaeltnis-absolut\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_verhaeltnis-absolut_En.pdf)
- [195] J. Pascher,  *$\Xi$  and Energy*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_xi-und-e\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_xi-und-e_En.pdf)
- [196] J. Pascher, *Inversion in T0*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0\\_umkehrung\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0_umkehrung_En.pdf)

- [197] J. Pascher, *T0 vs ESM Conceptual Analysis*, 2025. [https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0vsESM\\_ConceptualAnalysis\\_En.pdf](https://github.com/jpascher/T0-Time-Mass-Duality/blob/main/2/pdf/T0vsESM_ConceptualAnalysis_En.pdf)