Article

Letter 0 - Motivation for TEQ

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Letter 0 Motivation for TEQ

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Abstract: This opening letter presents the core motivation for the Total Entropic Quantity (TEQ) framework. TEQ does not reformulate physics by analogy or reinterpretation—it derives fundamental structures from first principles rooted in entropy geometry. Within this framework, we rigorously derive the Born rule, the Bohr quantization condition, the Heisenberg Uncertainty Principle, the Schrödinger equation, and the entropy-weighted Feynman path integral. TEQ also explains novel quantum phenomena such as wave–particle emergence and the behavior of Majorana fermions, and predicts deviations from standard formulations in entropy-curved regimes. By compressing at least seven foundational axioms into two entropic principles, TEQ offers a conceptually unified and empirically generative alternative to the postulatory foundations of modern physics. This letter outlines what follows and why it matters.

Keywords: entropy geometry; resolution principle; quantization; born rule; path integral; wave–particle emergence; majorana fermions; prediction; unification; experimental testability

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1. Introduction

Physics, as it stands, rests on an uneasy scaffolding of postulates: canonical quantization, unitary evolution, action extremization, and geometric covariance are all taken as given. But what if they are not fundamental? What if all of them—along with time, causality, and probability—emerge from a deeper structural condition?

The TEQ framework is built on two core axioms [1]:

Axiom 1: *Entropy as Structural Generator*: Observable structure arises from entropy geometry and its induced gradients.

Axiom 2: *Minimal Principle of Stable Resolution*: The physical world selects configurations that are locally stable under entropy curvature, maximizing distinguishability.

From these axioms, TEQ derives the quantum and classical structures we currently treat as axiomatic—including the key dynamical, probabilistic, and spectral behaviors that define modern physics.

2. Derivations

The TEQ framework **derives** the following structures without assuming them:

- **The Born Rule** [2], as the stable distribution under entropy-weighted path summation.
- **Bohr Quantization** [3], as a resonance condition under entropy-curved action flows.
- **The Heisenberg Uncertainty Principle** [4], as a consequence of resolution limits under entropy geometry.
- **The Schrödinger Equation** [5], emerging from the entropy-weighted action extremization.
- **The Entropy-Weighted Feynman Path Integral** [7], as a generative object, not a heuristic postulate.
- **Gravitational Geometry**, as an emergent constraint from entropy flow and distinguishability.

In addition, TEQ supports a conditional derivation of the **Riemann Hypothesis** by linking spectral stability to the structure of entropy-curved eigenmodes, and hints at structural reformulations of number-theoretic conjectures such as Goldbach's.

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3. Explanations

The explanatory power of TEQ goes beyond unification. It offers first-principles insight into phenomena that standard quantum mechanics either brackets or mystifies:

- **Wave–Particle Emergence**: No duality is needed—wave-like and particle-like behaviors follow from entropy-weighted path dynamics.
- **Measurement and Decoherence**: Collapse is an entropic selection effect—irreversible due to entropy gradients.
- **Quantum Interpretations Recast**: TEQ explains the apparent collapse of the wavefunction (Copenhagen) as a thermodynamic selection process and recovers the weighted sum over paths (MWI) without positing parallel branches—both emerge as limits of entropy-weighted inference [6].
- **Majorana Fermions**: TEQ accounts for the emergence of self-conjugate excitations as entropically stable boundary modes.
- **Recent Experiments**: Entropic uncertainty relations recently confirmed in laboratory settings [8,9] are not surprising—they are exactly what TEQ predicts.

These are not patched-in effects or interpretive overlays. They follow necessarily from the entropy-weighted structure of physical inference.

4. Predictions

Unlike formalist interpretations or geometric reformulations, TEQ makes predictions that diverge from standard theory:

- **Deviations from the Born Rule** in regimes of strong entropy curvature or time-dependent resolution constraints.
- **Corrections to the Schrödinger Equation** where entropy gradients shift local action structure.
- **Modified Uncertainty Relations** as resolution constraints become dynamic rather than fixed.
- **Flat Galactic Rotation Curves** without dark matter, derived from entropy flow induced by baryonic structure.
- **Single Entropic Peak** in the cosmological entropy curve, predicting a future regime of decelerating entropy realization [10].

These effects offer experimental pathways to confirm or falsify the framework. They are not optional—they are consequences of the two core axioms.

5. The Way Forward

This letter series is not simply a technical derivation. It is an invitation to understand physics as a system of distinctions shaped by entropy flow. Across the letters, we will:

- Derive known laws from entropy-weighted structure.
- Unpack unfamiliar but necessary consequences of that structure.
- Clarify intuitively how entropy, geometry, and resolution give rise to the observable world.

What TEQ offers is not just a unification—but a simplification. The compression of 7–10 major postulates into two guiding principles is a measure of conceptual power. But more than elegance, TEQ offers direction: a coherent structural approach to physics, ready for experimental, mathematical, and computational exploration.

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