

Preprint: The Geometric Theory of Phase

Part 1: Foundations of Phase Theory

Section 1: Introduction and Philosophy of Phase Theory

The Geometric Theory of Phase (GPT) presents a fundamental physical concept aimed at constructing a unified, consistent description of the Universe based on a minimal number of primary principles. Unlike standard approaches, GPT strives to explain, rather than postulate, the fundamental properties of matter, fields, interactions, and the very structure of space-time as emergent phenomena. These phenomena are considered to arise from the geometry and dynamics of a universal phase field, also referred to as the phase background. The core philosophical underpinning of GPT is the application of Occam's Razor: the elimination of redundant entities and the explanation of the broadest possible range of phenomena through a single, unified mechanism.

The theory aims to bridge the gaps between quantum mechanics and gravity, as well as to explain cosmological observations and the structure of elementary particles without introducing hypothetical substances (such as dark matter or dark energy) or distinct field carriers for each type of interaction.

The entire conceptual framework of GPT logically follows from three fundamental propositions:

- The Existence of a Phase Background:** The foundation of reality is a passive field of equilibrium phase tension (T_0), capable of subcritical fluctuations and the transmission of perturbations at the speed of light, c .
- Universal Local Motion (c):** All fundamental phase processes occur locally at the speed of light, c .
- Matter as Stable Phase Vortices:** Stable particles are topologically stable, closed vortex configurations of the phase field, forming when the local phase tension exceeds a critical threshold ($T > T_{critical}$) and which minimize phase energy.

From these principles, GPT derives, rather than postulates, several key aspects of physics:

- The origin of mass, spin, and charge as geometric and topological properties of these phase vortices.
- The mechanisms of all fundamental interactions (electromagnetic, gravitational, nuclear) through phase dynamics.
- Quantum effects as consequences of phase coherence and topology.
- Thermodynamics as the statistics of phase fluctuations.
- The structure of matter at all levels, from atoms and nuclei to molecules and crystals.
- Cosmological evolution without the need for spatial expansion, dark matter, or dark energy.
- Explanations for observed "anomalies" in standard models, presenting them as natural consequences of phase dynamics.