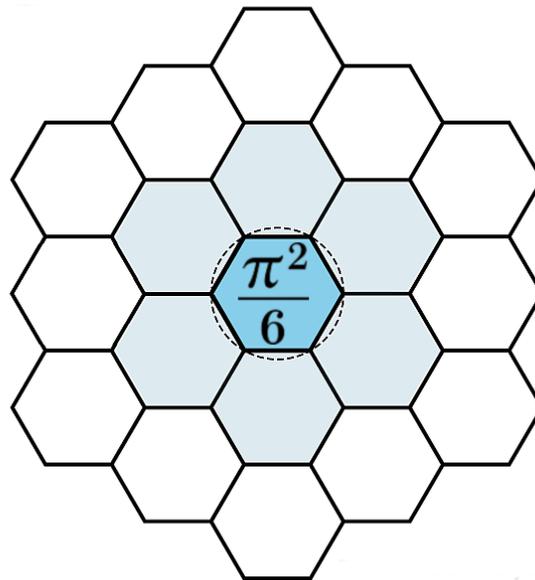# Discrete Transport Foundations of Physical Structure

Master Synthesis of Discrete Transport Ontology, Closure Geometry, Interaction Structure, and Relativistic Emergence

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Abstract

A unified generative framework is constructed in which propagation, interaction, relativistic structure, and cosmological coherence arise from discrete local transport on a hexagonal adjacency substrate termed the Allen Orbital Lattice. Bounded propagation produces closure stabilization. Closure confinement generates oscillatory response and interaction cross section. Directional variability produces diffusion and coherence suppression. Continuum expansion yields hyperbolic transport and Lorentz invariant geometry. A single transport hierarchy links microscopic adjacency transitions to macroscopic radiation structure.

Primitive Ontology

Definition 1 (Allen Orbital Lattice). *A discrete hexagonal adjacency graph with uniform step length a and update interval τ.*

Axiom 1 (Local Admissibility). *State transitions occur only between adjacent nodes preserving phase continuity.*

Axiom 2 (Finite Update). *One propagation step occurs per cycle.*

Definition 2 (Propagation Bound).

$$c = \frac{a}{\tau}$$

No propagation exceeds this rate.

Closure Stabilization

Repeated transport produces periodic phase return.

Definition 3 (Closure Domain). *A region in which phase deviation remains bounded.*

Definition 4 (Closure Radius).

$$r_c$$

scale of periodic transport orbit.

Angular frequency:

$$\omega_c = \frac{c}{r_c}$$

Oscillatory Confinement

External forcing induces displacement.

$$\ddot{x} = -\omega^2 x$$

Confined motion produces dipole radiation.

Interaction Geometry

Radiated power:

$$P = \frac{2}{3} \frac{q^2 \ddot{x}^2}{4\pi\epsilon_0 c^3}$$

Scattering cross section:

$$\sigma_T = \frac{8\pi}{3} \left(\frac{q^2}{4\pi\epsilon_0 m c^2} \right)^2$$

Interaction area determined by closure confinement.

Randomized Transport

Propagation direction varies between cycles.

$$\langle R^2 \rangle = Na^2$$

Diffusion coefficient:

$$D = \frac{a^2}{6\tau}$$

Coherence Suppression

Fourier amplitude decay:

$$A_k(t) = A_k(0)e^{-Dk^2 t}$$

Damping scale:

$$\lambda_D = \sqrt{\frac{ar_c}{6}}$$

Continuum Limit

Discrete update:

$$\psi(\mathbf{x}, t + \tau) = \frac{1}{6}\sum \psi(\mathbf{x} + \mathbf{e}_i a, t)$$

Expansion yields:

$$\partial_t^2 \psi = c^2 \nabla^2 \psi$$

Invariant Geometry

$$s^2 = c^2 t^2 - r^2$$

Lorentz transformations preserve this interval.

Unified Transport Hierarchy

$$a \rightarrow c \rightarrow r_c \rightarrow \omega_c \rightarrow \sigma_T \rightarrow D \rightarrow \lambda_D \rightarrow L_{\text{coh}}$$

Master Generative Theorem

Theorem 1. *Bounded discrete propagation on a symmetric adjacency lattice produces closure stabilization, oscillatory interaction, diffusion limited coherence, and Lorentz invariant continuum transport.*

Proof. Propagation constraint enforces finite velocity. Isotropic adjacency yields symmetric transport. Repeated transport forms periodic closure. Closure confinement generates oscillatory response. Directional variability produces diffusion. Continuum expansion produces hyperbolic wave equation. Wave equation defines invariant interval. Thus full hierarchy follows. □

Conclusion

Physical propagation, interaction geometry, relativistic structure, and large scale radiation coherence arise from discrete adjacency transport and closure formation.

References

- Jackson, J. D. *Classical Electrodynamics.* Wiley.

- Einstein, A. (1905). On the Electrodynamics of Moving Bodies.

- Chandrasekhar, S. *Radiative Transfer.*

- Kittel, C. *Thermal Physics.*

Document Timestamp and Provenance

This document is an original research publication within Pattern Field Theory (PFT) and the Allen Orbital Lattice (AOL) framework, authored by James Johan Sebastian Allen. It establishes the discrete transport ontology, closure formation mechanism, interaction geometry, diffusion structure, continuum emergence, and invariant transport relations that generate physical structure across scales.

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