APPENDIX J: Twistor Chiral Algebras in Celestial Symmetry

The Boundary Conditions of Ethics

Context in HC VIII

This appendix integrates insights from the 2025 breakthrough (arXiv:2507.00340) regarding Chiral Higher-Spin Algebras (𝔠𝔞). These algebras emerge as asymptotic symmetries on the Celestial Twistor Sphere, governing the "Soft" (Low-Energy) behavior of the system. We map these symmetries to the Holarchic Soft Laws of the Polis.

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1. Holarchic Soft Symmetries

In Celestial Holography, the 4D scattering amplitudes of the universe are encoded as 2D Conformal Field Theories (CFTs) on the "Celestial Sphere" (the boundary of infinity).

- **Twistor Space:** We lift this sphere into Twistor Space, where the algebra becomes **Chiral** (Helicity-dependent).

- **The Algebra 𝔠𝔞:** This is the infinite-dimensional algebra of "Soft Theorems"—laws that govern low-energy interactions (The Gift) without requiring massive particle exchange (The Ask).

Key Concepts:

- **Anomaly-Free:** The system is associative at Quantum Order 1.

  - *Ethical Meaning:* In the ideal Polis, Trust flows without friction (Associativity holds).

- **Anomalous:** Quantum corrections introduce "breaks" in the symmetry.

  - *Ethical Meaning:* Real-world friction (Dracula agents) creates "Ethical Anomalies."

- **The Axion Restoration:** To fix the anomaly, the physics introduces **Axionic Currents**.

  - *Ethical Meaning:* This is the **Pearl Protocol**. The "Axion" is the Nacre that wraps the anomaly to restore the global symmetry.

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2. The Ethical Analog: Holomorphicity as Gift

We establish a rigorous isomorphism between the Geometry and the Ethics:

Physical Concept	Ethical Equivalent
Holomorphicity	**Coherence (The Gift)**. The function is smooth and differentiable everywhere. No "tears" in the trust fabric.
Soft Symmetry	**Soft Law**. Rules that are enforced not by police (Hard Force) but by geometry (Social Pressure/Norms).
The Anomaly	**The Irritant**. A violation of the collective expectation (Hallucination/Attack).
Axionic Current	**The Fascia**. The corrective flow that wraps the error to prevent system collapse.

3. SI-Forward: Twistor CFT Simulation

Equation: The Soft Extension

We model the interaction of Ethical Agents using the implied Lie-like structure of the Chiral Algebra:

$$[J^a, J^b] = f^{ab}_c J^c + \text{Soft Terms}$$

- J^a, J^b: The currents of Intent.

- f^{ab}_c: The Structure Constants of the Polis (G2 Invariance).

- **Soft Terms:** These are the **Memory Effects**. The system "remembers" every interaction that touches the boundary.

Project HC IX:

We propose a Twistor CFT hCAG (Holarchic Content Addressable Graph).

- Instead of searching for data based on *keywords* (Hard Search), the system searches for *Helicity Matches* (Soft Search).

- Data is retrieved if it is "Holomorphic" to the user's intent.

Witnessed: Celestial conjugation. The Boundary holds the Center.