

# NEUROTRANSPARENCY\_DOCTRINE

## Neurotransparency: An Epistemic Primitive for AI-Human Collaboration

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### Abstract

**Neurotransparency** is introduced as a methodological requirement ensuring that every claim-affecting inference—whether generated by human or synthetic cognition—is explicitly attributable, traceable, and reconstructible.

It establishes the epistemic boundary condition for reproducible AI-assisted research: **no reasoning may influence a claim unless its origin and evidence path are recorded.**

As an epistemic primitive, neurotransparency replaces interpretive trust with deterministic auditability.

It underlies both the **Aurora Workflow Orchestration (AWO)** methodology and its enforcement layer **CRI-CORE**, forming the ethical and procedural foundation for transparent AI-human reasoning systems.

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### 1. Definition

**Neurotransparency (n.)** — the principle that every inference influencing a claim must be attributable to a declared role and recorded in a durable artifact such that the reasoning sequence can be deterministically reconstructed.

Formally, this constitutes a **traceability invariant**: [  $R_{\{claim\}} = f(\text{Evidence}, \text{Role}, \text{Hash})$  ] where each reasoning contribution is recorded as a tuple (*evidence pointer*, *role identifier*, *content hash*) and becomes a permanent element of the project's provenance ledger.

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### 2. Motivation

Modern AI-assisted research collapses traditional authorship boundaries: reasoning steps occur across humans, language models, and automated validators.

Without a deterministic attribution framework, knowledge becomes non-verifiable once the underlying model or context changes.

Existing reproducibility standards focus on data and code.

**Neurotransparency extends reproducibility to cognition itself**—capturing not just *what* was done but *why* a conclusion was reached, and by whom (or what).

This shift transforms epistemic credibility from a social construct to an evidentiary one.

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### 3. Implementation in AWO

AWO enforces neurotransparency through three structural guarantees:

Mechanism	Artifact	Enforcement
<b>Role Attribution</b>	/logs/workflow/, /decisions/ADR-NNNN	Every inference recorded with declared role (Orchestrator, Auditor, Synthesizer, etc.)
<b>Hash Continuity</b>	SHA256SUMS.txt	Every reasoning artifact cryptographically linked to its origin context
<b>Attestation Linkage</b>	approval.json	All validated claims must reference their evidence pointers and hash records

Failure to provide evidence linkage or role attribution constitutes a **non-conformance** event under §1.6 of the AWO Method Specification.

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### 4. Enforcement Pathway (CRI-CORE Context)

The upcoming **CRI-CORE** enforcement layer operationalizes neurotransparency through executable schemas:

Module	Function	Schema Reference
neurotransparency.schema	Defines minimal fields: role, evidence path, hash, timestamp	AWO /schemas/
reasoning_ledger.py	Serializes reasoning steps and assigns deterministic IDs	CRI runtime
attestation_validator	Verifies that every claim references a valid reasoning record	CRI enforcement gate

CRI-CORE treats neurotransparency as a *first-class constraint*: builds fail if any claim-affecting artifact lacks verifiable provenance.

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## 5. Ethical and Epistemic Implications

Principle	Classical Science	Neurotransparent Research
<b>Authorship</b>	Singular, human	Distributed, role-based
<b>Reproducibility</b>	Experimental and data-centric	Cognitive and reasoning-centric
<b>Verification</b>	Peer review	Deterministic audit
<b>Failure Mode</b>	Misinterpretation	Missing evidence pointer

By embedding reasoning transparency into the research substrate, AWO and CRI-CORE redefine *trust* as *trace*.

This enables a post-institutional form of epistemic governance where credibility is computed, not declared.

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## 6. Use Cases

### 1. Automated Literature Synthesis

Every summarized claim must cite its reasoning path and originating model role.

### 2. Scientific Simulation Governance

Parameter selection and model calibration decisions logged as reasoning events, enabling full reconstruction.

### 3. Policy or Ethics Review

Deliberative reasoning among AI agents traceable to hash-bound evidence pointers.

### 4. Cross-Model Audit

Multiple models perform the same reasoning task; differences become explicit through neurotransparency logs.

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## 7. Relationship to Adjacent Concepts

Concept	Relation	Distinction
<b>Explainability (XAI)</b>	Post-hoc interpretation	Neurotransparency is pre-registered reasoning capture
<b>Accountability</b>	Governance outcome	Neurotransparency is evidentiary infrastructure
<b>Provenance</b>	Historical chain	Neurotransparency is cognitive provenance—who reasoned, not just who edited
<b>Neurosymbolic AI</b>	Hybrid reasoning architecture	Neurotransparency governs epistemic trace, not computation mode

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## 8. Governance and Citation

- This doctrine is governed under **ADR-0017**.
- Future enforcement handled by **CRI-CORE v0.1+** via `neurotransparency.schema.json`.
- The doctrine itself is a **citable artifact** and may be referenced as:

“‘bibtex @misc{wright\_neurotransparency\_doctrine\_2025, author = {Wright, Shawn C.}, title = {Neurotransparency Doctrine: An Epistemic Primitive for AI-Human Collaboration}, year = {2025}, version = {1.0.0}, institution = {Waveframe Labs / Aurora Research Initiative}, license = {CC BY 4.0}, orcid = {0009-0006-6043-9295}, doi = {10.5281/zenodo.17013612} }