Aurora Workflow Orchestration — Whitepaper v1.1

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Aurora Workflow Orchestration (AWO): Framework for Reproducible AI–Human Collaboration

Abstract

The **Aurora Workflow Orchestration (AWO)** framework defines a reproducible, audit-first governance system for AI–human collaboration.
It formalizes falsifiability, provenance, and attestation within iterative research cycles, transforming scientific work from ad-hoc experimentation into a verifiable process.
This release (v1.1.0) finalizes automation for documentation builds and establishes institutional alignment within **Waveframe Labs' Aurora Research Initiative**, setting the foundation for **CRI-CORE**—the runtime layer that operationalizes continuous research verification.

Keywords: reproducibility, AI orchestration, falsifiability, provenance, audit automation

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1. Introduction

Scientific collaboration between humans and AI demands structure. The **Aurora Workflow Orchestration (AWO)** method provides that structure through deterministic, falsifiable, and auditable research cycles.
Unlike conventional "prompt-and-respond" workflows, AWO defines a reproducibility protocol that ensures each step of reasoning, audit, and synthesis can be independently verified.

AWO exists as part of the **Aurora Research Initiative**, a Waveframe Labs program advancing open, falsifiable science through independent governance. Companion projects include **Waveframe v4.0 (cosmology)** and the **Societal Progress Simulator**—each built using AWO as the foundational methodology.

2. Method Overview

AWO provides the **methodological layer** for reproducible AI-human research. **CRI-CORE** serves as the **operational layer**, automating AWO-compliant runs and verifications.
This separation ensures AWO remains implementation-agnostic—valid with or without CRI-CORE.

Each AWO iteration follows a reproducible pattern:

1. Define falsifiable claims.
2. Assign roles (human + AI).
3. Execute and log reasoning.
4. Conduct independent audits.
5. Capture evidence.
6. Validate, tag, and archive.

Artifacts such as `run_manifest.json`, workflow logs, and cryptographic attestations form the canonical research record.

3. Roles and Responsibilities

Role	Function
Orchestrator (Human)	Frames questions, defines falsifiability criteria, resolves conflicts, and approves releases.
Main Model (Continuity)	Maintains project context, synthesizes reasoning, and integrates audit feedback.
Auxiliary Auditors (Independent)	Logic, data, and peer auditors evaluate consistency, validity, and conceptual rigor.
System Auditor (Optional)	Validates runtime provenance through CRI-CORE logs, checksums, and attestations.

These formal designations replace earlier informal "Implementer / Refiner / Critic" roles, ensuring alignment with **AWO_Method_Spec_v1.2**.

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4. Core Artifacts

Each AWO repository must contain:

- **Falsifiability Manifest** (`/docs/FALSIFIABILITY_MANIFEST.md`) — claim IDs, tests, thresholds, and audit status.

- **Run Manifest** (`/runs/run_*/run_manifest.json`) — canonical record of execution.

- **Schemas** (`/schemas/*.json`) — validate manifests and logs.

- **Decision Records (ADRs)** (`/decisions/*.md`) — document trade-offs and rationale.

- **Logs** (`/logs/*.md`) — record draft, audit, synthesis, and outcome.

- **Attestations & Checksums** (`ATTESTATION.txt`, `SHA256SUMS.txt`, `.sig`, `.cert`) — verify integrity and provenance.

- **Release Artifacts** — `CHANGELOG.md`, `CITATION.cff`, `.zenodo.json`, version tags, and DOIs.

  Note: No `/notebooks` or `/data` directories are required unless explicitly declared and governed by ADRs.

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5. Lifecycle

AWO follows a falsifiability-driven lifecycle:

1. **Setup** — Define claims, initialize manifests, assign auditors.
2. **Draft** — Generate reasoning and initial outputs.
3. **Audit** — Perform independent logic, data, and peer reviews.
4. **Synthesis** — Integrate audit findings; revise claims or methods.
5. **Decision** — Record results in ADRs.
6. **Evidence Capture** — Save figures, manifests, and logs.
7. **Release Gate** — Validate checksums and attestations; archive via Zenodo.

CRI-CORE automates steps 3–7, ensuring deterministic replication and machine-verified validation.

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6. Integration Note — CRI-CORE

CRI-CORE operationalizes AWO principles in runtime.
It manages provenance, execution, and immutability of research runs by:

- Capturing `run_manifest.json` for each execution.
- Generating verifiable attestations and SHA-256 checksums.
- Enforcing deterministic replay.
- Maintaining immutable audit trails under `/runs/`.

This separation ensures that methodology (AWO) remains independent of implementation (CRI-CORE).

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7. Governance and Licensing

AWO is maintained by **Waveframe Labs** under the **Aurora Research Initiative**.
Text content is released under **CC BY 4.0** and code under **Apache-2.0**.
All releases are archived on **Zenodo** with both concept and version DOIs.

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8. Future Outlook

The AWO methodology is stabilized at **v1.2**.
Future work will focus on:

- **CRI-CORE Integration** — Full runtime automation of AWO principles.
- **Case Study Expansion** — Applying AWO to new domains beyond Waveframe v4.0.
- **Adoption Frameworks** — Ready-to-use templates and schemas for third-party replicators.

Appendix A — Authorship and Context

Developed within the **Aurora Research Initiative** at Waveframe Labs.
The initiative functions as an independent research organization advancing reproducible, falsifiable, and auditable AI-human collaboration.
This whitepaper represents the canonical specification for AWO v1.2, harmonized with the final Method Specification.

Maintained by Waveframe Labs
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Future modifications appear only as *Implementation Notes*, not method revisions.