

# Aurora Workflow Orchestration Whitepaper v1.1

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

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### Abstract

The **Aurora Workflow Orchestration (AWO)** framework defines a finalized, reproducible governance system for AI–human collaboration. It formalizes falsifiability, auditability, and provenance within iterative research cycles.

AWO enforces schema-validated manifests, audit records, and decision logs to make AI-assisted research transparent, falsifiable, and citable.

Its runtime implementation layer, **CRI-CORE**, automates these principles—ensuring every execution is reproducible, logged, and verifiable.

Developed under the **Aurora Research Initiative**, Waveframe Labs Division.

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## 1. Introduction

Scientific collaboration between humans and AI requires structure. The Aurora Workflow Orchestration (AWO) method provides that structure by defining an auditable workflow for hypothesis generation, validation, and publication.

Unlike ad hoc prompting or model-driven iteration, AWO transforms research into a deterministic process governed by falsifiability, reproducibility, and explicit role separation.

AWO is part of the **Aurora Research Initiative**—a multi-project effort focused on reproducible, audit-first science. Other projects under this initiative include **Waveframe v4.0 (cosmology)** and the **Societal Progress Simulator**.

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## 2. Method Overview

AWO provides the **methodological layer**.

**CRI-CORE** provides the **runtime implementation layer** that automates AWO-compliant runs and manifests.

This distinction ensures that the method remains valid regardless of implementation or runtime.

Each AWO iteration follows the same reproducible pattern:

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

The resulting artifacts—`run_manifest.json`, logs, and attestations—represent a self-contained, verifiable research record.

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## 3. Roles and Responsibilities

Role	Function
<b>Orchestrator (Human)</b>	Frames the problem, defines falsifiability criteria, resolves conflicts, and authorizes releases.

Role	Function
<b>Main Model (Continuity)</b>	Maintains context, produces reasoning, and integrates feedback.
<b>Auxiliary Auditors (Independent)</b>	Logic, data, and peer reviewers who evaluate consistency, validity, and critique rigor.
<b>System Auditor (Optional)</b>	Validates runtime provenance through CRI-CORE logs and checksums.

This role schema replaces older “Implementer / Refiner / Critic” terminology with formal designations that directly align with AWO\_Method\_Spec\_v1.2.

## 4. Core Artifacts

Each repository implementing AWO must include:

- **Falsifiability Manifest** (/docs/FALSIFIABILITY\_MANIFEST.md) — claim IDs, tests, thresholds, and audit status.
- **Run Manifest** (/runs/run\_\*/run\_manifest.json) — canonical record of an AWO execution.
- **Schemas** (/schemas/\*.json) — used to validate manifests and logs.
- **Decision Records (ADRs)** (/decisions/\*.md) — documented trade-offs and reasoning.
- **Logs** (/logs/\*.md) — date-stamped summaries of draft, audit, and synthesis phases.
- **Attestations & Checksums** (ATTESTATION.txt, SHA256SUMS.txt, .sig, .cert) — verify data integrity and provenance.
- **Release Artifacts** — CHANGELOG.md, CITATION.cff, .zenodo.json, version tag, and DOI registration.

These mirror the live structure in the AWO repository. No /notebooks or /data folders are required.

## 5. Lifecycle

AWO iterations are cyclical and falsifiability-driven:

1. **Setup** — Establish falsifiable claims, initialize manifests, define auditors.
2. **Draft** — Generate reasoning and outputs.
3. **Audit** — Perform independent logic, data, and peer reviews.
4. **Synthesis** — Integrate audit outcomes and revise claims.
5. **Decision** — Record result in ADRs.
6. **Evidence Capture** — Update figures, manifests, and logs.
7. **Release Gate** — Validate checksums and attestations, archive via Zenodo.

CRI-CORE automates steps 3-7 by executing workflows, capturing run manifests, and producing deterministic audit logs.

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## 6. Integration Note: CRI-CORE

CRI-CORE implements AWO at runtime.

It manages provenance, execution, and immutability of research runs by:

- Capturing **run\_manifest.json** files for each execution.
- Generating cryptographic attestations and SHA-256 checksums.
- Enforcing deterministic replay and validation.
- Maintaining immutable audit trails under **/runs/**.

This separation preserves methodological independence while enabling machine-verified reproducibility.

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## 7. Future Outlook

The AWO methodology is now stabilized at **v1.2**.

Future work will focus on:

- **CRI-CORE Integration** — Full runtime automation of AWO principles.
- **Case Study Expansion** — Applying AWO to additional research areas beyond Waveframe v4.0.

- **Adoption Frameworks** — Templates and schemas for third-party researchers and institutions.
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## 8. Governance and Licensing

AWO is maintained by **Waveframe Labs** under the **Aurora Research Initiative**.

All text is released under **CC BY 4.0**, and code is licensed under **Apache-2.0**. Releases are archived on **Zenodo** with concept and version DOIs.

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## Appendix A — Authorship and Context

Developed under the **Aurora Research Initiative**, Waveframe Labs Division. The Aurora Research Initiative serves as an independent research organization dedicated to developing reproducible, falsifiable, and auditable AI-human collaboration methods.

This whitepaper represents the finalized methodology for the Aurora Workflow Orchestration (AWO) framework (v1.2 specification aligned).

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### Maintained by Waveframe Labs

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Future changes appear only as *Implementation Notes*, not method revisions.