Appendices

Appendix A. Core Variables, Mappings, and Essential Structural Notes

This appendix gathers the principal variables, structural mappings, and conceptual constraints used throughout Paper A-10. Its function is not to introduce new theory, but to stabilize notation and prevent the reintroduction of time-first assumptions into the interpretation of the arrow of time.

All symbols listed below should be read in the structural sense developed in the main body of the paper. In particular, time is not treated here as a primitive ontological medium, but as a derived ordering index applied to realized history after directional collapse has already occurred.

A. Core State Spaces and Structural Domains

Ω: The space of possible pre-collapse configurations. This is the possibility-space within which reversible evolution, branching alternatives, and structural options are defined prior to realization.

$\mathcal{H}^{\mathbf{R}}$: The space of realized history states. It contains the definite outcomes produced by collapse and serves as the domain of historical constraint.

hᵢ:A particular realized history state. Each **hᵢ** is a definite outcome written into realized history by collapse.

$\mathcal{H}$:A history-chain or realized set of historical states, typically written as $\mathcal{H}$ = { h_1, h_2, …, h_n }. It represents accumulated realized history rather than motion through time.

$\mathcal{H}_n$: The realized history structure after n collapse events. It denotes history depth at a given level of realization.

$\mathcal{H}$_cosmic: The large-scale accumulated history structure of the universe, used in cosmological discussion to indicate the hierarchical buildup of realized cosmic constraint.

x: A possible configuration in Ω prior to realization.

x*: A selected realized configuration favored or stabilized under collapse bias and constraint structure.

B. Core Operators and Functions

C: The collapse or realization operator. It maps possibility-space into realized history.

S(x): The entropic structure defined over configuration space. It represents the local constraint-compatibility or accessibility landscape over Ω.

∇S(x): The entropic gradient over configuration space. It measures local entropic asymmetry and biases collapse preference.

P(x): Collapse probability density over Ω, schematically biased by entropic gradient structure.

a($\mathcal{H}_n$): The cosmological scale factor interpreted as indexed by realized history depth rather than by a primitive flowing time variable.

C. Core Mappings and Structural Relations

$C : \Omega \longrightarrow \mathcal{H}^{R}$

Collapse maps a space of possible configurations into the space of realized history.

$C(x) = h_i, \quad h_i \in \mathcal{H}^{R}$

A particular collapse event selects a definite realized history state.

$C^{-1}(h_i)$ is undefined

Reverse collapse is structurally undefined. Realization is non-invertible.

$h_i \prec h_j$

A partial-order relation on realized history states. It indicates historical precedence in the structural sense, not motion through a primitive time-substance.

$h_i \prec h_j \quad \Leftrightarrow \quad h_j \in C(\Omega \mid h_i)$

A realized history state h_i precedes h_j if h_j is realized under constraints already including h_i.

$S = S(x), \quad x \in \Omega$

Entropic structure is defined over possibility-space rather than over a primitive temporal stream.

$P(x) \propto \exp(-\alpha \cdot |\nabla S(x)|)$

A schematic expression indicating that collapse preference is biased by local entropic asymmetry.

$\nabla S(x) = 0$

The limiting case of local entropic symmetry, in which collapse bias disappears.

$\mathcal{H} = \{ h_1, h_2, \ldots, h_n \}$

A realized history chain produced through repeated collapse.

$\mathcal{H}_n \subset \mathcal{H}_{n+1}$

Monotonic inclusion of realized history. History is extended, not overwritten.

$C(\Omega \mid \mathcal{H}_{n+1}) \subseteq C(\Omega \mid \mathcal{H}_n)$

The accessible future realization-space becomes increasingly constrained as history accumulates.

$S(\mathcal{H}_{n+1}) \geq S(\mathcal{H}_n)$

Entropy evaluated on realized macrostates increases as a consequence of accumulated realized history.

$|\Omega(\mathcal{H}_{n+1})| \leq |\Omega(\mathcal{H}_n)|$

The accessible configuration space compatible with realized history shrinks monotonically under constraint accumulation.

$\Omega \longrightarrow \Omega \mid h_i$

Collapse and record creation redefine the effective accessible domain.

$$\Omega \mid \mathcal{H}_n \rightarrow \Omega \mid \mathcal{H}_0$$

A putative recurrence reversal mapping; treated in the paper as structurally undefined.

$$\mathcal{H}_1 \subset \mathcal{H}_2 \subset \mathcal{H}_3 \subset \ldots \subset \mathcal{H}\_\text{cosmic}$$

Hierarchical buildup of realized cosmic history.

$$a = a(\mathcal{H}_n)$$

Cosmic expansion indexed by realized history depth rather than by a primitive time flow.

D. Essential Structural Distinctions

Collapse is realization, not evolution.

Directionality belongs to realization, not to time itself.

Entropy biases collapse; it does not generate the arrow.

Irreversibility is history creation, not motion through a flowing temporal medium.

Quantum, thermodynamic, and cosmic arrows are domain-expressions of one structural arrow.

Time is a derivative ordering index applied to realized history.

Psychological time asymmetry is an effect of physical record accumulation, not its cause.

E. Language Discipline Required by Paper A-10

Do not treat time as a primitive substance that flows.

Do not identify entropy increase with the arrow itself.

Do not speak of collapse as though it were merely evolution under a time parameter.

Do not treat irreversibility as a statistical illusion when persistent records exist.

Do not project human temporal intuition directly onto cosmological ontology.

When using 'before' and 'after', specify whether the sense is structural, historical, or merely indexical.

Closing Note

The role of this appendix is to keep the argument of Paper A-10 structurally clean. Once the arrow of time is reassigned from time itself to collapse-driven history creation, notation must reinforce that shift rather than quietly undo it. The symbols and constraints listed here are intended to preserve that discipline throughout the paper.