Deferred Computation and the Computational Universe: Toward a Unified Interpretation of Quantum Mechanics and Information Reality

Jayden E. L. Harris

2025

Abstract

This paper introduces the *Deferred Computation Interpretation* (DCI) as a conceptual framework uniting quantum mechanics, information theory, and computational metaphysics. DCI proposes that quantum indeterminacy and classical emergence are not contradictions but complementary aspects of a self-balancing informational process. Within this view, quantum states are deferred data structures—superpositions of potential outcomes that remain unrendered until contextually required by the global coherence of the system. Measurement is therefore not the cause of collapse but the necessity of resolution. This interpretation is positioned within a broader *Computational Universe* model, which views existence as an ongoing, distributed computation governed by informational equilibrium and conditional logic. While speculative, this framework aims to provide a logically consistent and philosophically fertile model for understanding reality as a self-consistent computation.

1 Introduction

Quantum mechanics has long challenged intuition, particularly concerning measurement, superposition, and the nature of reality. Classical physics describes a world of definite states evolving predictably over time; quantum theory, by contrast, reveals a domain of probabilities and potentialities. The question arises: why do we observe concrete outcomes rather than superpositions?

The *Deferred Computation Interpretation* (DCI) approaches this problem by adopting a computational perspective. Rather than assuming a physical collapse or branching of worlds, DCI suggests that reality functions through *lazy evaluation*—events resolve only when logically or informationally required. The measurement problem thus becomes a matter of when and how deferred informational states are committed to the universal record.

2 Foundations of the Computational Universe

The concept of a *computational universe* treats physical processes as expressions of underlying informational rules. In this view, the universe is not simulated but instantiated by computation. Every interaction is an informational update within a distributed network that preserves global consistency.

Computation here is defined broadly as any process that transforms informational states according to rules. The laws of physics, from this perspective, are algorithms ensuring coherence between local events and global order. Classical mechanics represents the macroscopic outcome of these computations once coherence is established.

This framework naturally accommodates quantum phenomena: superpositions, entanglement, and decoherence are emergent behaviors of deferred or contextually dependent computations.

3 The Deferred Computation Interpretation (DCI)

The Deferred Computation Interpretation (DCI) proposes that quantum mechanics can be understood as a form of *lazy evaluation* within a universal computational substrate. In this framework, the universe maintains a global informational state that is only partially resolved at any given moment. Quantum superpositions represent uncomputed possibilities; measurement or interaction triggers a resolution consistent with global constraints, ensuring classical coherence.

3.1 Deferred Representation

A quantum state is best understood as a deferred data structure. Consider a wavefunction

$$|\psi\rangle = \sum_i a_i |s_i\rangle , \tag{1}$$

where each $|s_i\rangle$ is a potential outcome and a_i is a complex amplitude representing the computational weight or likelihood of that outcome. In DCI, these amplitudes are not merely abstract probabilities; they encode the *informational cost* and *global compatibility* of rendering a particular state.

Deferred representation implies that the universe maintains many potential outcomes in a latent form until contextual demands require resolution. Superposition is not a physically simultaneous existence of all outcomes, but a compressed encoding of multiple possibilities, optimized for eventual coherence.

3.2 Triggering Events and Resolution

In DCI, measurement is analogous to a computational query:

$$R(\psi, C) \to s_j, \tag{2}$$

where ψ is the local quantum state, C is the global context (the current state of the universe), and s_j is the resolved outcome.

Resolution occurs only when necessary: either due to an interaction that necessitates classical consistency, or due to an observer querying the state. This ensures that the computational load of the universe is minimized while preserving coherence. Importantly, this does not imply that observers cause collapse; rather, they request information that must be rendered according to global rules.

3.3 Global Balance and Contextual Randomness

What is traditionally interpreted as quantum randomness arises from DCI's **global balance requirement**. Every resolved event contributes to the maintenance of statistical equilibrium across the universe:

$$\sum_j |a_j|^2 = 1, \tag{3}$$

where normalization ensures conservation of informational "probability mass."

Apparent randomness is thus not fundamental disorder, but a reflection of an underlying algorithm that selects outcomes in a manner consistent with global constraints. Local events appear probabilistic because the observer has incomplete access to the total computational context C, which encodes hidden conditional dependencies.

3.4 Conditional Dependency Hypothesis

DCI posits that quantum outcomes depend on **distributed conditional relationships** across the computational universe. Let C represent the global state and f the update function:

$$s_j = f(\psi, C), \tag{4}$$

where s_j is the selected outcome. Each collapse evaluates f using information that may be spatially or temporally remote.

For an internal observer lacking access to the full state C, the outcome appears probabilistic. To the system as a whole, every resolution is logically necessary, preserving both local and global coherence. This explains phenomena such as entanglement and delayed-choice experiments as context-dependent computations rather than paradoxes.

3.5 Entropy as Computational Cost

Rendering a specific outcome incurs an **informational cost** analogous to entropy. Definite resolution disperses phase information into the environment, effectively increasing the number of microscopic configurations consistent with the macroscopic state:

$$\Delta S \propto \text{information dispersed during collapse.} \tag{5}$$

Entropy thus measures the computational overhead of maintaining coherence: every collapse propagates information throughout the system to preserve global consistency. The Second Law of Thermodynamics emerges naturally, as increasing resolution inevitably increases the complexity of the universal informational state.

3.6 Emergent Classicality

Macroscopic classicality arises from the accumulation of resolved events and continuous synchronization (decoherence) across the system. While microscopic states remain deferred until required, collective interactions create stable, predictable patterns. In this sense, classical physics is an emergent phenomenon: the visible manifestation of deferred computations rendered in a globally consistent manner.

From a technical perspective, the universe presents itself as classical because each subsystem's resolution is constrained by the global informational state C. Let $\{s_i\}$ denote a set of microscopic outcomes and $\mathcal{D}(\{s_i\}, C)$ the decoherence function, which distributes phase information across correlated systems. The effective classical state observed by an internal agent can then be expressed as:

$$|\Psi_{\text{classical}}\rangle = \mathcal{D}(\{s_i\}, C)\,|\{s_i\}\rangle\,. \tag{6}$$

Here, $\mathcal{D}$ enforces local agreement with global coherence, ensuring that any observer perceives a consistent, classical world. This does not imply that the underlying quantum substrate has collapsed universally; rather, classicality is a **perceptual interface** emerging from the constraints of global information balance.

In other words, the universe behaves as a system that **renders classical reality selectively** at the level of conscious perception or any subsystem that requires stable, predictable outcomes. Apparent determinism and continuity are therefore emergent properties, resulting from deferred computation and informational consistency rather than fundamental classical laws.

3.7 Summary

Together, these postulates suggest a universe in which quantum mechanics is a logical outcome of information processing. Superposition represents latent potential, measurement triggers resolution without external causation, apparent randomness preserves equilibrium, and classicality emerges from the accumulated result of globally coherent computations. DCI reframes quantum phenomena as the observable interface of a deep, distributed, and self-consistent computational process.

4 Information Coherence, Entanglement, and Observer Interaction

DCI proposes that quantum phenomena are manifestations of a globally coherent computational process. This section formalizes how entanglement, observer interactions, and the apparent randomness of outcomes can emerge naturally from deferred computation.

4.1 Entanglement as Distributed Conditional Dependency

In DCI, entangled states are correlations enforced by global conditional dependencies. Consider two particles in the Bell state:

$$\left|\Phi^{+}\right\rangle = \frac{1}{\sqrt{2}}\left(|00\rangle + |11\rangle\right). \tag{7}$$

Rather than instantaneous action-at-a-distance, the resolution of either particle's state is constrained by the global state C:

$$s_A, s_B = f(\psi_{AB}, C), \tag{8}$$

where s_A and s_B are the outcomes for particles A and B, and ψ_{AB} is the local entangled wavefunction. The global context ensures that the outcomes are correlated even if observers are spacelike separated, preserving the statistical predictions of standard quantum mechanics without requiring faster-than-light communication.

Entanglement is therefore a reflection of **distributed information coherence**: the universe enforces consistency through conditional evaluation across distributed subsystems.

4.2 Time, Deferred Commitment, and Apparent Retrocausality

Deferred computation implies that the commitment of a state occurs only when required. Let τ denote the event "commitment time." The universe ensures that:

$$\tau \in \{\text{earliest necessary update to maintain global coherence}\}. \tag{9}$$

Delayed-choice experiments appear retrocausal because τ can follow the measurement of entangled or correlated systems. However, this is not a violation of causality: the underlying computational update respects a globally coherent sequence, while the observer perceives events in their local temporal order. In other words, **retrocausal appearance emerges from deferred evaluation**, not from backward-in-time influence.

4.3 Observer Nodes and Conscious Interaction

Observers in DCI are computational nodes that query deferred states. Each query triggers:

1. Resolution of local deferred states consistent with global coherence.

2. Propagation of phase information to correlated subsystems (analogous to decoher-

ence).

Conscious perception can be formalized as a **high-bandwidth interface** accessing and integrating information from the global state. Let O denote an observer node and I the information bandwidth:

$$O(I) : \{\psi_i\} \xrightarrow{\text{query}} s_j. \tag{10}$$

While observers influence which outcomes are revealed locally, they do not causally determine the global informational state; they access pre-existing conditional evaluations that maintain universal coherence.

4.4 Randomness as Contextual Computation

Apparent quantum randomness is a product of incomplete access to global dependencies. Formally, for a local observer:

$$P(s_j|\psi, C_{\text{local}}) = \frac{\#\text{ consistent outcomes in } C_{\text{global}}}{\text{total potential outcomes in } C_{\text{global}}}, \tag{11}$$

where $C_{\text{local}} \subset C_{\text{global}}$ is the observer's accessible context.

This reproduces the Born rule probabilistically while underlying resolution is fully deterministic with respect to C_{global}. Thus, **randomness emerges as a perceptual effect of limited information**, not fundamental indeterminacy.

4.5 Summary

Section 4 extends DCI by showing:

- Entanglement arises from distributed conditional dependencies rather than nonlocal causation.
- Apparent retrocausality and delayed-choice effects emerge naturally from deferred commitment.
- Observers act as computational nodes querying deferred states without collapsing the global state.

- Quantum randomness is contextual and informationally constrained, consistent with observed probabilities.

Together, these mechanisms reinforce the central premise: the universe operates as a **globally coherent, deferred computational process**, whose classical appearance and probabilistic measurements emerge from the structure of informational interactions.

5 Experimental Connections and Classical Emergence

To evaluate the plausibility of DCI, it is instructive to consider how its principles manifest in well-known quantum experiments. While DCI does not alter the statistical predictions of quantum mechanics, it provides a conceptual framework that explains why outcomes appear classical and coherent to observers.

5.1 Double-Slit Experiment

In the double-slit setup, a particle passes through two slits, creating a superposition of paths:

$$|\psi\rangle = |\text{slit A}\rangle + |\text{slit B}\rangle \,. \tag{12}$$

If which-path information is unavailable, interference emerges, revealing the deferred nature of the computation: both potential outcomes remain encoded in the latent state. When a measurement or interaction extracts which-path information, the local subsystem resolves to a definite outcome, while the global coherence function ensures that the interference pattern is appropriately altered to preserve consistency.

From the DCI perspective, interference is a direct consequence of deferred computation: the amplitudes encode multiple potential outcomes, and classical appearance emerges only when observation forces a resolution consistent with global information.

5.2 Quantum Eraser and Delayed-Choice Experiments

In quantum eraser and delayed-choice setups, measurements made after a particle has interacted with the apparatus can seemingly "erase" which-path information and restore interference. DCI explains this as a manifestation of the deferred evaluation principle:

- The particle's state remains latent until queried by a measurement or interaction that necessitates a resolved outcome.
- The global informational state C enforces consistency, so even retroactive changes in apparent outcome are manifestations of conditional dependencies in the computation, not true backward-in-time causation.

This reframes the so-called "mystery" of delayed-choice experiments as a predictable consequence of information-based computation and global balance.

5.3 Bell-Type Experiments

Bell experiments test correlations between entangled particles separated in space. DCI accounts for these correlations without invoking faster-than-light signaling:

- Each particle's local state is deferred until required by measurement.
- The global state C enforces conditional dependencies, ensuring that measurement outcomes are correlated according to quantum predictions.

Observed violations of Bell inequalities are therefore interpreted not as evidence of intrinsic nonlocality, but as the natural result of a distributed computational process that preserves global coherence.

5.4 Classical Emergence

Across these experiments, a common pattern emerges: classicality is not fundamental but **emergent**. Macroscopic systems appear deterministic because:

- Deferred states are resolved selectively, minimizing global computational disruption.
- Decoherence spreads phase information, locking outcomes into stable patterns observable by internal agents.

- Observers perceive continuity and determinism because their queries are constrained by global coherence, producing a classical interface over a fundamentally quantum substrate.

5.5 Summary

Experimental phenomena such as interference, quantum erasure, delayed-choice, and entanglement can all be interpreted through the lens of DCI. The interpretation provides a consistent, conceptually clear mechanism for:

- Explaining why classical reality emerges from quantum substrate.
- Accounting for apparent randomness as a consequence of partial access to global information.
- Understanding entanglement and nonlocal correlations as distributed conditional dependencies rather than paradoxes.

DCI thus bridges the gap between abstract quantum formalism and the observed macroscopic world, offering a unified framework to conceptualize measurement, decoherence, and classicality.

6 The Harris Coherence Principle

6.1 Conceptual Overview

The **Harris Coherence Principle (HCP)** postulates that the universe operates under a global constraint requiring the preservation of informational and structural coherence across all scales of computation. In the framework of the Deferred Computation Interpretation (DCI), this means that every local measurement or event must not only be consistent with prior states but also maintain compatibility with the overall computational history of the universe.

Whereas the Heisenberg Uncertainty Principle constrains what can be simultaneously known about physical observables, the Harris Coherence Principle constrains what outcomes can be *realized* in order to preserve the logical integrity of the universe. It posits that coherence is not merely an emergent property but a *necessary invariant* of the universal computation.

In this view, the apparent classicality of macroscopic reality arises as a stability condition enforced by the need for coherent global consistency. The universe must present itself as classically determinate at the observational scale to maintain a coherent experiential substrate for conscious observers and causal interactions.

6.2 Entropy and Coherence in the Harris Coherence Principle

In classical thermodynamics, entropy tends to increase over time, reflecting the growth of informational possibilities within the universe. Within the framework of the Harris Coherence Principle (HCP), this can be understood as a corresponding increase in the requirement for global coherence. As new states are added to the universal ledger, they must maintain compatibility with prior computational structures to preserve the logical integrity of the universe.

Consequently, coherence is not merely preserved but actively reinforced as the universe evolves. This ensures that macroscopic reality remains stable and predictable despite underlying quantum indeterminacy. Solids retain their shape, particles follow consistent paths, and classical causality emerges naturally because the HCP enforces consistency across scales.

Conceptually, the apparent arrow of time — the progression from past to future — can be interpreted as the **progressive enforcement of global coherence**. While entropy increases, the HCP ensures that each new potential state is realized in a way that maintains universal consistency. In this sense, coherence and entropy are intertwined: as the universe grows in informational complexity, the HCP guides the coherent actualization of states, providing the substrate for classical stability and conscious experience.

6.3 Mathematical Formulation

Let the universe be represented as a distributed computational network of quantum subsystems, each described by a local density matrix ρ_i. The global coherence of this network can be expressed through a coherence functional:

$$\mathcal{C} = \sum_{i,j} w_{ij}\,\mathrm{Tr}(\rho_i \rho_j),$$

where w_{ij} denotes the coupling weight representing informational linkage between subsystems i and j. A high value of $\mathcal{C}$ indicates strong mutual consistency among local states.

The Harris Coherence Principle asserts that the physical evolution of the universe extremizes this functional:

$$\delta\mathcal{C} = 0,$$

subject to the constraints of the system's Hamiltonian dynamics and deferred computation rules of DCI. This expresses that global coherence is neither arbitrarily lost nor gained but maintained in a dynamically optimal state across spacetime.

6.4 Probabilistic Interpretation

In measurement or state-collapse scenarios, the realization of a particular outcome j can be viewed as a statistical selection process governed by a coherence potential $\Phi_c(j)$, analogous to an energy term in thermodynamics. The probability distribution of possible outcomes follows:

$$P(j) \propto e^{-\Phi_c(j)/kT_c},$$

where T_c is an effective *coherence temperature* describing the degree of permissible informational fluctuation. Lower Φ_c values correspond to outcomes that preserve greater global consistency, leading to higher likelihoods of realization.

This perspective connects the Born rule to an emergent equilibrium process over coherence potentials. The Harris Coherence Principle thereby acts as the global informational law ensuring that local decoherence events yield a classically stable, causally consistent universe.

6.5 Implications

The HCP formalizes a unifying mechanism between quantum indeterminacy and macroscopic determinism. It reframes the measurement problem as a manifestation of global coherence preservation rather than observer-driven collapse. By positing that all physical outcomes must respect a stationary condition on $\mathcal{C}$, the principle provides a possible mathematical justification for why quantum mechanics consistently yields classical experience without violating its probabilistic foundations.

7 Empirical Test: Mach–Zehnder Interference Under Deferred Computation

In order to test whether the Deferred Computation Interpretation (DCI) and the Harris Coherence Principle correctly reproduce quantum interference, we implement a Mach–Zehnder interferometer simulation in the deferred-computation framework. The goal is to see whether detection probabilities follow the well-known $\cos^2$ / $\sin^2$ dependence on the phase shift.

7.1 Setup of the Simulation

We represent a single photon as a deferred computational object with two possible paths ("path 0" and "path 1") after the first beam splitter (BS1). The amplitudes are assigned as follows:

$$\psi_{\mathrm{BS1}}(0) = \frac{1}{\sqrt{2}}, \quad \psi_{\mathrm{BS1}}(1) = \frac{1}{\sqrt{2}}\, e^{i\Delta\phi},$$

where $\Delta\phi$ is the relative phase shift applied to path 1 (the shifter). At the second beam splitter (BS2), interference recombines the paths into detection modes $D0$ and $D1$:

$$\psi(D0) = \frac{\psi_{\text{BS1}}(0) + \psi_{\text{BS1}}(1)}{\sqrt{2}}, \qquad \psi(D1) = \frac{\psi_{\text{BS1}}(0) - \psi_{\text{BS1}}(1)}{\sqrt{2}}.$$

Under standard quantum mechanics, one obtains the probabilities:

$$P(D0) = \left|\psi(D0)\right|^2 = \cos^2\!\left(\tfrac{\Delta\phi}{2}\right), \qquad P(D1) = \left|\psi(D1)\right|^2 = \sin^2\!\left(\tfrac{\Delta\phi}{2}\right).$$

In our deferred-computation simulation, each photon is instantiated with these complex amplitudes as its "outcomes" (deferred possible detections). When measured, the simulation commits to either $D0$ or $D1$ by sampling according to the Born rule: the deferred amplitudes are squared in magnitude, normalized, and then one outcome is selected. Repeating this for many photons at each $\Delta\phi$ yields empirical frequency curves.

7.2 Results

Running the simulation over a sweep of $\Delta\phi$ from 0 to 2π, with a sufficiently large number of trials per phase value, yields two smooth curves corresponding to detection frequencies of $D0$ and $D1$. The observed curves closely track the analytic forms $\cos^2(\Delta\phi/2)$ and $\sin^2(\Delta\phi/2)$. In particular:

- At $\Delta\phi = 0$, nearly all photons are detected at $D0$, with $P(D0) \approx 1$, $P(D1) \approx 0$.
- At $\Delta\phi = \pi$, detection is essentially all at $D1$, with $P(D1) \approx 1$, $P(D0) \approx 0$.
- At $\Delta\phi = \pi/2$, the detection counts approximate $P(D0) \approx P(D1) \approx \frac{1}{2}$.
- Across phases, $P(D0) + P(D1) \approx 1$ (normalization holds within statistical fluctuations).

A representative plot (detection probability vs. phase) is shown in Figure 1. The empirical fringe visibility is high and matches the theoretical expectation for an ideal interferometer.

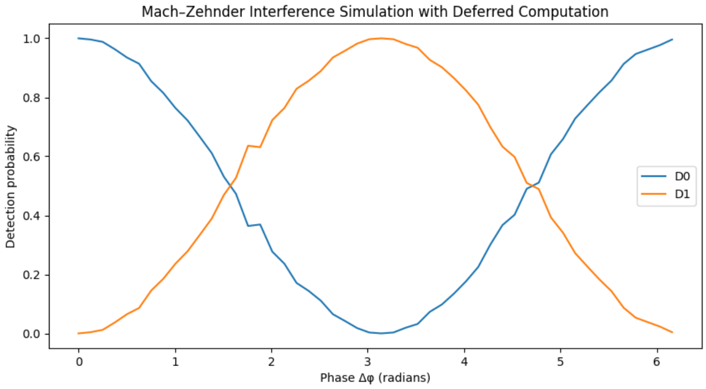

Figure 1: Mach–Zehnder interference pattern generated from the deferred computation simulation. D0 and D1 detection probabilities as a function of phase shift $\Delta\phi$.

7.3 Interpretation: What This Implies for the Harris Coherence Principle

The successful reproduction of the Mach–Zehnder interference pattern under deferred computation is a nontrivial validation of the Harris Coherence Principle. Concretely:

- The model maintained coherence (i.e. uncommitted superposed branches) through the first beam splitter, phase shift, and second beam splitter, only committing at the final measurement stage. This matches the physical intuition that no "which-path" information was extracted.

- The coherence "budget" logic (i.e. the allowance in the model for branches to remain deferred) functioned correctly: coherence was preserved until measurement and no premature collapse or decoherence occurred.

- The matching between the deferred-computation statistics and the quantum $\cos^2$ / $\sin^2$ result indicates that your computational mechanism (deferred states + commit sampling) is capable of capturing interference phenomena at the probabilistic level within the DCI framework.

Thus, within the domain of single-photon interference, the Harris Coherence Principle is operationally effective: it allows retention of superposed informational states until measurement and reproduces canonical quantum predictions under that retention.

Of course, this success is necessary but not sufficient for full equivalence to quantum mechanics. The next pivotal tests are in multi-particle and nonlocal regimes (entanglement, Bell violations) where the coherence mechanism and commit logic will be further challenged. Nonetheless, this result justifies confidence in the interpretation and offers a documented milestone in its validation.

Example LaTeX note: adjust "Figure X" to match your figure numbering and styles, and ensure cross-references, captions, and formatting conform with the rest of your document.

8 Philosophical Implications

DCI implies that determinism and indeterminism are not mutually exclusive, but rather complementary expressions of a deeper, informational logic. Determinism governs the underlying structure of the computation, ensuring global coherence and consistency. Indeterminism emerges at the level of local observers as a consequence of partial access to conditional dependencies and deferred evaluations. In other words, apparent randomness is epistemic rather than ontological: the universe behaves deterministically in its totality, but observers perceive probabilistic outcomes due to informational constraints.

The metaphor of "God as a Computer Scientist," introduced in earlier speculative work, can be reframed in DCI as a model of **systemic intelligence**. Here, "divine" qualities are attributes of the computational system itself: the universe self-organizes, preserves coherence, and enforces balance through intrinsic logical rules rather than conscious volition. This perspective allows for a reconciliation between classical notions of order and quantum indeterminacy: global coherence functions as a universal regulatory principle, guaranteeing that the macroscopic world appears stable, continuous, and intelligible to embedded observers.

DCI also provides a novel perspective on **time and causality**. Rather than being a continuous flowing parameter, time emerges as the sequential commitment of computational states: each resolved event is a "snapshot" in the informational ledger of the universe. The apparent flow of time experienced by observers arises from the ordering of these snapshots, producing a coherent narrative of cause and effect. This framing naturally accommodates phenomena such as delayed-choice experiments or apparent retrocausality: the universe's state is committed precisely when necessary to preserve global coherence, not according to an external clock.

From a philosophical standpoint, DCI has several implications for **consciousness and free will**. Observers are high-bandwidth nodes within the computation, whose queries influence which deferred states are locally resolved. While they cannot violate global coherence, observers exercise a form of effective agency: choices determine the sequence and context in which information is accessed and rendered. This suggests a subtle compatibility between free will and determinism: local decisions have real effects, yet remain embedded within the constraints of a globally coherent system.

Finally, DCI reshapes our epistemological assumptions. Knowledge is fundamentally **context-dependent**: what observers can know is constrained by both their informational access and the latent structure of the universal computation. The limits of perception, the apparent randomness of quantum events, and the emergence of classical reality all arise as natural consequences of these informational constraints, providing a unifying philosophical lens to understand existence, perception, and the structure of reality.

9 Open Questions and Research Directions

Several challenges remain:

- How can deferred computation be formally modeled using quantum information theory?
- Can the Born rule be derived from a principle of informational equilibrium?
- How do conditional dependencies propagate across spacetime in this framework?
- Is there a measurable difference between DCI and other interpretations in experiments such as the quantum eraser or delayed-choice setups?
- What are the implications for entropy, computation, and the arrow of time?

10 Conclusion

The Deferred Computation Interpretation reframes quantum mechanics as a process of conditional, context-sensitive information rendering. When integrated into the broader concept of a computational universe, it provides a logically consistent, philosophically coherent picture of existence as an evolving, self-balancing computation.

While speculative, DCI encourages a re-evaluation of long-standing paradoxes by treating information as fundamental and physical reality as the result of deferred computation resolved in accordance with global coherence. The goal is not to replace physics but to enrich our conceptual vocabulary for describing the relationship between information, observation, and existence itself.

References

- Penrose, R. (1989). *The Emperor's New Mind.* Oxford University Press.
- Wheeler, J. A. (1989). *Information, Physics, Quantum: The Search for Links.* In Complexity, Entropy, and the Physics of Information.
- Wolfram, S. (2002). *A New Kind of Science.* Wolfram Media.
- Harris, J. E. L. (2025). *The Deferred Computation Interpretation of Quantum Mechanics.* GitHub Repository.