Observer-Driven Coherence as a Foundation of Physical Realization in Mandrov Unified Coherent Field Theory

Dmitry A. Mandrov

2025

Abstract

This paper establishes the conceptual and mathematical basis for the Mandrov Unified Coherent Field Theory (MU-CFT), which proposes that physical reality emerges not from all potential quantum configurations, but from those that are coherently realized by observer-driven dynamics. We define the formalism of coherence, compare MU-CFT with major physical paradigms, and outline implications for time, cosmology, and neurophysics.

Contents

1. Ontological Premises

The theory postulates that reality does not consist of all physically possible states. Instead, there exists a space of all potential configurations Ω, of which only a coherently selected subset $\Omega_{\text{eff}}(t)$ becomes realized at time t.

The selection is determined not by objective randomness, but by the coherence structure of the observer field. This ontological approach replaces external measurement with internal coherence, positioning consciousness as the selector of reality paths.

2. Formalism of Subjective Coherence

Let each potential configuration be described by a state $\psi_i \in \Omega$. The probability of its realization is governed by a coherence functional:

$$\mathcal{C}(\psi_i) = P(\psi_i) \cdot \exp(-\Delta S_i) \cdot E_i$$

where:

- $P(\psi_i)$: baseline probability from the quantum amplitude,
- ΔS_i: entropy increase caused by realization,
- E_i: internal energy coherence or stability.

Only those ψ_i with maximal $\mathcal{C}$ are realized in $\Omega_{\text{eff}}(t)$.

3. Comparison with Other Interpretations

MU-CFT differs from traditional interpretations:

- **MWI:** All branches are real; MU-CFT selects only coherent ones.
- **QBism:** Treats measurement as personal belief; MU-CFT grounds it in coherence.
- **Collapse theories:** Rely on external triggers; MU-CFT uses internal structure.

MU-CFT is not merely interpretational—it alters the dynamics of realization.

4. Neuro-Coherent Coupling

The brain is modeled as a coherence amplifier, capable of shaping Ω_{eff} by maintaining globally stable neural states.

The coherence of cognitive states can bias quantum transitions. Such coupling implies that cognition plays an active causal role in physical events, not through classical influence, but via coherence selection.

5. Time and Phase Transitions

Time in MU-CFT is directional due to entropy-based selection. The effective subset $\Omega_{\text{eff}}(t)$ evolves via:

Exponential Actualization

$$\Omega_{\text{eff}}(t) \propto 1 - e^{-\alpha t}$$

Observer-Driven Logistic Transition

$$\Omega_{\text{eff}}(t) \propto \frac{1}{1 + e^{-\beta(t-t_0)}}$$

These reflect spontaneous emergence and phase transitions due to observer complexity.

6. Postulates of MU-CFT

1. A universal space Ω of all coherent potentials exists.
2. Reality is a time-evolving subset $\Omega_{\text{eff}}(t) \subset \Omega$.
3. Realization is determined by subjective coherence $\mathcal{C}$.
4. Consciousness emerges as the regulator of coherent realization.

7. Experimental Directions

MU-CFT suggests possibilities for:

- Coherent cognitive-matter interfaces,
- Observer-sensitive quantum systems,
- Subjective-state-modulated physical transitions.

A key testable implication is whether the coherence of mental states can bias low-level quantum outcomes measurably.

8. Conclusion

MU-CFT provides a unified, observer-centered paradigm integrating quantum physics, relativity, cognition, and information. Coherence is proposed not only as a physical principle, but as the mechanism of actualization itself.

Acknowledgments: This paper was developed with the structural assistance of OpenAI's ChatGPT-4o. The theory, formulations, and concepts are original to Dmitry A. Mandrov.