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The Law of Observational Reciprocity (LOR): A Relational Onto-Epistemology of Knowing

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Abstract

This paper proposes the Law of Observational Reciprocity (LOR), a unifying principle asserting that the act of observation alters the observer as much as the observed. Challenging the Cartesian spectator model, LOR reframes observation as a relational, co-constitutive process grounded in quantum physics and phenomenology. We present a formal sketch of LOR, define its axiomatic conditions, and demonstrate its validity through quantum mechanical evidence. By establishing observation as a reciprocal transformation rather than passive reception, LOR offers a new relational onto-epistemology where knowing and being are co-emergent.

Keywords: Law of Observational Reciprocity, LOR, epistemology, ontology, quantum physics, phenomenology, relational onto-epistemology, observer effect

Introduction

The Myth of the Detached Observer. Classical epistemology and scientific methodology often presume observation to be a one-way transaction: the observer gathers information from a passive object without being fundamentally altered (Descartes, 1996; Bacon, 2000). This "spectator model" assumes neutrality is both possible and desirable. However, insights across physics and phenomenology suggest a more reciprocal dynamic—one in which observation does not merely reveal the world but transforms the observer (Bohr, 1935; Varela, Thompson, & Rosch, 1991).

This paper articulates the Law of Observational Reciprocity (LOR): the principle that to observe is to be observed in return—not physically, but epistemologically and existentially. By "epistemological transformation," we denote a shift in the observer's knowledge structure and representational framework. By "existential transformation," we mean a reconfiguration of the observer's self-understanding and agency. This is not metaphor; it is a law-like epistemic principle grounded in the relational nature of knowing.

2. A Formal Sketch of LOR. To distinguish LOR from mere metaphor, we propose a formal structure based on three axiomatic conditions: (1) relationality of observation, (2) irreversibility of epistemic uptake, and (3) symmetry of ontological implication.

Let S be the system under observation and K the observer's knowledge structure. Let S represent the intrinsic state-space of S , independent of observation. What is observed is not in isolation, but—the portion of S rendered meaningful within the observer's representational framework. This interface determines reality as observed (Kant, 1998). Crucially, the act of observation modifies both S and K . We express this as a coupled update rule:

$$S \leftarrow S + \Delta S(K, \text{interaction}) \quad K \leftarrow K + \Delta K(S, \text{interaction})$$

Here, ΔS captures the change in the system (e.g., wave function collapse), while ΔK captures the observer's epistemic and existential transformation (e.g., identity formation, representational reconfiguration). These functions are non-linear and path dependent. This model extends Kantian phenomena by specifying that the phenomenon is defined by, and extends Piagetian constructivism by asserting that the *self* is reformed through interaction, not just knowledge schemas.

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3. Empirical Grounding: The Quantum Observer.

Quantum mechanics provides the most rigorous evidence for LOR. In the double-slit experiment, the introduction of a detector collapses the wave function ψ . Standard interpretations focus on the system's change. LOR compels us to ask: what collapses within the observer?

The physicist who activates the detector enacts a theoretical commitment and solidifies their identity as a participant in quantum reality. Their knowledge structure ψ is altered in orientation, not just content (Wigner, 1961). This is evident in delayed-choice experiments, where the decision to measure is made after the quantum event. The outcome appears retroactively determined: if we choose to measure, the particle behaves as if it had always been a particle (Wheeler, 1984).

LOR offers an elegant interpretation: the observer's representational structure ψ now includes the measurement outcome, which recursively alters how they represent the entire sequence. The past does not change; the observer's relationship to it does. This is not a flaw in causality but a feature of relational knowing: what we see is filtered through, and that filter evolves with every act of observation.

4. Philosophical Foundations: A Relational Onto-Epistemology.

LOR situates itself within pragmatism, enactivism, and phenomenology to challenge the Cartesian spectator model (Dewey, 1938; Heidegger, 1962).

- **Phenomenology:** LOR affirms Heidegger's insight that we are beings-in-the-world, engaged from the start. We never stand outside the system we observe.
- **Enactivism:** Drawing on Varela et al. (1991), LOR posits that cognition is not representation of a pre-given world but enactment of a world through structural coupling.
- **Dialogism:** Deepening Bakhtin (1981), even solitary observation is a dialogue where self and system respond to each other across time.

The key advance of LOR is its insistence on two-way transformation. Most theories acknowledge that observation shapes knowledge. LOR asserts that it also reshapes the observer's existential structure. It is not merely that we see through filters; it is that the act of seeing reshapes the filter. This makes LOR a relational onto-epistemology framework in which being and knowing are co-constituted.

5. Implications and Conclusion. If observation transforms the observer, profound ethical and ontological questions arise. Does the scientist who measures a quantum state inherit a duty to the system now entangled with their knowledge? Does objectivity require neutrality, or responsible engagement? LOR challenges the Cartesian myth not by denying truth, but by redefining it: truth is found in responsible engagement, not detachment.

The Law of Observational Reciprocity is not a metaphor but a law-like epistemic principle. It dissolves disciplinary boundaries, showing that the observer effect in physics and the co-constitution of mind in phenomenology are manifestations of a single logic. To observe is to participate. In that participation, both the world and the self are made anew. Future research must operationalize through neurocognitive and physical experiments, but the theoretical framework is clear: reality is not merely found; it is forged in the reciprocal gaze of the knower.

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