

Peer Review

Review of: "Measurement Problem from the Perspective of Wittgenstein's Philosophy"

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Critique of

Measurement Problem from the Perspective of Wittgenstein's Philosophy

by Tadashi Nakajima

Summary

This manuscript offers a Wittgensteinian reinterpretation of the quantum measurement problem, arguing that the dilemma arises from a conceptual misstep—namely, the Postulate of Classicality of Apparatus (PCA). The author proposes that by rejecting PCA and adopting a Microscopic Quantum Jump (MIJ) framework, the measurement problem dissolves. The paper draws on Wittgenstein's philosophy of language to support this reframing and illustrates the emergence of classicality through macroscopic quantum phenomena such as Bose–Einstein condensation and superconductivity.

Evaluation

The manuscript is philosophically ambitious and presents a fresh perspective on a longstanding foundational issue. Its central thesis—that the measurement problem is a pseudo-problem born of linguistic confusion—is consistent with certain strands of philosophical thought, particularly those influenced by Wittgenstein. However, the paper leaves several critical issues insufficiently addressed, both conceptually and technically.

Major Points of Critique

1. Conceptual Novelty and Historical Context

The claim that the measurement problem is a pseudo-problem is not new. It echoes earlier positions from instrumentalist, relational, and epistemic interpretations. The manuscript would benefit from a more explicit engagement with this tradition and a clearer articulation of how its Wittgensteinian framing advances beyond prior dissolutions.

2. The Role and Depth of PCA

While the critique of PCA is central to the paper, its dismissal overlooks PCA's deeper entanglement with the logical and operational structure of quantum theory. PCA is not merely a pragmatic assumption—it is structurally tied to the binary logic underlying the Hilbert space formalism. Classical apparatuses enforce Boolean outcomes, which are essential for the Born rule and the collapse postulate. Rejecting PCA without reformulating the logical foundations of quantum mechanics risks undermining the coherence of the measurement framework itself.

3. Decoherence as an Incomplete Substitute

The manuscript gestures toward decoherence as a mechanism for emergent classicality, but this is philosophically and technically insufficient. Decoherence suppresses interference but does not yield definite outcomes. The post-decoherence wavefunction remains a superposition, and without interpretive supplementation, decoherence cannot explain why a single outcome is perceived. This limitation is well-documented and should be acknowledged more explicitly.

4. Neglect of Interpretations That Reject Classicality Entirely

The paper does not engage with interpretations such as Everettian (Many-Worlds), which reject classicality altogether and offer a coherent ontological framework in which every possible outcome exists in its own branch. These interpretations dissolve the measurement problem without invoking PCA or collapse, and their omission weakens the manuscript's claim to conceptual completeness.

5. Wittgensteinian Philosophy: Underdeveloped Application

The invocation of Wittgenstein is philosophically promising but underutilized. The manuscript asserts that measurement must be described in ordinary language, yet it does not reconstruct the grammar or semantics of such a description. A deeper engagement with Wittgenstein's later philosophy—particularly his views on rule-following, language-games, and semantic closure—would strengthen the argument considerably.

Recommendation

While the manuscript presents an intriguing philosophical perspective and raises important questions about the conceptual foundations of quantum mechanics, it requires substantial revision. Specifically, the author should:

- Clarify the novelty of the Wittgensteinian approach relative to existing literature.
- Address the logical and mathematical entanglement of PCA with the formalism of quantum theory.
- Acknowledge the limitations of decoherence and engage with interpretations that reject classicality.
- Deepen the philosophical analysis of Wittgenstein's relevance to quantum measurement.
- Consider the implications of quantum logic and the role of Boolean structure in measurement theory.

Final Verdict: Major Revision Required

The manuscript has potential, but its philosophical and technical foundations must be more rigorously developed to meet the standards of scholarly publication in quantum foundations.

Declarations

Potential competing interests: No potential competing interests to declare.