

## " Is Time ' Handed' in a Quantum World?"

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### Abstract

This paper considers the possibility that nonrelativistic quantum mechanics tells us that Nature cares about time reversal. In a classical world we have a fundamentally reversible world that appears irreversible at higher levels, e.g., the thermodynamic level. But in a quantum world we see, if I am correct, a fundamentally irreversible world that appears reversible at higher levels, e.g., the level of classical mechanics. I consider two related symmetries, time reversal invariance and what I call ' Wigner reversal invariance.' Violation of the first is interesting, for not only would it fly in the face of the usual story about temporal symmetry, but it also appears to imply (as I'll explain) that time is ' handed' , or as some have misleadingly said in the literature, ' anisotropic' . Violation of the second is, as I hope to show, even more interesting. The paper also contains a discussion of two mostly neglected topics: what it means to say time is handed and what warrants such an attribution to time.

**Keywords:** quantum mechanics; time reversal; direction of time

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