



# Why Not Require Just One Everettian World?

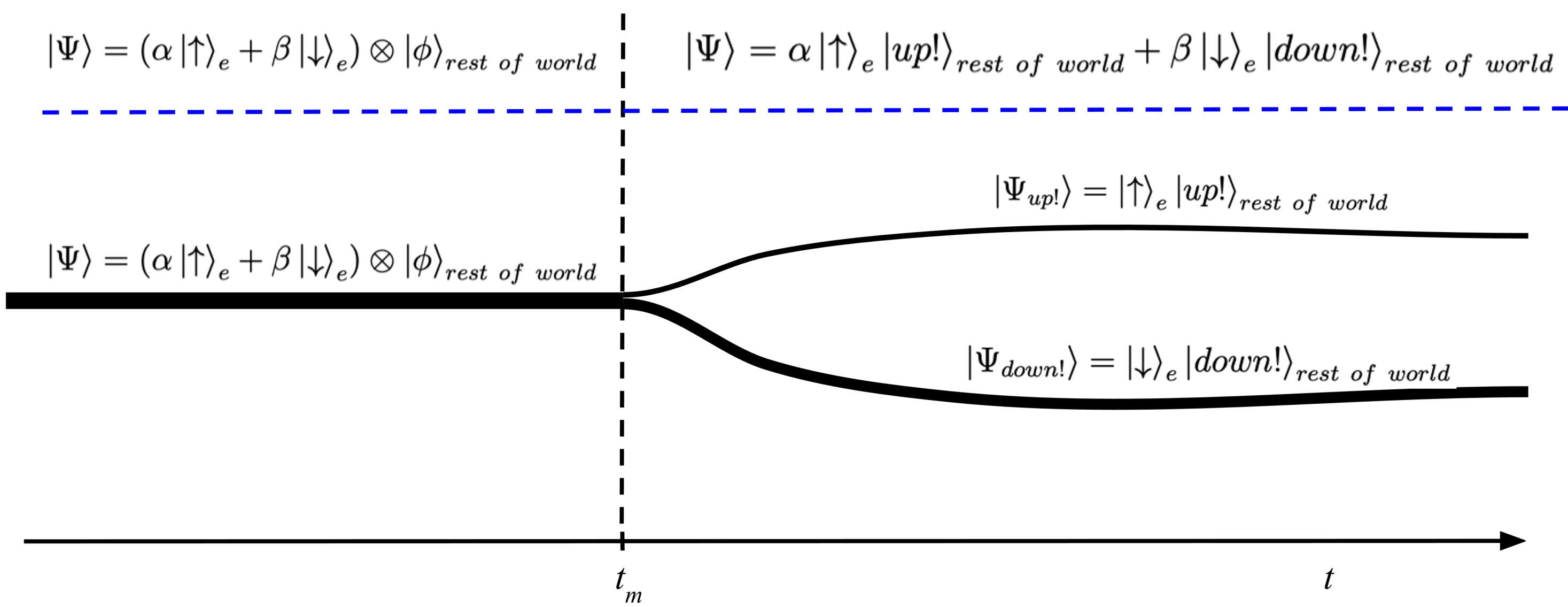
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## Abstract

In recent decades, Everettian quantum mechanics (EQM) has re-emerged as an active area of inquiry in the literature; however, just how EQM ought to inform our metaphysics remains unclear. In this paper, I begin with a close examination of three different metaphysical accounts of EQM: David Wallace's Lewisian view, Alastair Wilson's quantum modal realism, and Christina Conroy's Everettian actualism. From these accounts, I devise a taxonomy of dominant metaphysical readings of EQM, where the choice dimensions are single concrete history versus many concrete histories and overlapping versus diverging worlds. From this, a fourth view emerges that remains underdeveloped in the literature: the Hydra view, under which we are committed to only one dendritic world. I present a negative argument for the Hydra view first, illustrating how each of the three alternatives require additional theoretical machinery that may not be strictly necessary. Next, I present a positive argument for adopting the Hydra view. In order to address foundational issues with the Hydra view relating to identity and probability that were previously damning, I present a novel mereological account for how we ought to conceptualize parts of the world and the objects in superposition that populate it.

## Quantum Decoherence



## Four Metaphysical Accounts of Decoherent Branching

What does decoherence tell us about the world? Metaphysical views in the literature include:

- David Wallace's **Lewisian View**: "Possible worlds are branches in a decoherent-history space: that is, sets of possible worlds are (more or less coarse-grained) histories within the emergent branching structure defined by decoherence" (Wallace 2012: 266).
- Alastair Wilson's **Quantum Modal Realism**: "Everett worlds do not mereologically overlap... each Everett world is actual according to its own inhabitants, and only its own inhabitants" (Wilson 2020: 22).
- Christina Conroy's **Everettian Actualism**: "There is only one term [of the global wave function] that describes the state of affairs that obtain – the term that describes the actual world as we happen to experience it. The other terms describe our concrete world in counterfactual ways." (Conroy 2018: 18).

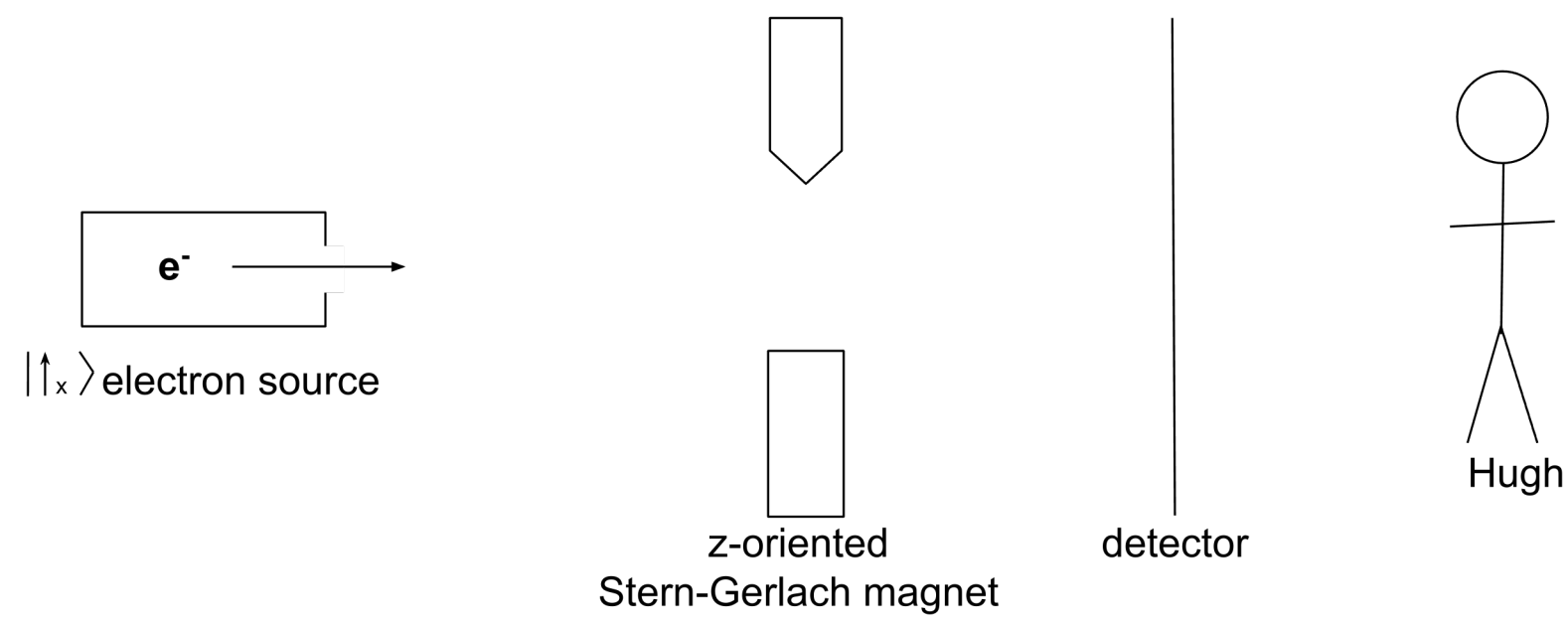
From these three accounts two choice dimensions emerge:

- Are there many concrete histories or one?
- Do worlds overlap or diverge?

	Diverging Histories	Overlapping Histories
Single Concrete History	i. 	ii. 
Many Concrete Histories	iii. Wilson's Quantum Modal Realism 	iv. The Hydra View 

## Future-Tensed Statements in an Everettian Universe

Suppose some agent, Hugh, plans to perform a typical Stern-Gerlach experiment.



Their epistemic statements (E) do not depend on their selection of a metaphysical view; however, their selection influences their future tensed metaphysical statements (M).

	Diverging Worlds	Overlapping Worlds
Single Concrete History	<b>E</b> : Hugh knows they will see up or down, and not both up and down. <b>M</b> : There is a matter of fact as to whether Hugh will see up or down.	<b>E</b> : Hugh knows they will see up or down, and not both up and down. <b>M</b> : There is no matter of fact as to whether Hugh will see up or down.
Many Concrete Histories	<b>E</b> : Hugh knows they will see up or down, and not both up and down. <b>M</b> : There is a matter of fact as to whether Hugh will see up or down, and at least one of Hugh's counterparts in another concrete world will see they result that they will not see.	<b>E</b> : Hugh knows they will see up or down, and not both up and down. <b>M</b> : Hugh will see up and down.

## A Mereological Vindication of the Hydra View

I propose a new type of mereological part of the world and the objects that populate it: branch-like parts (BLiPs). Objects in states of superposition at times after decoherence events are composed of object-BLiPs, where each object-BLiP lies along a distinct branch of the world (which is itself a world-BLiP) at a particular time. From this, solutions to the identity problem and the probability problem are possible.

	All Branches	One Branch
All Times	The whole x 	A complete possible history of an x-BLiP 
One Time (Or, one subset of history consisting of consecutive times between t <sub>1</sub> and t <sub>2</sub> )	A temporal part of x 	An x-BLiP 

## References

- Conroy, C. (2018). Everettian actualism. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 63, 24–33.
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- Wilson, A. (2020). *The Nature of Contingency: Quantum Physics as Modal Realism*. Oxford University Press.