Orthodoxies on the Interpretation of Quantum Theory: The Case of the Consistent Histories Approach

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Abstract:

Controversy over the interpretation of quantum theory continues to be, as once remarked by Max Jammer, "essentially a story without an ending." When he wrote his comprehensive book on the matter, in 1974, this story could be told as a dispute between the "almost unchallenged monocracy of the Copenhagen school" and its many disputers. While the recent history ad philosophy literature has shown that "Copenhagen" is a label that more hide than enlighten the history of this controversy, it has been argued (Bub, 1997) that "a modern, definitive version of the Copenhagen interpretation has emerged," which presents itself as "the interpretation of quantum mechanics, not an interpretation."

This updated orthodox interpretation has its own founding fathers, namely Robert Griffiths, Roland Omnès, Murray Gell-Mann, and James Hartle and was born between 1984 and 1990. Its usual presentation says that it brings together three different achievements: "the decoherence effect," "the emergence of classical physics from quantum theory," and the "constitution of a universal language of interpretation by means of consistent histories." According to Omnès (1999, 69), consistent histories, firstly suggested by Griffiths, is a method which "provides a logical structure for quantum mechanics and classical physics as well, " and "when these three ideas are put together, they provide a genuine theory of interpretation in which everything is derived directly from the basic principles alone and the rules of measurement theory become so many theorems."

It is indeed a bold claim, but one should consider that alternative interpretations such as of Bohm's 1952 hidden variable and Everett's 1957 relative states were also presented with analogous high stakes. Thus, one would like to know what share of orthodoxy relates to its affiliation to the views of the first founding fathers, even if updated, and what share concerns its claim to have solved the fundamental issues on the interpretation of quantum mechanics. In order to account, from the perspective of the history of science, the birth of this interpretation, I will dissect its supposed, or claimed, orthodoxy, paying attention both to their common and different views as well as the intellectual and professional background of their proponents. As an example, while Gell-Mann and Hartle (1990), coming from a background interested in cosmology, considered their approach "an attempt at extension, clarification, and completion of the Everett interpretation," Griffiths and Omnès (1999), more interested in foundational issues, did not acknowledge such an affiliation. However, when affiliations are at stake, the

reference to Hugh Everett is far from being unproblematic as the line between his work and Bohr's, through the role of Wheeler, is in itself highly complex (Osnaghi, Freitas, and Freire 2009). Finally, Bub's label is not innocent, it should be considered part of the mixed early reception of the consistent histories approach. Debates it have involved, in addition to Bub, physicists such as Kent, van Kampen, DeWitt, and Goldstein. Thus I also take into consideration its early reception and analyze these debates.