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A glimpse to Feynman's contributions to the debate on the foundations of quantum mechanics

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The wide debate on foundational issues in quantum mechanics, which took place at the famous 1957 Chapel Hill conference on "The Role of Gravitation in Physics", is here critically analysed with an emphasis on Richard Feynman's contributions [1, 2, 3]. One of the most debated questions at Chapel Hill was whether the gravitational field had to be quantized at all and its possible role in wave function collapse. Feynman's arguments in favor of the quantization of the gravitational field, based essentially on a series of gedanken experiments, are here discussed. Then we switch to the related problem of the wave function collapse, for which Feynman hints to decoherence as a possible solution. Finally, another topic is analysed, concerning the role of the observer in a closed Universe. In this respect, Feynman's many-worlds characterization of Everett's approach is discussed together with his later contributions, involving a kind of Schroedinger's cat paradox, scattered throughout the 1962-63 Lectures on Gravitation [4]. Philosophical implications of Feynman's ideas in relation to foundational issues are also discussed.

[1] C. DeWitt-Morette, D. Rickles, The Role of Gravitation in Physics, Report from the 1957 Chapel Hill Conference, Edition Open Access, Berlin, 2011.
[2] M. Di Mauro, S. Esposito, A. Naddeo, A road map for Feynman's adventures in the land of gravitation, arXiv: 2102.11220, submitted to Eur. Phys. J. H (2021).
[3] D. Zeh, Feynman's interpretation of quantum theory, Eur. Phys. J. H 36 (2011) 63.
[4] R. P. Feynman, F. B. Morinigo, W. G.Wagner and B. Hatfield, Feynman Lectures on Gravitation, Addison-Wesley, Reading, MA, 1995.

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